Power quality interface for low, medium and high voltage networks

Type PQI-D

- **in wall mounting housing**
- **in panel mounting housing**
- **as a 19" plug-in module**

1. Application

The state-of-the-art PQI-D power quality interface for medium and high voltage networks is the central component of a system for carrying out all of the required measurement tasks in electrical networks. PQI-D can be used both as a power quality interface according to DIN EN 50160 and as a measuring device for all physically defined measurement quantities in three-phase networks.

The component is primarily designed to monitor special reference qualities and quality agreements between the energy supplier and the customer, as well as to monitor, record, evaluate and store the data.

Modern voltage quality measuring devices operate according to the IEC 61000-4-30 standard. This standard defines measuring methods and so provides the user with a basis for comparison.

Devices from different manufacturers which function in accordance with this standard must provide the same measurement results.

The standard defines two different measuring devices classes.

- Class A measuring devices are used primarily for measurements related to contracts in the customer/supplier relationship,
- Class B measuring devices can be used for determining statistical quality values.

PQI-D complies with the requirements of IEC 610004-30 for Class A devices for all parameters.

Parameters	Class
Accuracy of voltage measurement	A
Determination of time intervals	A
Marking of measurement values for events	A
Harmonics, interharmonics	A
Frequency	A
Voltage asymmetry	A
Event recording	A
Synchronisation	A (with DCF77 or GPS)

In addition, three different fault value recorders can be used.

The **oscilloscope recorder** stores fault records which are composed of 100 µs-sampling values of freely selectable length (pre-event and post-event history)

The **r.m.s. recorder** stores fault records which are composed of the r.m.s. values of half period values (10 ms). The length of the fault record (pre-event and post-event history) is also freely selectable.

The **harmonics recorder** stores the corresponding spectrum of all harmonics from the 2nd to the 50th if a limit value (harmonic or THD of a voltage) is exceeded.

All fault records are triggered by a freely definable event. This enables phase-phase and phase-earth events to be recorded simultaneously.

Limit value violations can also be signalled via LEDs or relays if required.

The inputs and outputs of the interface can be supplied in various hardware versions; its later use is prescribed by the configuration of the input current transformer and the voltage transformer.

The PQI-D can also be used as a "genuine" fault recorder.

Input currents of up to 20 times the value of the nominal current can be measured using design features C21 or C31. In this way, the variation in time of currents before and after a fault can be recorded and evaluated for fault analysis.

The following input configurations can be selected:

- 4 voltage transformers for conventional power quality applications (feature C1)
- 8 voltage transformers for power quality applications in double busbar systems (feature C10)
- 4 voltage transformers and 4 current transformers for power quality tasks and general measurement tasks.

The following versions are also available:

- 5 binary outputs, 16 binary outputs, status output (feature M00)
- 3 binary outputs, 6 binary inputs, 4 analogue outputs, status output (feature M92)
- 6 binary outputs, status output (feature M93)
- 8 analogue outputs (feature M94)
- 6 analogue outputs, 2 relay outputs, status output (feature M95)
- 16 binary inputs, 4 analogue inputs and status output (features M97 / M98)

If the PQI-D is supplied in a 20TE or 30TE housing, the desired number and type of inputs and outputs on the terminal strip must be specified.

The version should be specified since the plug-in module offers a wide range of different inputs and outputs but the options for connecting terminals are limited.

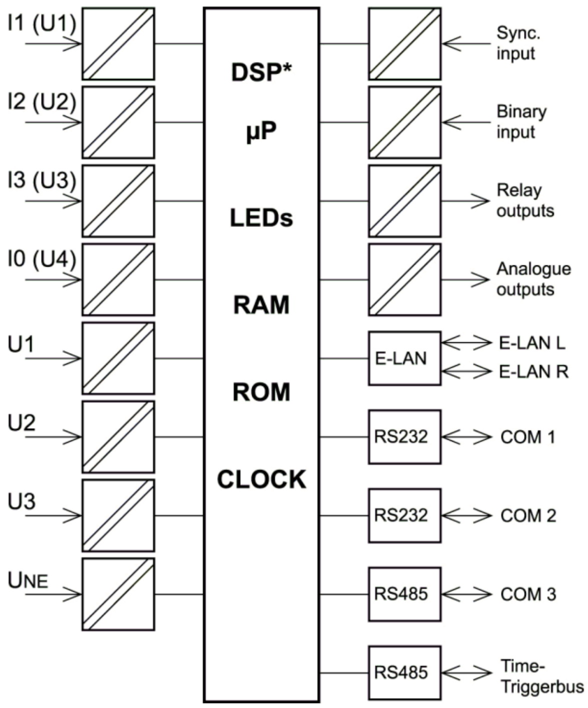
Up to 255 devices can be connected to one another via the system bus (E-LAN). Connections to the REGSys™ voltage regulation system and the EORSys Petersen coil regulation and earth fault detection system are always possible.

Each component has two RS 232 interfaces (COM 1 and COM 2), one RS485 bus interface (COM 3), two interfaces each for the E-LAN (Energy-Local Area Network) system and transport buses and two RS485 Time and Trigger buses.

1.1 Power quality interface features PQI-D

- Measuring the voltage quality acc. to DIN EN 50160
- Class A device according to IEC 61000- 4-30
- 10.24 kHz sampling frequency
- Fault recording function up to 20 • In
- Phase-phase and phase-earth measurements are possible simultaneously
- Voltage measurement channels for U12, U23, U31, UNE
- Additional measurement of currents I1, I2, I3, Io
- Determination of over 3000 measurement values
- Freely programmable limit values and output via isolated contacts
- Five freely programmable LEDs
- Freely programmable binary inputs to start or stop measurements remotely
- Adoption of conventional measurement transducer functions; up to eight measurement quantities can be selected and output via mA signal
- Evaluation of data via a mySQL-supported database using the WinPQ software package
- Connection to the control system according to IEC 870-5-103
- Connection to control technology according to IEC 61850

1.2 Description



* DSP : Digital Signal Processor

Power quality interface function

2. Technical characteristic values

Regulations and standards

IEC 61010-1 / DIN EN 61010-1

IEC 60255-22-1 / DIN EN 60255-22-1

IEC 61326-1 / DIN EN 61326-1

IEC 60529 / DIN EN 60529

IEC 60068-1 / DIN EN 60068-1

IEC 60688 / DIN EN 60688

IEC 61000-6-2 / DIN EN 61000-6-2

IEC 61000-6-4 / DIN EN 61000-6-4

IEC 61000-6-5 / DIN EN 61000-6-5

Electromagnetic compatibility	
Interference emissions	Group 1 limit class A according to EN 55011:1991
Interference immunity	Electrostatic discharge according to EN 61000-4-2:1995 Air discharge: 8 kV Contact discharge: 4 kV Electromagnetic fields according to EN 50140:1993 and ENV 50204:1995 80 - 1000 MHz: 10 V/m 900 ± 5 MHz: 10 V/m pulse modulated Fast transient interferences (bursts) acc. to EN 61000-4-4: 1995 Supply voltage 230 V AC: 2 kV; Data cables 1 kV Conducted interferences acc. to ENV 50141:1993 0.15 - 80 MHz: 10 Veff 50 Hz magnetic fields according to EN 61000-4-8:1993 30 A/m

Voltage inputs		
Option	**E1**	**E2**
Nominal voltage	100 V	230 V
Voltage end range	200 V	460 V
Input resistance	360 k Ω	810 k Ω
Measurement fault	< ±0.1% von U_{din} Range 10% ... 150% of U_{din}	
Phase error	< ± 0.15° Range 50% ... 150% of U_{din}	
Bandwidth	DC...3 kHz	
Harmonics 2nd ... 50th Measurement fault	< ±5% of meas. value U_m = 1% ... 16% of U_{din} < ±0.05% of U_{din} - U_m < 1% of U_{din}	
Interharmonics 2th ... 49th Measurement fault	< ±5% of meas. value U_m = 1% ... 16% of U_{din} < ±0.05% of U_{din} - U_m < 1% of U_{din}	
Insulation category	CAT III / 300 V	

*) Note: See features list on pages 24 and 25 for feature characteristics, e.g."E1, E2, C20, C31..."

Current inputs

Option	C20	C21	C30	C31
Nominal current	1 A		5 A	
Current end range	0 < I ≤ 2 A	0 < I ≤ 20 A	0 < I ≤ 10 A	0 < I ≤ 100 A
Load (In)	< 0.1 VA		< 0.5 VA	
Measurement fault	< ± 0.1% of measurement value			< ± 0.2% of meas-urement value
Phase error	< ± 0.15° Range 10% ... 100%	< ± 0.15° Range 5% ... 50%	< ± 0.15° Range 10% ... 100%	< ± 1.0° Range 5% ... 10%
Bandwidth	25 Hz...3 kHz			
Harmonics 2nd ... 50th Measurement fault	< ±5% of measurement value- I_m = 1%...16% of I_n < ±0.05% von I_n - I_m < 1% von I_n			< ±10% of measure-ment value I_m = 1% ... 16% of I_n < ±0.1% of I_n I_m < 1% von I_n
Interharmonics 2nd ... 49th Measurement fault	< ±5% of measurement value I_m = 1% ... 16% of I_n < ±0.05% von I_n - I_m < 1% von I_n			< ±10% of measure-ment value I_m = 1% ... 16% of I_n < ±0.1% of I_n I_m < 1% of I_n
Overload capacity permanent ≤ 10 s ≤ 1 s ≤ 5 ms	5 A 10 A 30 A 100 A	10 A 30 A 100 A 500 A		
Insulation category	CAT III / 300 V			

Feature C40: mV inputs for Rogowski coils

Input resistance	10 kΩ
Full scale range	150 mV

Note : In order to guarantee measurement accuracy only Rogowski coils from A. Eberle GmbH & Co. KG should be used.

Feature C41: mV-inputs for mini clamps

Input resistance	2 M Ω
Full scale range	230 mV

Analogue outputs (AO)

See ordering information for number

Output range – Y1...Y2	-20 mA...0...20 mA Y1 and Y2 programmable
Electrical isolation	Optocoupler
Load range	0 ≤ R ≤ 8 V / Y2
Alternating component	<0.5 % von Y2

The outputs can be continuously short-circuited or operated open. All output connections are galvanically isolated from all other circuits.

Binary inputs (BI)

Control signals U_{st}	In the range AC/DC 48 V...230 V (additional voltage ranges available on request)
Curve shapes – H – level – L – level	Rectangular, sinusoidal ≥ 35 V < 20 V
Signal frequency	DC ... 60 Hz
Switching delay	Selectable from 1..999 s
Input resistance	108 kΩ
Electrical isolation	Optocoupler; all inputs earthed on one side

Binary outputs (BO)	
Max. Switching frequency	≤ 1 Hz
Electrical isolation	Isolated from all device-internal potentials
Contact load	AC: 250 V, 5 A $(\cos\varphi = 1{,}0)$ AC: 250 V, 3 A $(\cos\varphi = 0{,}4)$ DC: 220 V, 150 W Switching capacity
No. Of switching operations	≥ $1 \cdot 10^4$ electrical

Limit value monitoring	
Limit values	programmable
Response times	programmable
Alarm displays	LED programmable relay programmable

Measurements quantities (selection from over 3000 meas. quantities)	
Voltages TRMS	U_{1N}, U_{2N}, U_{3N}, U_{NE}, U_{12}, U_{23}, U_{31}
Current TRMS	I_1, I_2, I_3, I_0
Active power	P_n
Reactive power	Q_n
Apparent power	S_n
Power factors	$\cos \varphi_n$
Harmonics	U / I up to 50.
Interharmonics	U / I DC up to 49.
Frequency	f

Reference conditions	
Reference temperature	23°C ± 1 K
Input quantities	U_E = 90 ... 110V I_E = 0 ... 1A / 0 ... 5A
Auxiliary voltage	H = Hn ± 1 %
Frequency	50 Hz...60 Hz
Load	Rn = 4 V / Y2 ± 1 %

Reference conditions	
(for features M92; M94 only)	
Other	IEC 688 - Part 1

Data acquisition	
Error limit — all errors compared to Y2	
Voltage	0,1 %
Current	0,1 % (C20, C30) 0,5 % (C21, C31)
Frequency	0,01 % (i.e. @ 50 Hz ⇒ 5 mHz)
Powers and all other quantities	0,25 % (C20, C30) 1,0 % (C21, C31)
Measurement cycle time	10 ms / 200 ms
Sampling rate	10240 Hz
ADC resolution	24bit
Anti-Aliasing filter – Analogue filter – Digital filter	 3rd order Butterworth Filter sinc5 decimation filter (ADC)
Nominal frequency	f_{nom} = 50 Hz, 60 Hz
Frequency measuring range	f_{nom} ±15%

Storage of measurement values	
Memory	64 MB

Electrical safety	
Protection class	I
Degree of pollution	2
Overvoltage category	II, III

III	II
Current and voltage inputs Auxiliary voltage	Control circuits Analogue outputs COM´s, E-LAN

Operating voltages		
50 V	**150 V**	**230 V**
E-LAN, COM1 ... COM3 Analogue outputs Time- / Trigger-BUS	Voltage input (E1) Current input	Voltage input (E2) Auxiliary voltage Binary inputs Relay outputs

Test voltages	
Mounting rack / housing	2.5 kV
Auxiliary voltage	3.1 kV
COM´s, E-LAN, Time-/Trigger-BUS	0.35 kV
Binary outputs	1.8 kV
Binary inputs (250 V)	1.8 kV
Analogue outputs	0.35 kV
Input voltage (E1, E2)	1.4 kV
Input currents	1.4 kV

Note: All test voltages are AC voltages in kV, which may be applied for 1 minute

Power supply		
Feature	**H1**	**H2**
AC	90 ... 264 V	-
DC	100 ... 300 V	18 ... 72 V
Power consumption.	≤ 15 VA	≤ 15 Watt
Frequency	45 ... 400Hz	-
Microfuse	T2 250 V	T2 250 V

The following applies to all features:
Voltage dips of ≤ 80 ms cause neither a loss of data nor a malfunction

Climatic stability	
Temperature range – Function (housing) – Function (plug-in module) – Transport and storage	 -10 °C ... +50 ° -10 °C ... +60 °C -25 °C ... +65 °C

Data storage	
Device parameters	serial EEPROM with ≥ 1000 k write/read cycles
RAM - data	Li battery laser welded

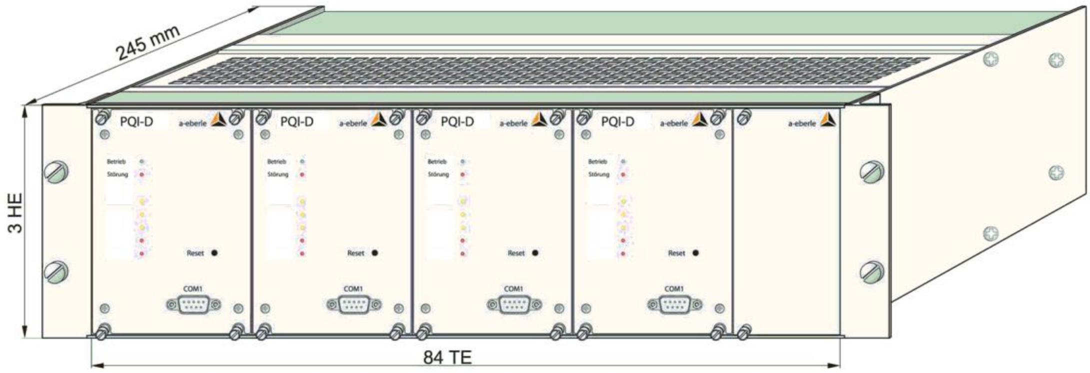
3. Mechanical design

Plug-in module	
Front panel	aluminium, RAL 7035 grey
Height	3 HE (132.5 mm)
Width	18 TE (91.44 mm)
Circuit board	160 mm x 100 mm
Weight	≤ 1.0 kg
Degree of protection – Plug-in module – Socket connector	 IP 00 IP 00
Mounting	According to DIN 41494 part 5
Plug-in connectors	DIN 41612

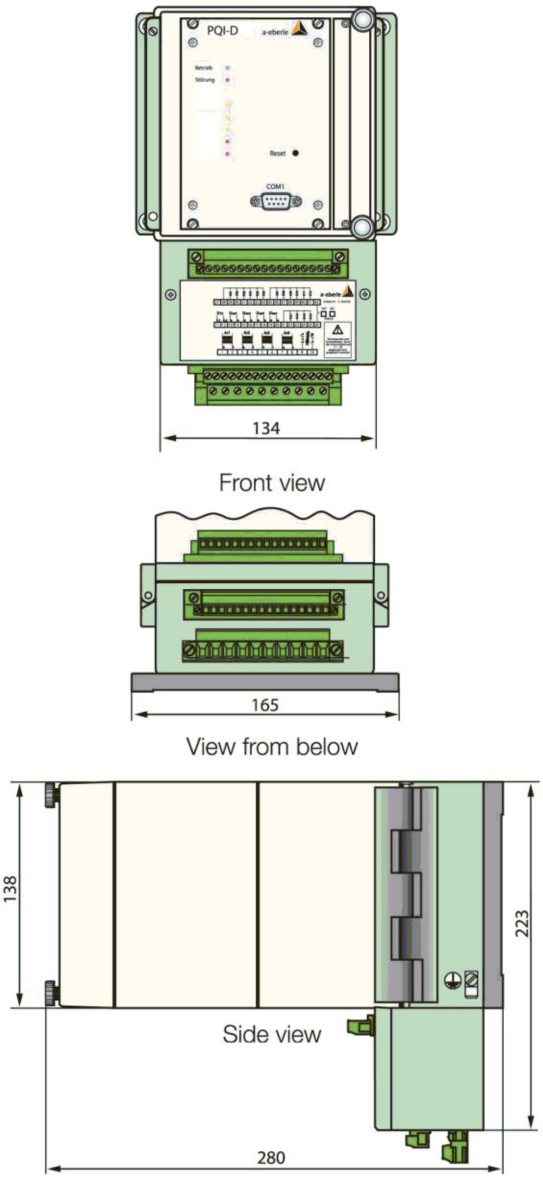
Housing

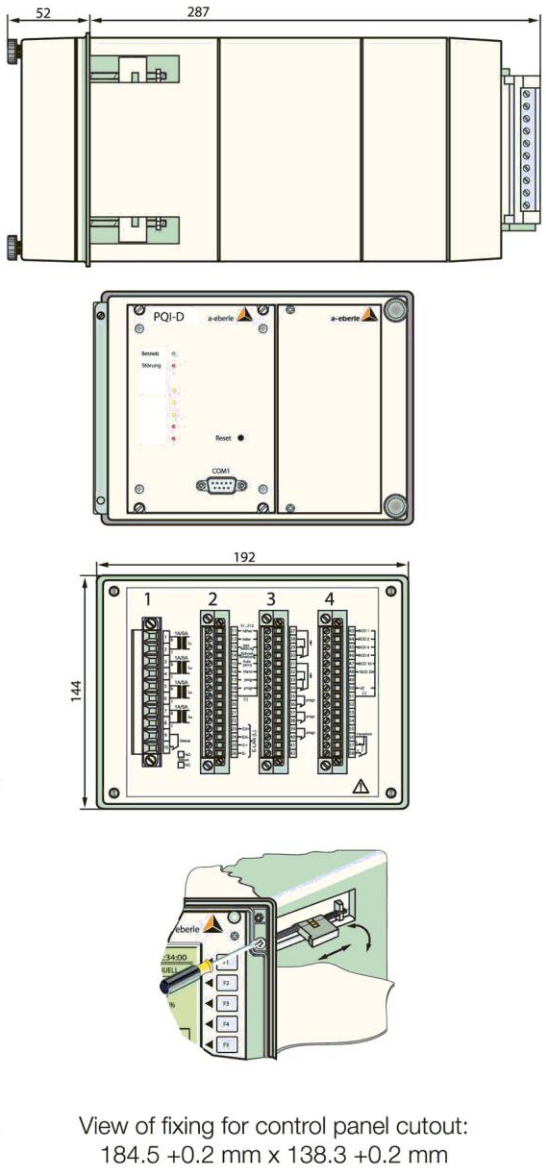
The PQI-D is also very flexible with regard to the type of housing used. Some possible types of housing are described below. The standard versions are the two described at feature B90 and feature B92. Since the number of inputs, outputs, COMs, etc. in a 19" plug-in module is much greater than the number of available terminals on the housing, pin assignment must be individually specified for versions B90...B92.

Material	plastic
Degree of protection	housing IP 65
Weight	≤ 1.5 kg
Dimensions	See figures 5 and 6
Connection elements	Screw terminals



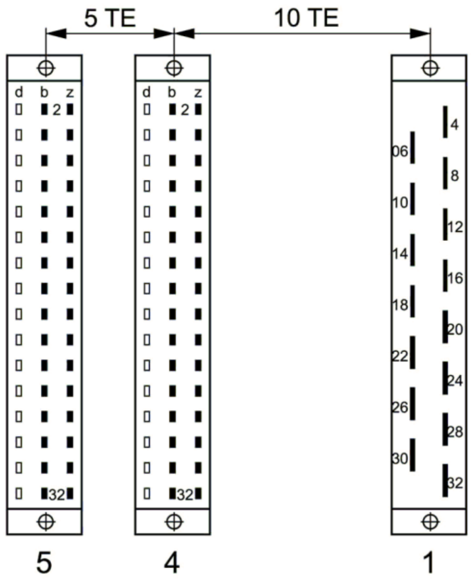
19" plug-in modules in mounting rack 84 TE feature B92



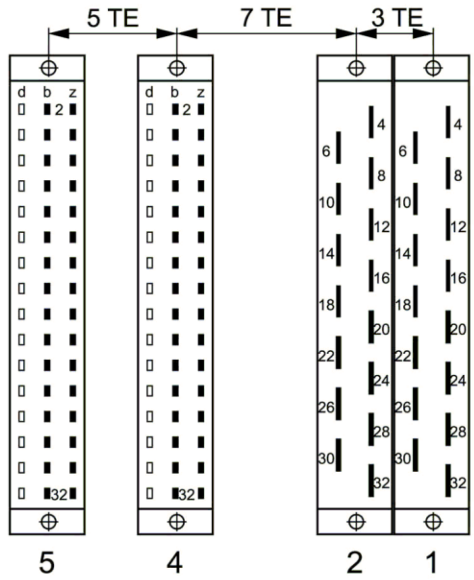


Wall-mounted housing 20TE - feature B90

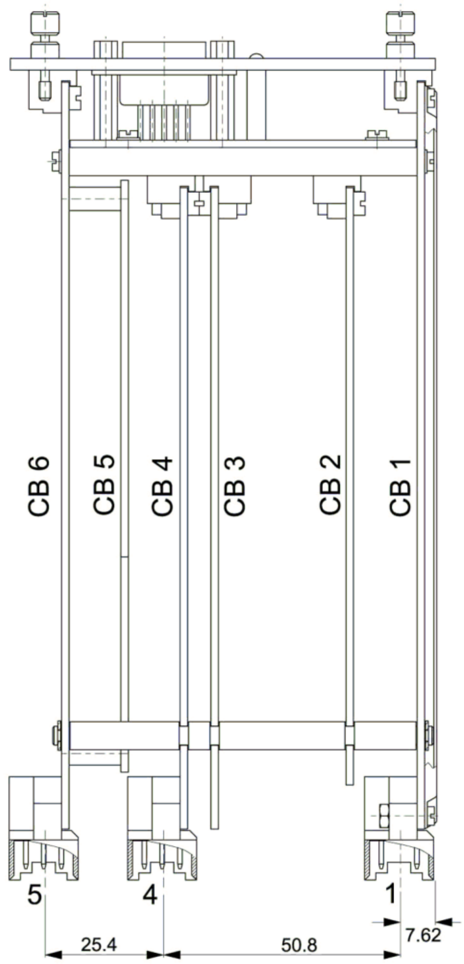
Panel mounting housing 30TE feature - B91



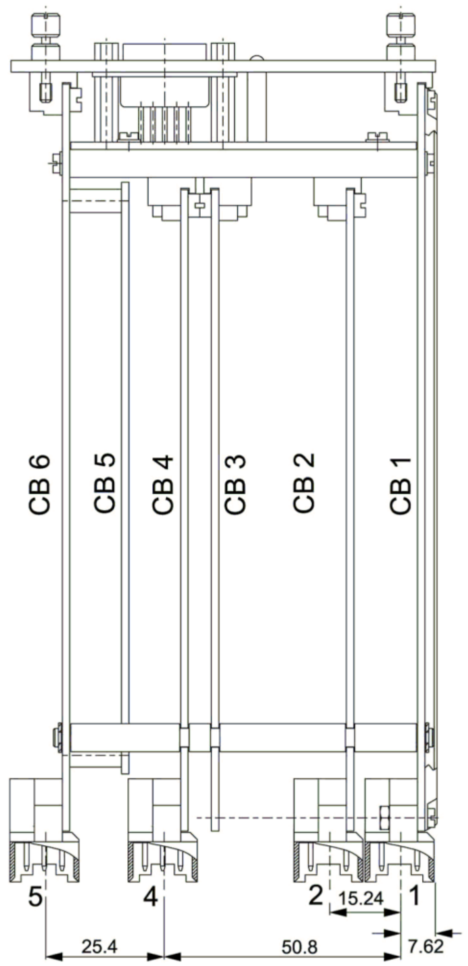
Position of socket connectors for feature C00



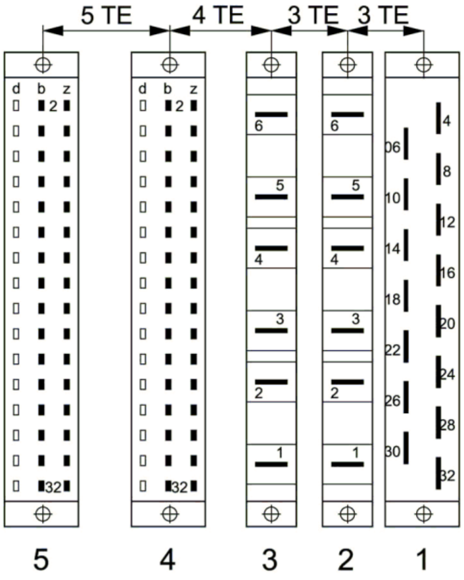
Position of socket connectors for feature C10



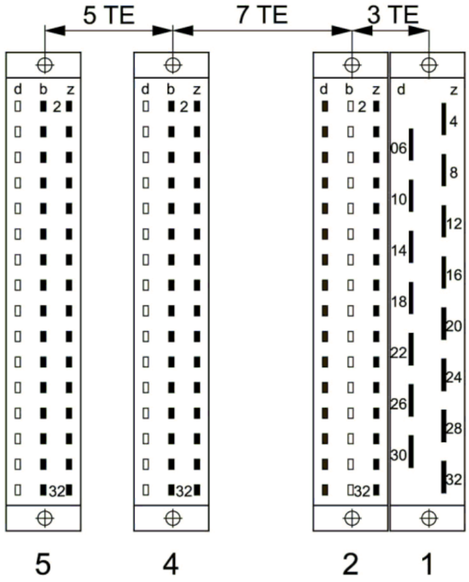
Position of blade connectors and PCBs for feature C00



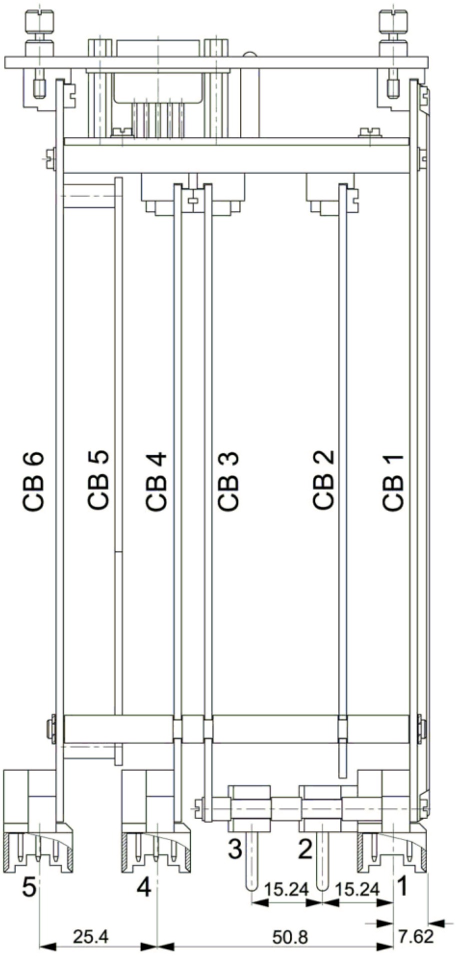
Position of blade connectors and PCBs for feature C10



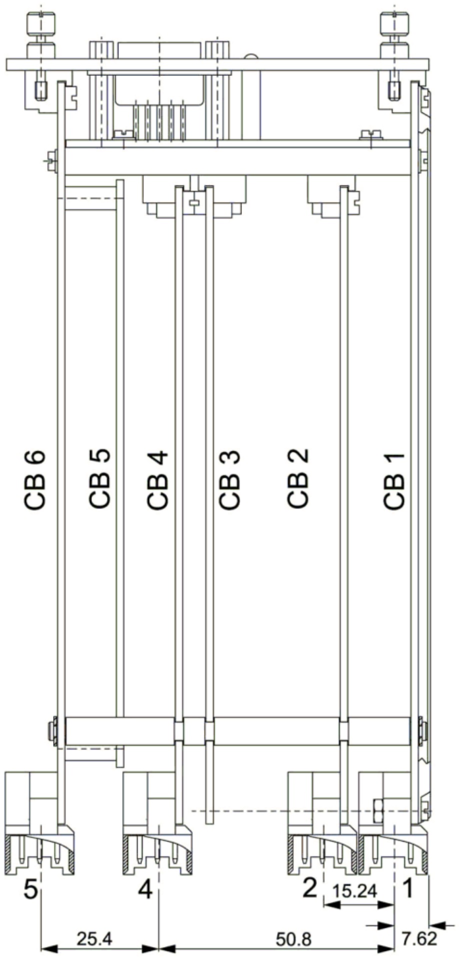
Position of the socket connectors for feature C20... C31



Position of the socket connectors for feature C40... C41



Position of the blade connectors and PCBs for feature C20...C31



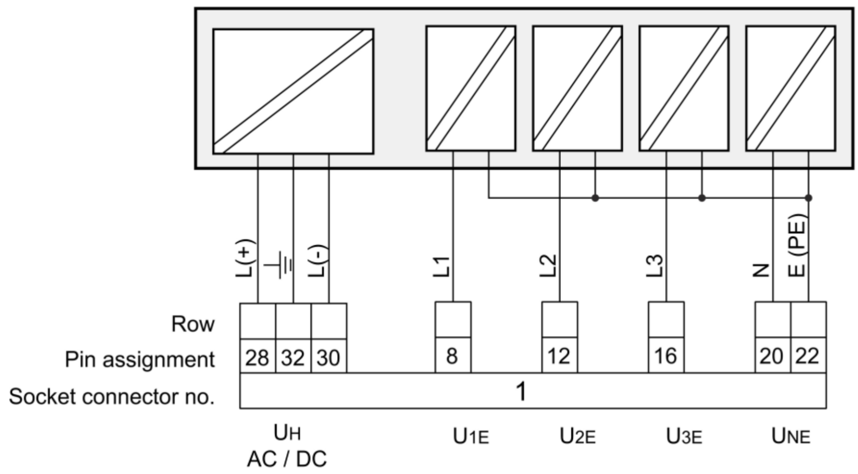
Position of the blade connectors and PCBs for feature C40...C41

4. Assignment of socket connectors 1 ... 5

Note:
Please refer to pages 7 and 8 for the position of the socket connectors

Socket connector 1 (obligatory for all feature combinations C00 ... C31)

Auxiliary voltage, voltage inputs
Input voltages U_{1E}...U_{3E}, U_{NE}, U_{sync} and auxiliary voltage



Designation		Function	Pin	assignment
Phase voltage L1 (AC)	U_{1E}	L1	8	
		E	22	
Phase voltage L2 (AC)	U_{2E}	L2	12	
		E	22	
Phase voltage L3 (AC)	U_{3E}	L3	16	
		E	22	
Neutral earth voltage	U_{NE}	N	20	
		E (PE)	22	
Auxiliary voltage	U_H	L (+)	28	
		L (-)	30	
Auxiliary voltage	U_H	PE	32	

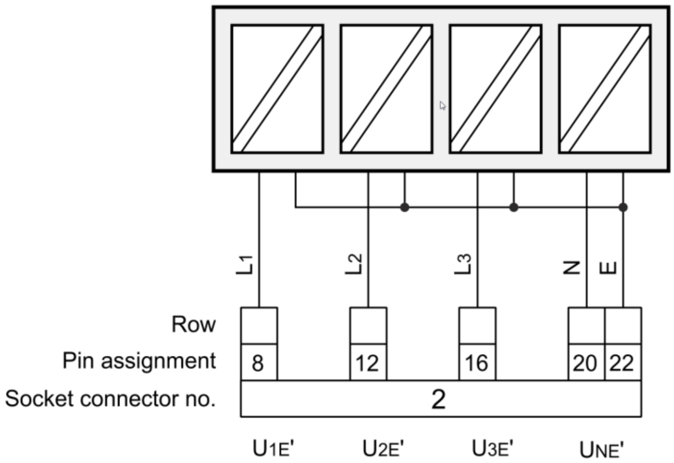
Voltage inputs U_{1E} ... U_{3E} can be used for a rated value of up to 110 V (E1) or 230 V (E2).

Socket connector 2 – is not required for feature C00

Socket connector 2 – feature C10

4 voltage inputs

Note: voltages for busbar 2 are indicated by

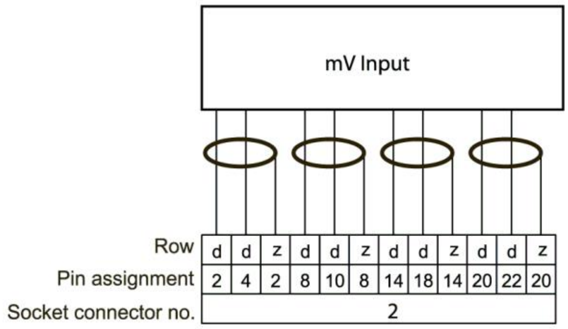


Designation		Function	Pin	assignment
Phase voltage L1 (AC)	U_{1E}	L1	8	
		E	22	
Phase voltage L2 (AC)	U_{2E}	L2	12	
		E	22	
Phase voltage L3 (AC)	U_{3E}	L3	16	
		E	22	
Neutral earth voltage	U_{NE}	N	20	
		E (PE)	22	

Socket connector 2 – features C40 and C41

4 current inputs for current clamps

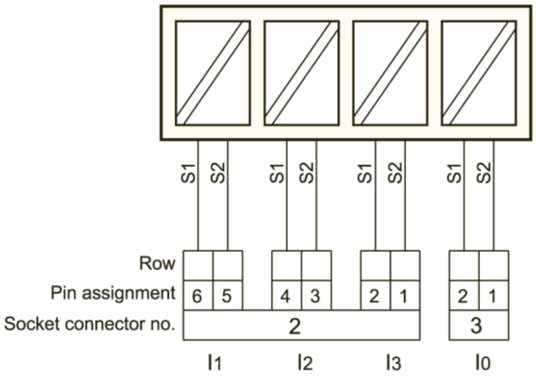
Note: The mV inputs are not galvanically isolated from each other or from the CPU



Designation		Function	Pin	assignment
Phase current I1 (AC)	I_1	+	d2	
		-	d4	
		Shielding	z2	
Phase current I2 (AC)	I_2	+	d8	
		-	d10	
		Shielding	z8	
Phase current I3 (AC)	I_3	+	d14	
		-	d16	
		Shielding	z14	
Sum current (AC)	I_0	+	d20	
		-	d22	
		Shielding	z20	

Socket connector - feature C20 ... C31

Current inputs via high-current contact with upstream short-circuit contact



Designation		Function	Pin	assignment
Phase current I1 (AC)	I_1	S1	6	
		S2	5	
Phase current I2 (AC)	I_2	S1	4	
		S2	3	
Phase current I3 (AC)	I_3	S1	2	
		S2	1	

Socket connector - feature C20 ... C31

Current inputs

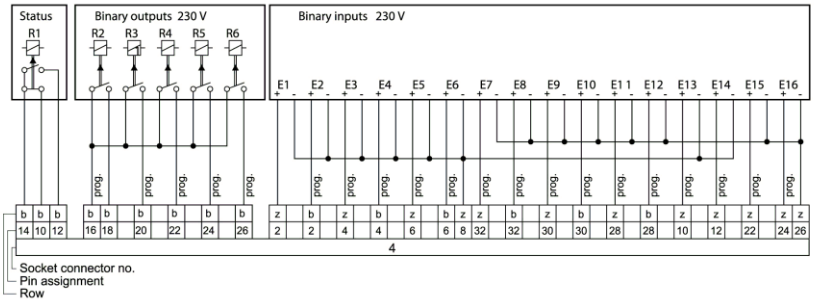
Version with:	4	voltage inputs and
	4	current inputs with high-current contacts

Designation		Function	Pin	assignment
Not assigned	-	-	6	
		-	5	
Not assigned	-	-	4	
		-	3	
Sum current (AC)	I_0	S1	2	
		S2	1	

Socket connector 4 - feature M00 / M96

Binary inputs, outputs

Version with:	16	binary inputs
	5	binary outputs (NO contacts)
	1	status relay

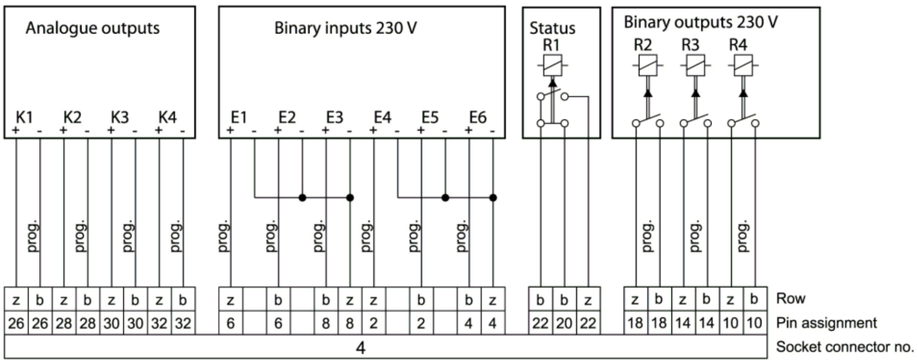


Designation		Function	Pin	Comments
Status	Relay R1	NC contact NO contact Pole	b10 b12 b14	Freely programmable
Binary outputs 230 V	R2	NO contact	b18	Freely programmable
	R3	NO contact	b20	Freely programmable
	R4	NO contact	b22	Freely programmable
	R5	NO contact	b24	Freely programmable
	R6	NO contact	b26	Freely programmable
	R2...R6	Pole	b16	
Binary inputs 230 V	E1	+	z2	Freely programmable
	E2	+	b2	Freely programmable
	E3	+	z4	Freely programmable
	E4	+	b4	Freely programmable
	E5	+	z6	Freely programmable
	E6	+	b6	Freely programmable
	E1...E6, E13, E14	GND	z8	
	E7	+	z32	Freely programmable
	E8	+	b32	Freely programmable
	E9	+	z30	Freely programmable
	E10	+	b30	Freely programmable
	E11	+	z28	Freely programmable
	E12	+	b28	Freely programmable
	E13	+	z10	Freely programmable
	E14	+	z12	Freely programmable
	E15	+	z22	Freely programmable
	E16	+	z24	Freely programmable
	E7...E12, E15, E16	GND	z26	

Socket connector 4 - feature M92

Binary inputs, outputs, analogue outputs

Version with:	6	binary inputs
	2	binary outputs (NO contacts)
	4	analogue outputs
	1	status relay

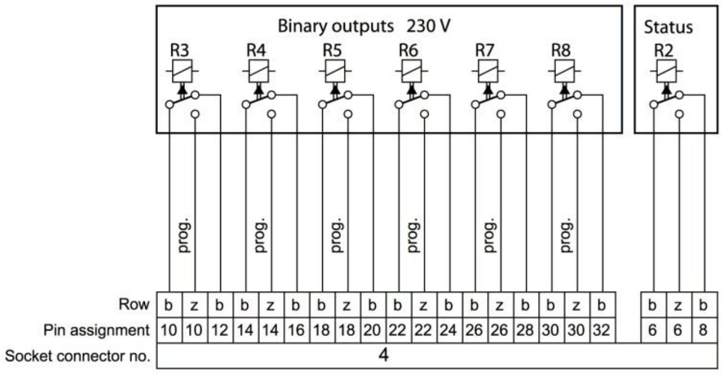


Designation		Function	Pin	Comment
Analogue outputs	K1	+ -	z26 b26	Freely programmable
	K2	+ -	z28 b28	Freely programmable
	K3	+ -	z30 b30	Freely programmable
	K4	+ -	z32 b32	Freely programmable
Binary inputs 230 V	E1	+	z6	Freely programmable
	E2	+	b6	Freely programmable
	E3	+	b8	Freely programmable
	E1...E3	GND	z8	
	E4	+	z2	Freely programmable
	E5	+	b2	Freely programmable
	E6	+	b4	Freely programmable
	E4...E6	GND	z4	
Binary outputs 230 V	Status R1	NC contact NO contact Pole	z20 z22 b22	
Binary outputs 230 V	R2	NC contact NO contact	b18 z18	Freely programmable
	R3	NC contact NO contact	b14 z14	Freely programmable
	R4	NC contact NO contact	b10 z10	Freely programmable

Socket connector 4 - feature M93

Binary outputs

Version with: 6 Binary outputs
1 Status relay

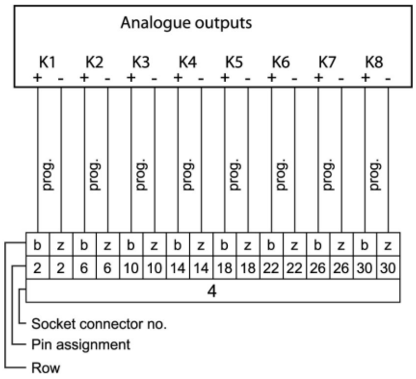


Designation		Function	Pin	assignment
Binary outputs 230 V (Relays 1....6)	R3	Pole NC contact NO contact	b10 b12 z10	Freely programmable
	R4	Pole NC contact NO contact	b14 b16 z14	Freely programmable
	R5	Pole NC contact NO contact	b18 b20 z18	Freely programmable
	R6	Pole NC contact NO contact	b22 b24 z22	Freely programmable
	R7	Pole NC contact NO contact	b26 b28 z26	Freely programmable
	R8	Pole NC contact NO contact	b30 b32 z30	Freely programmable
Binary outputs 230 V	Status R2	Pole NC contact NO contact	b6 b8 z6	

Socket connector 4 - feature M94

Analogue outputs

Version with: 8 Analogue outputs

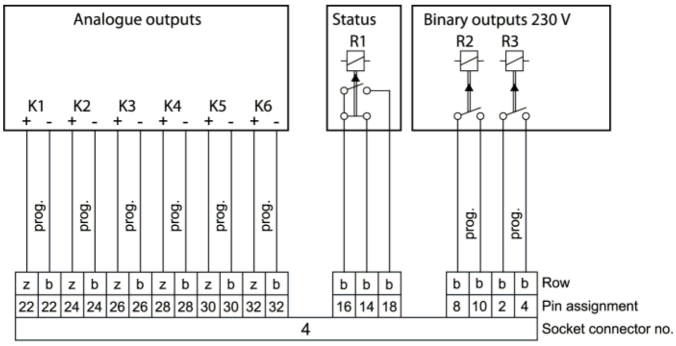


Designation		Function	Pin	Comments
Analogue outputs	K1	mA output + -	b2 z2	Freely programmable
	K2	mA output + -	b6 z6	Freely programmable
	K3	mA output + -	b10 z10	Freely programmable
	K4	mA output + -	b14 z14	Freely programmable
	K5	mA output + -	b18 z18	Freely programmable
	K6	mA output + -	b22 z22	Freely programmable
	K7	mA output + -	b26 z26	Freely programmable
	K8	mA output + -	b30 z30	Freely programmable

Socket connector 4 - feature M95

Analogue outputs, binary outputs

Version with:	6	Analogue outputs
	2	Binary outputs (NO contacts)
	1	Status relay

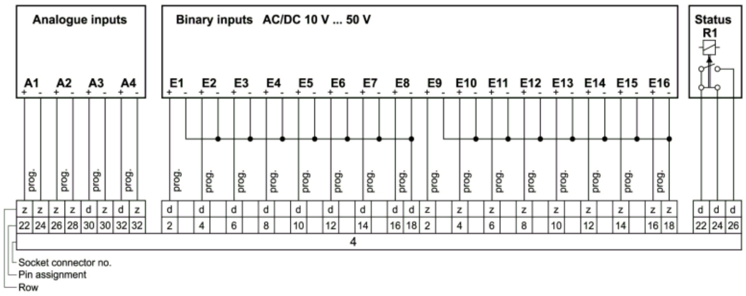


Designation		Function	Pin	Comment
Analogue outputs	K1	+ -	z22 b22	Freely programmable
	K2	+ -	z24 b24	Freely programmable
	K3	+ -	z26 b26	Freely programmable
	K4	+ -	z28 b28	Freely programmable
	K5	+ -	z30 b30	Freely programmable
	K6	+ -	z32 b32	Freely programmable
Binary outputs 230 V	Status R1	NC contact NO contact Pole	b14 b18 b16	
Binary outputs 230 V	R2	NC contact NO contact Pole	b10 b8	Freely programmable
	R3	NC contact NO contact Pole	B4 b2	Freely programmable

Socket connector 4 – feature M97

Binary inputs, analogue inputs

Version with: 16 Binary inputs
4 Analogue inputs
1 Status relay

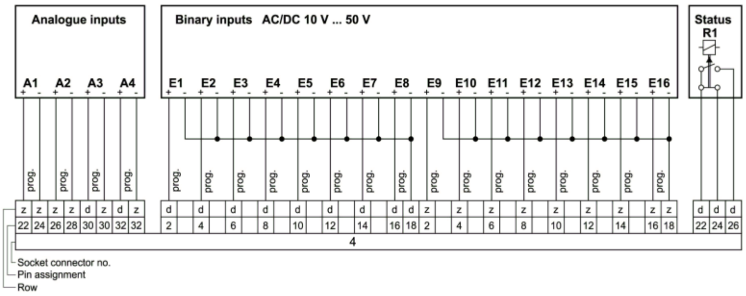


Designation		Function	Pin	Comments
Analogue inputs	A1	+ -	z22 z24	Freely programmable
	A2	+ -	z26 z28	Freely programmable
	A3	+ -	d30 z30	Freely programmable
	A4	+ -	d32 z32	Freely programmable
Binary inputs 230 V	E1	+	d2	Freely programmable
	E2	+	d4	Freely programmable
	E3	+	d6	Freely programmable
	E4	+	d8	Freely programmable
	E5	+	d10	Freely programmable
	E6	+	d12	Freely programmable
	E7	+	d14	Freely programmable
	E8	+	d16	Freely programmable
	E1...E8	GND	d18	
	E9	+	z2	Freely programmable
	E10	+	z4	Freely programmable
	E11	+	z6	Freely programmable
	E12	+	z8	Freely programmable
	E13	+	z10	Freely programmable
	E14	+	z12	Freely programmable
	E15	+	z14	Freely programmable
	E16	+	z16	Freely programmable
	E9...E16	GND	z18	
Status	Relay R1	NC contact NO contact Pole	d24 d26 d22	

Socket connector 4 – feature M98

Binary inputs, analogue inputs

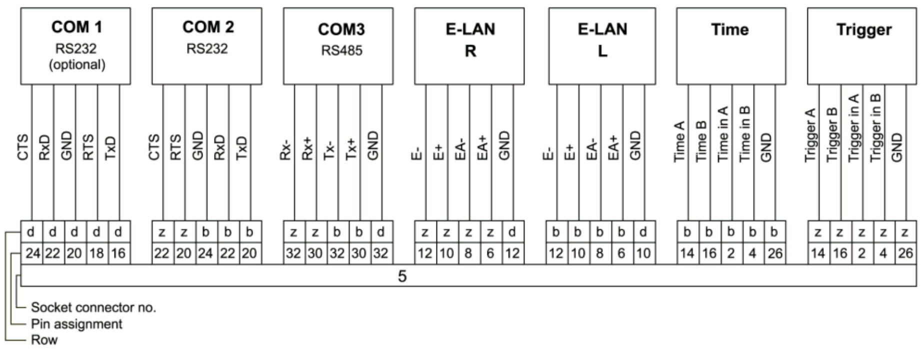
Version with:	16	Binary inputs
	4	Analogue inputs
	1	Status relay



Designation		Function	Pin	Comments
Analogue inputs	A1	+ -	z22 z24	Freely programmable
	A2	+ -	z26 z28	Freely programmable
	A3	+ -	d30 z30	Freely programmable
	A4	+ -	d32 z32	Freely programmable
Binary inputs 230 V	E1	+	d2	Freely programmable
	E2	+	d4	Freely programmable
	E3	+	d6	Freely programmable
	E4	+	d8	Freely programmable
	E5	+	d10	Freely programmable
	E6	+	d12	Freely programmable
	E7	+	d14	Freely programmable
	E8	+	d16	Freely programmable
	E1...E8	GND	d18	
	E9	+	z2	Freely programmable
	E10	+	z4	Freely programmable
	E11	+	z6	Freely programmable
	E12	+	z8	Freely programmable
	E13	+	z10	Freely programmable
	E14	+	z12	Freely programmable
	E15	+	z14	Freely programmable
	E16	+	z16	Freely programmable
	E9...E16	GND	z18	
Status	Relay R1	NC contact NO contact Pole	d24 d26 d22	

Socket connector 5 Interfaces

COM2 and COM3 communication, E-LAN, Time- / Trigger-BUS



Designation	Function	Pin
COM 1 RS 232	CTS	d24
	RxD	d22
	GND	d20
	RTS	d18
	TxD	d16
COM 2 RS 232	CTS	z22
	RTS	z20
	GND	b24
	RxD	b22
	TxD	b20
COM 3 RS 485	Rx -	z32
	Rx +	z30
	Tx -	b32
	Tx +	b30
	GND	d32
E-LAN R (right)	E-	z12
	E+	z10
	EA-	z8
	EA+	z6
	GND	d12
E-LAN L (left)	E-	b12
	E+	b10
	EA-	b8
	EA+	b6
	GND	d10
Time	Time A	b14
	Time B	b16
	Time in A	b2
	Time in B	b4
	GND	b26

Designation	Function	Pin
Trigger	Trigger A	z14
	Trigger B	z16
	Trigger in A	z2
	Trigger in B	z4
	GND	z26

5. Serial interfaces

RS232 interfaces

The PQI-D has two RS232 serial interfaces (COM1, COM2). COM1 is accessible via the D-Sub socket on the front of the device or via the screw terminals / D-Sub socket on the housing; COM2 is accessed via the screw terminals or the D-Sub on the housing.

COM2 is used to connect the regulating system to higher-level control systems or modems.

Connection elements

COM1	Pin strip, Sub Min D, on front of device pin assignment as on PC
COM2	Terminal strip (circuit board CB4)
Connection possibilities	PC, Terminal, Modem, PLC
Number of data bits/ protocol	Parity 8, even, off, odd
Transmission rate bit/s	1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200
Handshake	RTS / CTS or XON / XOFF

RS485 interfaces

Each PQI-D is equipped with a double E-LAN interface as standard. This provides bus connections to other PQI-Ds, to REG-D voltage regulators, REG-DP Petersen coil regulators and the EORSys earth fault locating system.

E-LAN (Energy- Local Area Network)

Features

- 255 bus stations can be addressed
- Multi-master structure
- Integrated repeater function
- Open ring, bus or combination of bus and ring
- Protocol based on SDLC/HDLC framework
- Transmission rate 62.5 or 125 kbit / s
- Telegram length 10... 30 Bytes
- Average throughput approx. 100 telegrams / s

COM3

For connection of ≤ 8 interface modules (BIN-D, ANA-D) in any combination to each PQI-D.

Time and trigger bus

Several devices can be accurately synchronised via the time bus.

The trigger bus makes it possible to trigger a device on the basis of an event on another measuring device

Hardware-oriented device versions

The flexibility of the system, i.e. precisely matching specific requirements, can also be achieved using the hardware characteristics of the input and output configuration.

Tables 1 and 2 show the different possibilities.

A few typical possibilities have been selected from a total of 15, and these are shown under the heading "Application examples".

Further individual adaptations can also be achieved by specially programming the device.

Measurement inputs

Feature	
C00	4 voltage inputs (100 V / 230 V)
C10	8 voltage inputs (100 V / 230 V) for double busbar system
C20 ... C31	4 voltage inputs (100 V / 230 V), 4 current inputs (1 A / 5 A)
C40 / C41	4 voltage inputs (100 V / 230 V), 4 current inputs for current clamps (mV)

Table 1

Binary inputs and outputs, analogue outputs

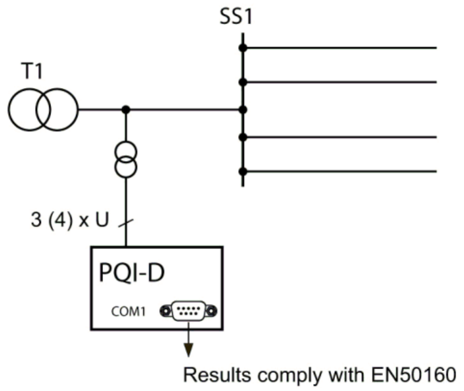
Feature	BO	BI	AO	AI	Status / life contact
M00	5	16	-	-	1
M92	3	6	4	-	1
M93	6	-	-	-	1
M94	-	-	8	-	-
M95	2	-	6	-	1
M96	5	16	-	-	1
M97	-	16	-	4	1
M98	-	16	-	4	1

Table 2

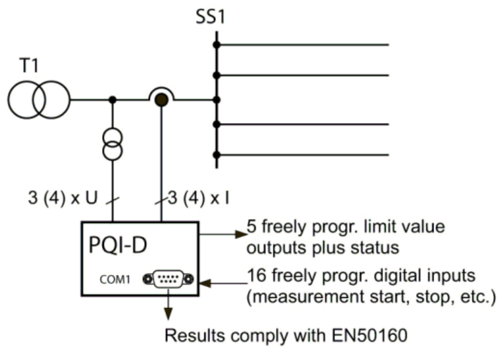
BO: Relay Outputs
BI: Binary Inputs
AO: Analogue Outputs
AI: Analogue Inputs

Application Examples (a selection)

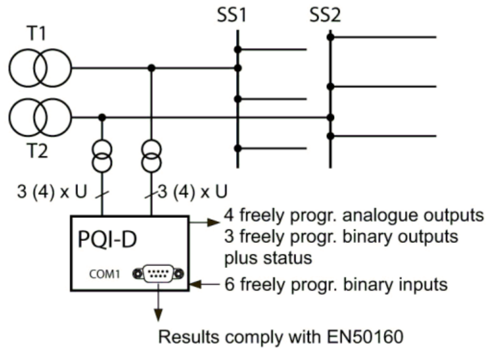
By combining feature groups "C" and "M", there are 36 possible device versions.
Four typical hardware versions are described below.



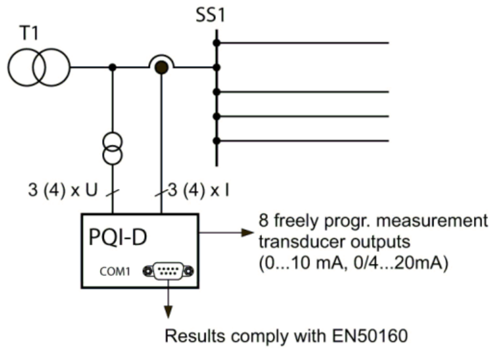
Features... C00 ...



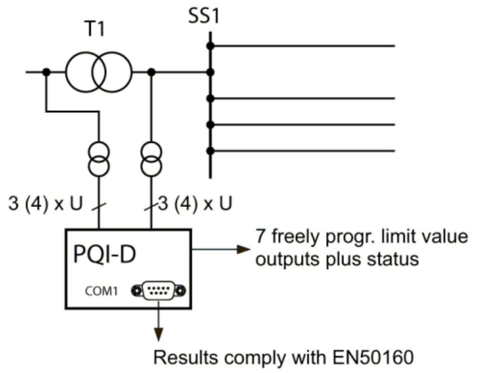
Features... C20 - C31 M00 ...



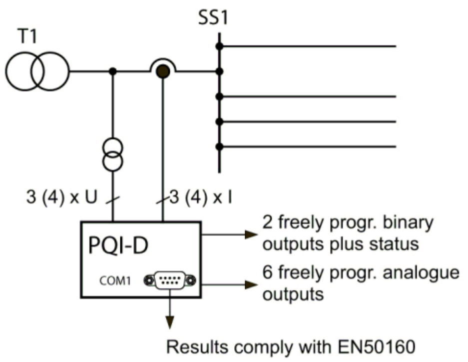
Features... C10 M92 ...



Features... C20 - C31 M94 ...

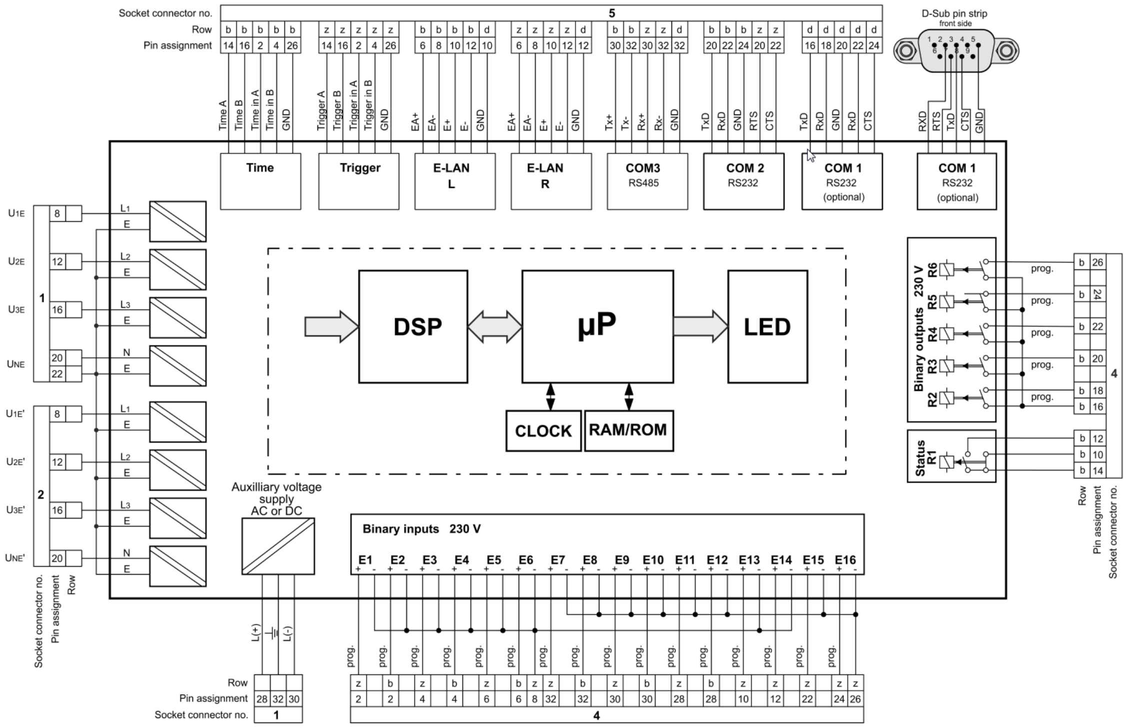


Features... C10 M93 ...

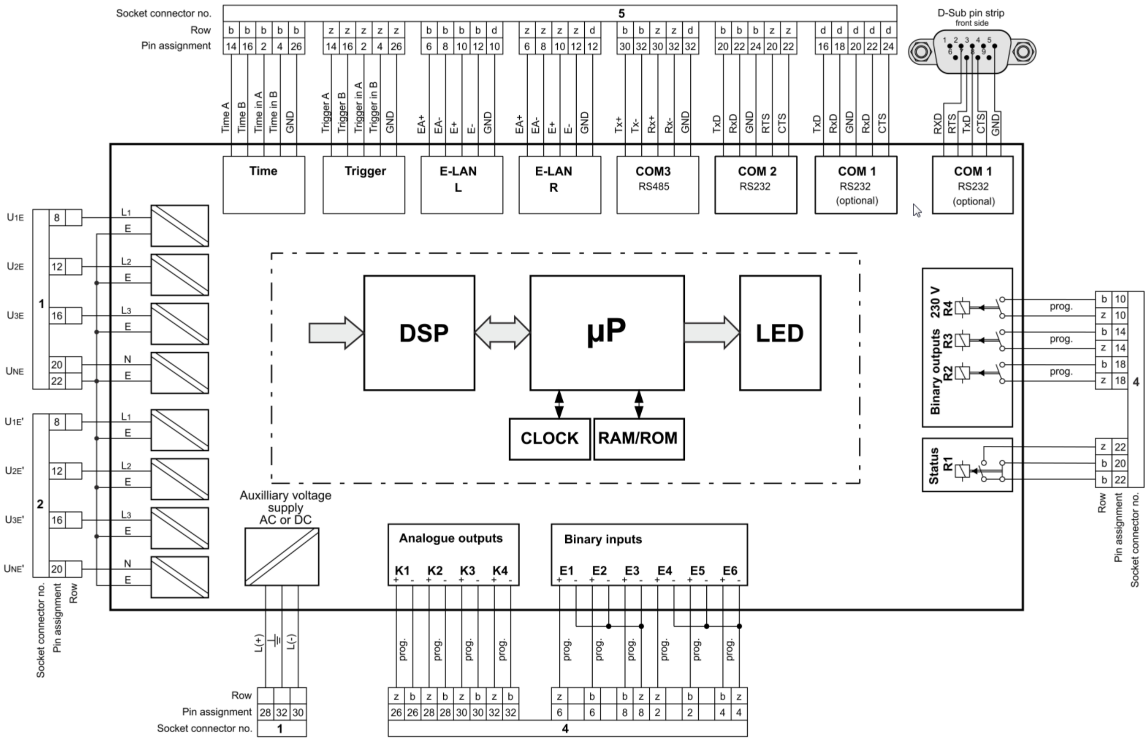


Features... C20 - C31 M95 ...

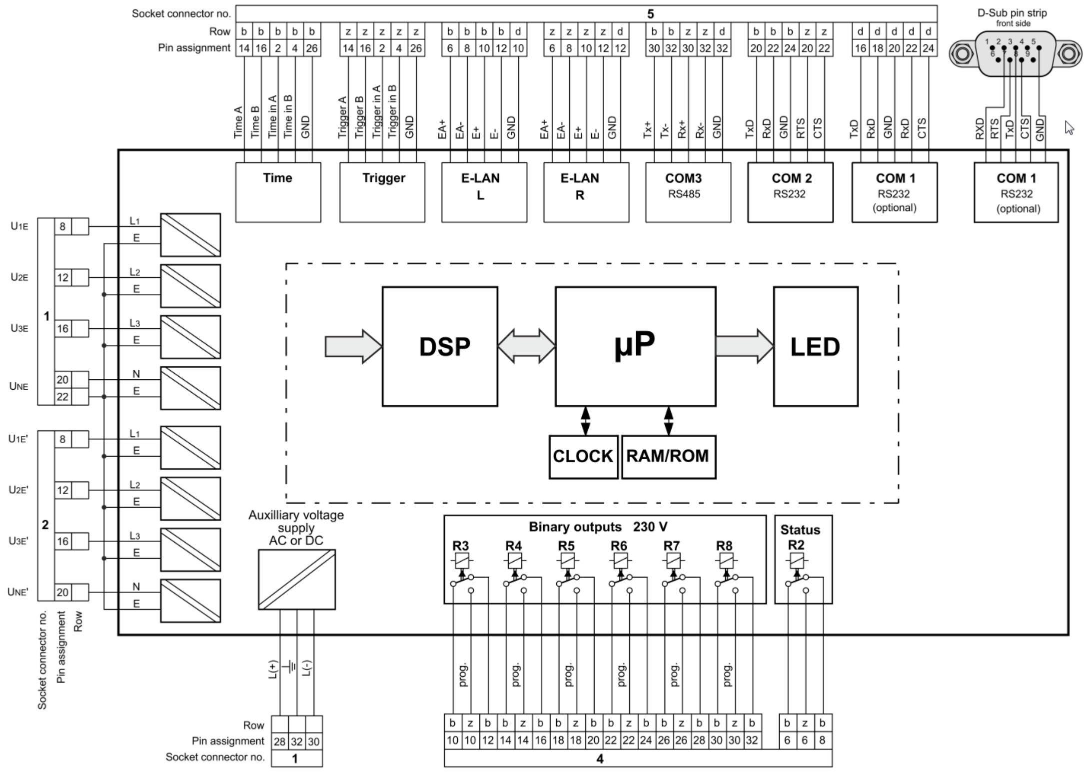
Block diagram feature C10 / M00, M96



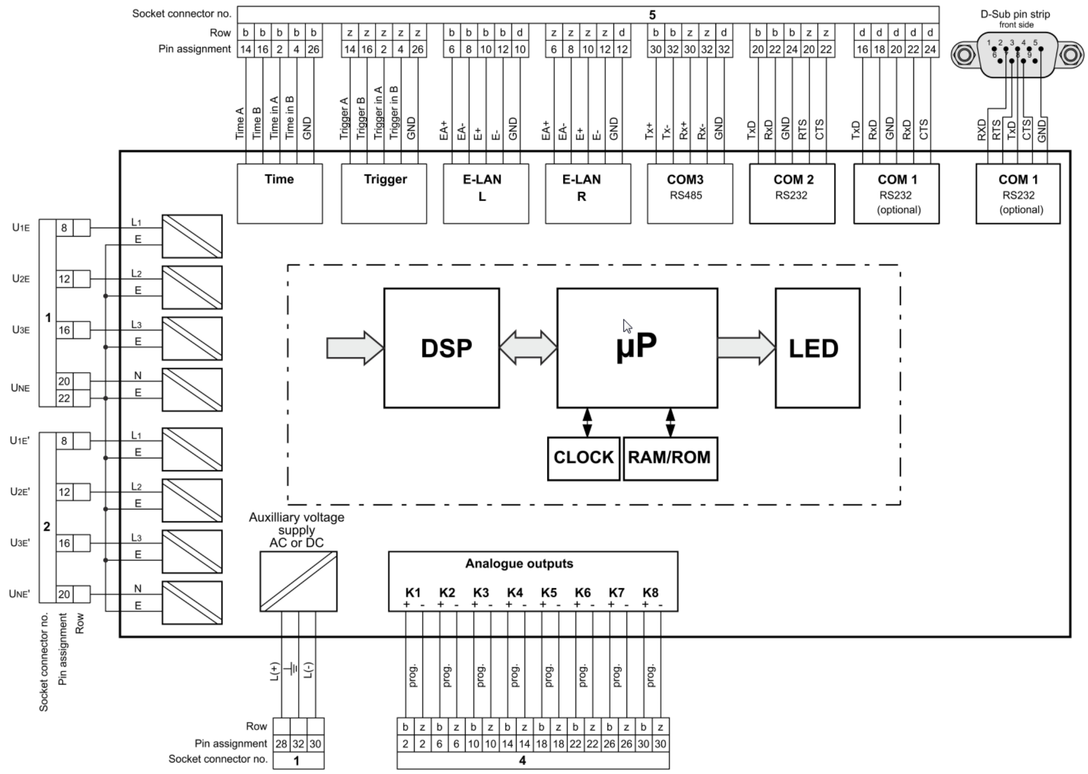
Block diagram feature C10 / M92



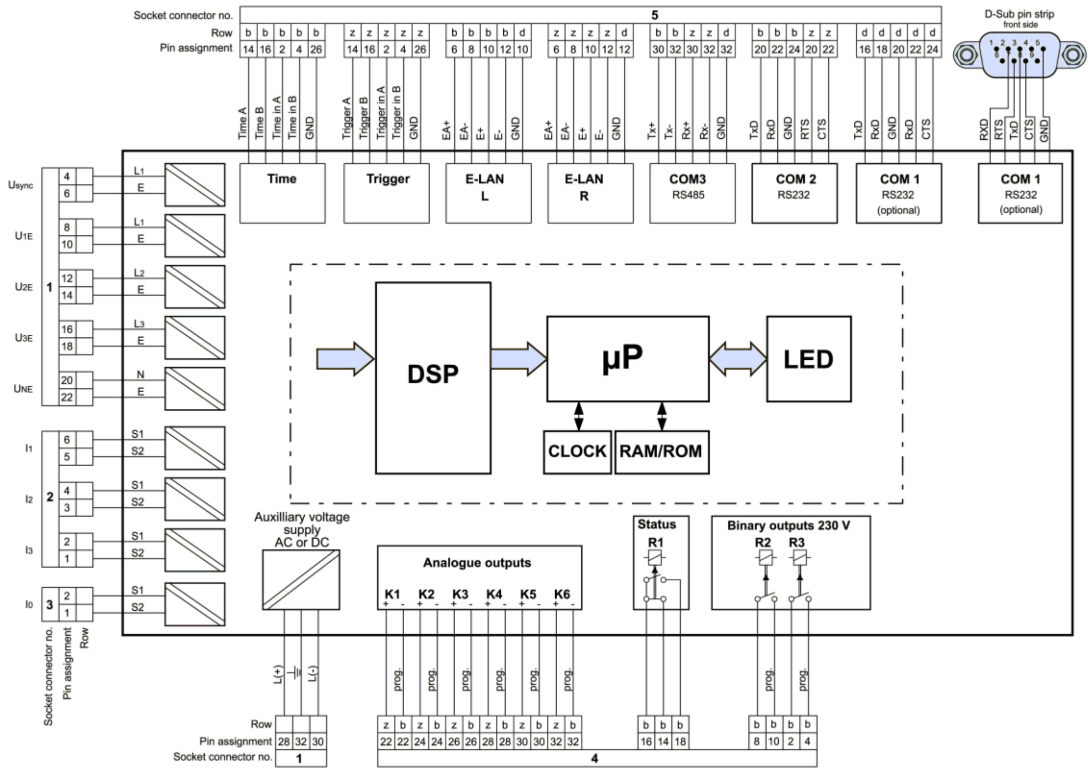
Block diagram feature C10 / M93



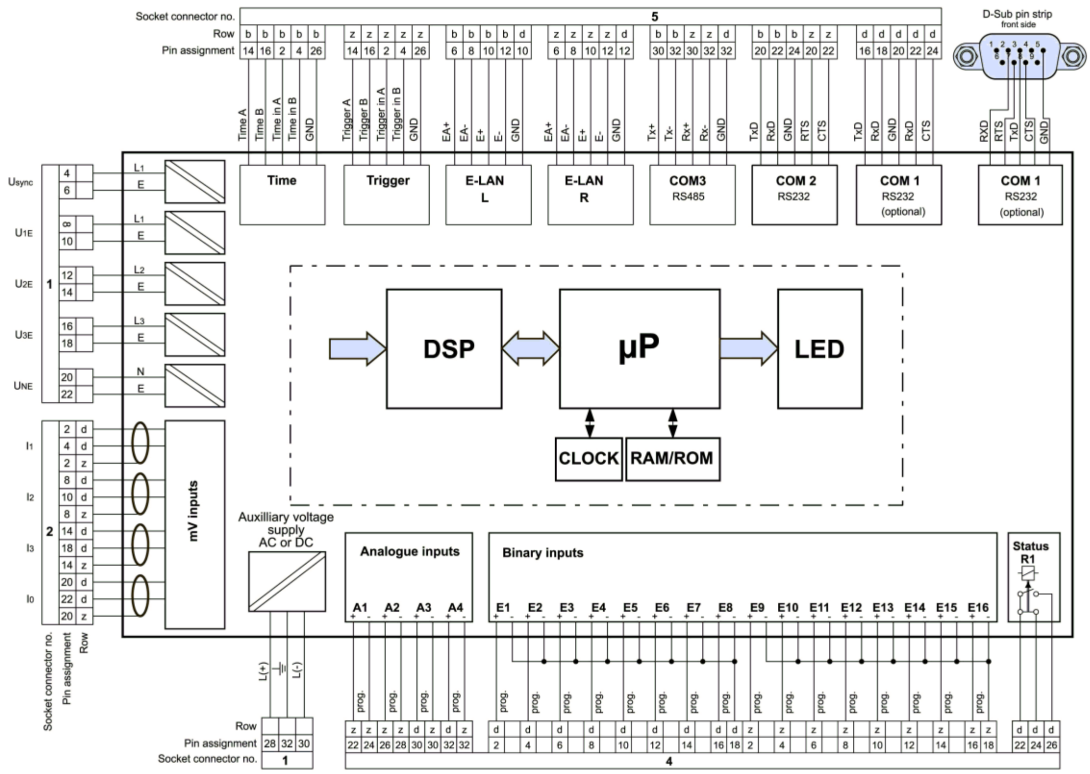
Block diagram feature C10 / M94



Block diagram feature C20...C31 / M95



Block diagram feature C40...C41, M97, M98



6. Ordering information

Please note the following when ordering:

- Only one code with the same capital letter is possible.
- If the capital letter is followed by the number 9, additional details in plain text are required.
- If capital letters are followed only by zeros, the code can be omitted.

FEATURE	CODE
Power Quality Interface for medium and high voltage networks	PQI-D
• according to DIN EN 50160 and IEC 61000-4-30	
• with two E-LAN interfaces for communication	
• with REGSys components REG-D(A), PAN-D, REG-DP(A), MMU-D, EOR-D and REG-DM.	
The standard version is equipped with COM 1, COM 2 and COM 3	
Design	
• 19" plug-in module (18TE/3HE)	B01
• Wall mounting housing (20TE)	B90
• Panel mounting housing (30TE)	B91
• 19" frame or wall mounting housing (30TE, 49TE)	B92
Wiring according to agreement	
Supply voltage	
• AC 90V..110V..264V oder DC 100V..220V..300V	H1
• DC 18V...60V...72V	H2
Input configuration	
• 4 voltage transformers	C00
• 8 voltage transformers	C10
• 4 voltage transformers 4 current transformers In =1A (I_{max} < 2 x In)	C20
• 4 voltage transformers 4 current transformers In=1A (I_{max} < 20 x In)	C21
• 4 voltage transformers 4 current transformers In=5A (I_{max} < 2 x In)	C30
• 4 voltage transformers 4 current transformers In=5A (I_{max} < 20 x In)	C31
• 4 voltage transformers, 4 current inputs for Rogowski-coils	C40
• 4 voltage transformers, 4 current inputs for mini current clamps	C41
Rated value of the input voltage	
• 100V / 110V	E1
• 230V / 400 V	E2
• Other rated voltages (e.g. 4 x 100V and 4 x 400V)	E9
Additional inputs and outputs	
• with 5 programmable relays plus life contact 16 programmable binary inputs (48...250 V AC/DC) (additional voltage ranges possible on request)	M00
• with 3 programmable relays plus life contact 4 programmable mA outputs and 6 programmable binary inputs **Note**: Please specify the nominal voltage for the binary inputs!	M92
• with 7 programmable relays plus life contact	M93
• with 8 programmable mA outputs	M94
• with 6 analogue mA outputs and 2 binary outputs plus life contact	M95
• with 5 relays plus life contact, 16 binary inputs for	M96

FEATURE	CODE
DC signals (48 V...250 V) with time stamp accuracy of +20ms (additional voltage ranges possible on request) ● with one programmable relay contact (e.g. life contact) 16 programmable binary inputs (10 ... 50 V AC/DC) 4 analogue inputs (0... 10 V / 4 ... 20 mA) ● with one programmable relay contact (e.g. life contact) 16 programmable inputs (48 ... 250 V AC/DC) 4 analogue inputs (4 ... 20 mA)	 M97 M98
Operating manual ● German ● English ● French	 G1 G2 G3

Accessories

Additions to PQI-D	CODE
Rogowski coil: Measurement range: 1 A to 2650 A, coil circumference: 61cm with an 8m long feeder cable	111.7009
Mini current clamp: Measuring range: 10 mA to 20 A, feeder cable 10m with an 8m long feeder cable	111.7010
Modem Develo MicroLink 56K	11.9030.02
Power supply unit Phoenix In: 120 V to 230 V AC or 90 V to 250 V DC; Out: 24 V DC mounting on standard mounting rails	111.9005.02
10MBit TCP/IP adaptor ● can be installed on standard mounting rails with power supply unit for Uh 230 V AC ● as 8TE, 3HE plug-in module with power supply unit: 85 V AC ... 110 V ... 264 V / 88 V ... 220 V ... 280 V DC ● as 8TE, 3HE plug-in module with power supply unit: 18 V ... 60 V ... 72 V DC	REG-COM A01 A02 A03
DCF 77 radio clock	111.9024
GPS NIS Time radio clock ● Supply voltage AC/DC 85V...264V ● Supply voltage DC18V..72V	 111.9024.45 111.9024.46
RS 232 extension cable (10m)	582.2040.10
USB adaptor for zero modem cable	111.9046
Industry modem - Westermo TD36 VA can be used as a dial-up line or dedicated line modem (Uh: 20..260 V AC/ 14 V..280 V DC) with mounting rail adaptor for use on PC and device side!	111.9030.17
IRIG-DCF77 - converter (10 TE) ● AC 90V..110V..264V oder DC 100V..220V..300V ● DC 18V ... 60V ... 72V ● As plug-in module 10TE, 3HE ● As wall mounting housing 20TE	IRIG-DCF H1 H2 B2 B1
Operating manual	

Additions to PQI-D	CODE
• German • English	G1 G2

Software

FEATURE	CODE
Software WinPQ For parameterising, archiving and evaluating of PQI-D/DA measurement data with the following basic functions: • 32-bit Windows program interface • SQL database for storage of measurement values for each measurement point • Data access via TCP/IP network • Option of displaying all measurement quantities that can be read by a PQI-D/DA as a function of time and as statistical quantities • An additional workplace licence is included in the price	**WinPQ**
Licence • As a single licence for 2 PQI-D/DAs L0 • As a single licence for 2 to 10 PQI-D/DAs L1 • As a single licence for > 10 PQI-D/DAs L2 • Company licence	 L0 L1 L2 L3
Language • German • English	 A1 A2
Further licences for WinPQ For up to three workplaces	
ParaPQ software (without database) For the parameterisation of PQI-D/DAs and to read PQI-D/DA measurement data (free of charge)	**PQ Para Express**

Notes

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Software - Version:

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