Controller for Petersen coils

REG-DP

- **in surface-mounted housing**
- **in -panel-mounted housing**
- **as 19” plug-in module**

1. Application

The freely programmable REG-DP regulator is used in medium and high-voltage grids to control arc suppression coils (Petersen coils) that are adjustable under continuous load. It can also solve all other control, measurement and recording tasks related to the Petersen coil.

Control methods:

- **Classic**

The regulator controls Petersen-coils in several ways. Depending on the requirements, the regulator can be set to a percentage or absolute detuning. For overhead transmission grids with high natural unbalance, a certain zero sequence voltage and detuning value can be set to balance between high neutral voltage displacement und right compensation. When an earth fault occurs, the regulator can correct the Petersen coil by the detuning and tune the grid to the resonance. There are a number of ways in which the regulator can control several Petersen coils in a compensation district.

- **Optional current injection**

In some grid configurations, it is possible that the Petersen coil cannot be tuned in the traditional way. For example such situations are:

  - Very balanced grids (cable grids)
  - Measuring signal that is heavily distorted by crosstalk (non-linear consumer or generator in the grid area)
  - Overhead transmission grids with asymmetrical conditions

The optional current injection can deal with all of these side-effects and accurately tune the Petersen coil to the real grid situation.

Resistor control (increase residual watt current)

It contains a freely configurable resistance control to increase the residual watt current supporting fault finding using the cos(φ) method. A thermal image of that resistor is computed to protect the same as an independent function unit.

Take over control tasks for pulse location

The free programmability of the regulator enables it to perform special tasks, such as controlling a pulse cabinet.

Pulse locating is a method to search for earth faults in the medium voltage grid by introducing a pulse pattern to the fault current. The regulator can be equipped with a background program that controls and monitors the pulse locating unit. This ensures that the conditions for successful pulse locating are met.

Control system / Communication

The REG-DP regulator has a system bus (E-LAN) that enables it to communicate with other system devices.

A parallel (relay contacts) and serial remote control centre connection are available. The following protocols are available (additional protocols on request):

- IEC 60870 - 5 - 101 / 103 / 104
- IEC 61850
- DNP 3.0 over Ethernet
- DNP 3.0
- MODBUS RTU / MODBUS TCP
- SPABUS

2. Characteristics

Multimaster system architecture

The REG-DP is part of a range of devices that is based on a standard hardware platform.

If multiple devices are connected through the system bus E-LAN, every bus participant can be configured or read from a single PC. In addition, several PCs can access individual system participants (multimaster).

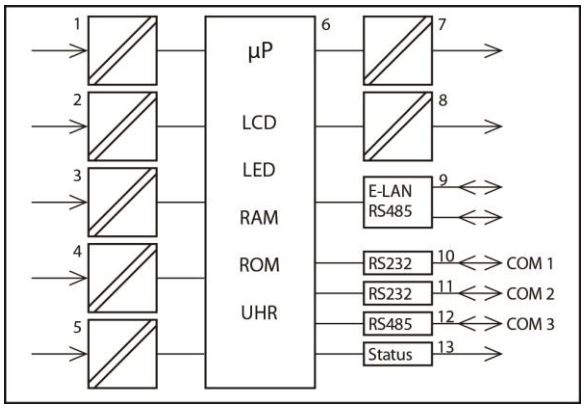

Figure 1: REG-DP regulator functions

1	Voltage transducer (zero sequence voltage)
2	Position signal (resistance sensor) for the coil
3	Current transducer (e.g. current through the P-coil)
4	Binary inputs
5	Power supply
6	Display and processing unit
7	Binary outputs
8	Analogue outputs
9	E-LAN connection (2 x RS485 with repeater function)
10	COM1, COM 1-S RS232
11	COM2, RS232
12	COM3, RS485
13	Status - Signal (relay)

2.1 Regulator functions

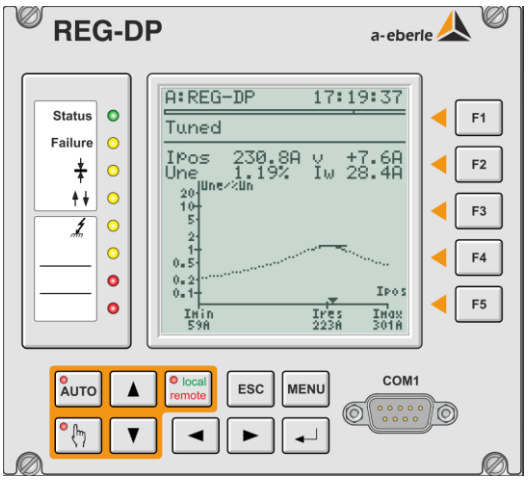

Figure 2: Regulation of the detuning

A change in the grid's switching status is recognized by a change in the zero sequence voltage. The regulator repositions the Petersen coil while taking into account the configurable conditions to the set detuning current.

The following data are displayed in addition to the regulator's status:

- Coil position
- Zero sequence voltage
- Detuning (v)
- Total active current in the grid over the fault location (Iw)
- The resonance curve and its parameters

The switching status is monitored through a complex evaluation of the zero sequence voltage (value and phase).

Regulation to percentage or absolute detuning current:

The regulator positions the Petersen coil according to the configured setpoint value and effective positioning tolerance.

Special requirements for the 110 kV grid

Additional parameters can be taken into account for high-voltage grids, such as a maximum continuous adjacent zero sequence voltage. The following conditions are also taken into account:

- Value of the allowable zero sequence voltage
- Compensation limit = Value of the detuning current that may not be exceeded

Adjusting the Petersen coil during the earth fault:

The regulator can be configured so that the Petersen-coil can be corrected by compensation value during an earth fault. Additional corrections can be made through binary inputs.

Parallel operation of Petersen coils:

A number of methods are available to control Petersen coils that are switched in parallel.

- Parallel control with communication over E-LAN (master-slave)
- Parallel control without communication
- Parallel control with recognition of external grid coupling (only with optional current injection)

2.2 Recorder and logbook function

An integrated **recorder** continuously records the progression of the zero sequence voltage and the coil position. The time line diagram can both be displayed and evaluated on the regulator or on a PC. This integrated 'grid spy' enables long-term changes in the zero sequence voltage to be recorded and monitored. The configuration software WinEDC is used to evaluate and archive recorded data on the PC.

The progression of the zero sequence voltage Uen is also displayed as a line diagram. The time grid (feed rate) for the recording is adjustable. The stored values and the allocated time can be displayed using a keyboard or PC.

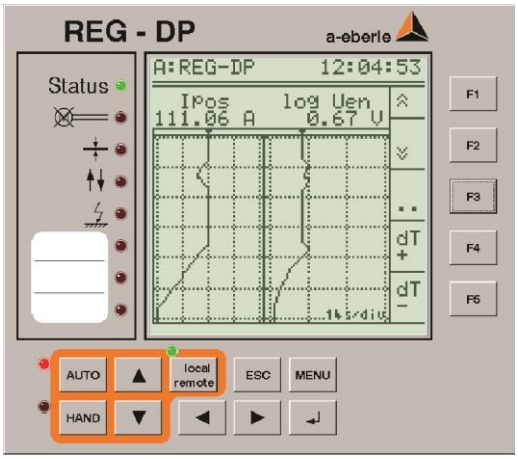

Figure 3: Recorder view

Important events are recorded in a **logbook** with date and time information and can be displayed on the screen or a PC.

2.3 Regulator statistics

Statistics mode displays the most important sum times and counters. This information can be used to determine how many tuning procedures were carried out in which time frame, and how many were successfully completed. It also enables you to recognize for how many tuning procedures the P-coil's adjustment range was insufficient.

Statistics mode also records the number of earth faults and increases in residual watt current that were carried out.

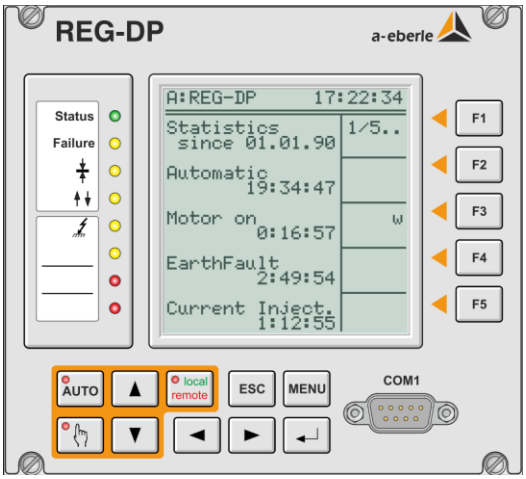

Figure 4: Statistics Page 1/5

2.4 Resistor control

The freely configurable and autonomous resistor control automatically connects a resistor to increase the residual watt current in the event of an earth fault. A resistor's load is monitored with a 'thermal image' whereby the current zero sequence voltage is taken into account when it is connected. The connection is blocked in the event of over temperature. The remaining resistor connections are displayed in the screen until the limit temperature has been reached.

A recurring connection by transient earth faults can be suppressed.

A resistor can be connected manually through a binary input or the remote control system.

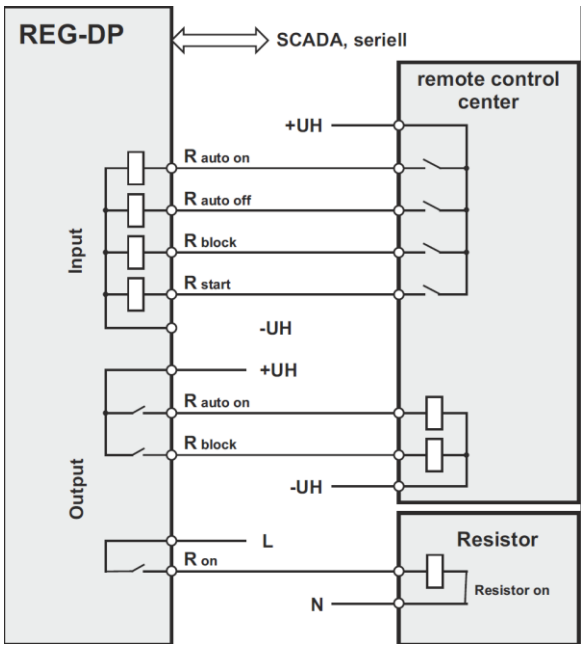

Figure 5: Example for the resistor control

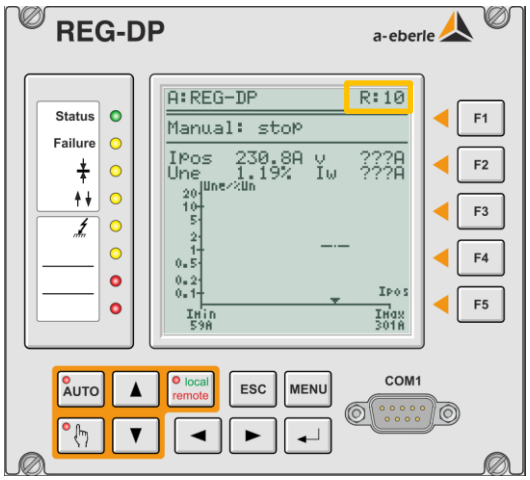

Figure 6: R:10 = Number of possible resistor cycles

2.5 Configuration

The configuration of the regulator is menu driven, and therefore very easy.

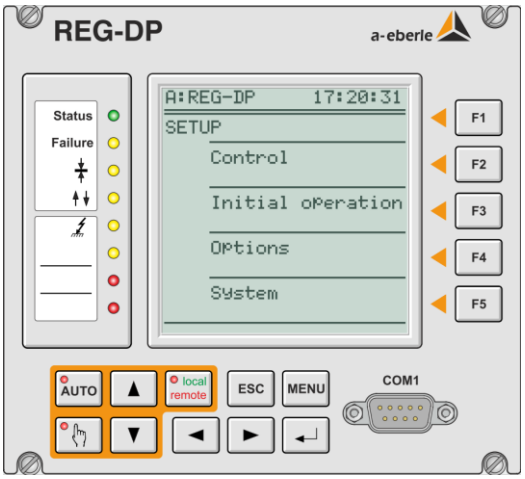

Figure 7: Regulator Menu

The putting into operation of the regulator and its configuration for the P-coil (e.g. linearization of the coil position) is largely automatic. The process' reactions are continuously monitored and checked for plausibility. Errors are analysed and displayed in the status bar. Additional information and troubleshooting tips can be viewed as an additional menu.

3. Technical specifications

3.1 Regulations and standards

- IEC 61010-1
- CAN/CSA C22.2 No. 1010.1-92
- IEC 60255-22-1
- IEC 61326-1
- IEC 60529
- IEC 60068-1
- IEC 60688
- IEC 61000-6-2
- IEC 61000-6-4
- IEC 61000-6-5 (in preparation)

CE

3.2 AC voltage inputs

AC voltage input (U_{en})	
Zero sequence voltage U_o	0.1 V ... 120 V
Shape of the curve	Sine
Frequency range	45....50....60....65 Hz
Internal consumption	≤ U^2 / 100 kΩ
Overload capacity	1.2 * 120 V

AC voltage input (U_{12})	
Synchronization voltage U_{12}	0.1 V ... 230 V
Shape of the curve	Sine
Frequency range	45....50....60....65 Hz
Internal consumption	≤ U^2 / 100 kΩ
Overload capacity	1.2 * 230 V

3.3 AC current inputs

AC current input (I_p and I_2)	
Current range	1 A / 5 A (can be selected through the hardware and the software)
Shape of the curve	Sine
Frequency range	45....50....60....65 Hz
Internal consumption	≤ .5 VA
Overload capacity	10 A continuous 30 A for 10 s 60 A for 1 s 500 A for 5 ms

3.4 Potentiometer input

Position signal (I_{Pos})	
Transmitter	Potentiometer
Nominal value Rn	0.2 kΩ, 0.5 kΩ, 1 kΩ, 3 kΩ
Measuring voltage	ca. 5 VDC
Current selectable through jumper (pure)	1 mA (3 kOhm) 5 mA (600 Ohm) 10 mA (300 Ohm) 20 mA (150 Ohm)

Error message when sensor breaks or is short circuited or when the voltage of the loop is outside of the measurement range.

3.5 Binary inputs (BI)

Binary inputs (BI)	
Inputs E1 ... E16	
Control signals U_{st}	in the AC/DC range 48 V ... 250 V, 10 V ... 50 V, 80 V ... 250 V, 190 V ... 250 V in accordance with Characteristic Dx
Shape of the curve, permissible	Rectangular, sinusoidal
Characteristic X15 48 V...250 V – H - Level – L – Level	 ≥ 48 V < 10 V
Characteristic X24 10 V...50 V – H - Level – L - Level – Input resistance	 ≥ 10 V < 5 V 6.8 kΩ
Characteristic X29 80 V ... 250 V – H - Level – L - Level	 ≥ 80 V < 40 V
Characteristic X28 190 V ... 250 V – H - Level – L - Level	 ≥ 176 V < 88 V

Binary inputs (BI)	
Inputs E1 ... E16	
Signal frequency	DC, 40 ... 70 Hz
Input resistance	108 kΩ, except 10...50 V
Potential isolation	Optocoupler; each galvanically isolated from each other.
Debouncing	Software filter with integrated 50Hz filter

3.6 Binary outputs (BO)

Binary outputs (BO)	
R 1 ... R11 max. switching frequency	≤ 1 Hz
Potential isolation	Isolated from all device-internal potentials
Contact load	AC: 250 V, 5 A (cosφ = 1.0) AC: 250 V, 3 A (cosφ = 0.4) Switching capacity max. 1250 VA DC: 30 V, 5 A resistive DC: 30 V, 3.5 A L/R=7 ms DC: 110 V, 0.5 A resistive DC: 220 V, 0.3 A resistive Switching capacity max. 150 W
Inrush current	250 V AC, 30 V DC 10 A for max. 4 s
Switching operations	≥ $5 \cdot 10^5$ electrical

3.7 Analogue outputs

20 mA - Analogue outputs	
Quantity	See order specifications
Output range Y1...Y2	-20 mA...0...20 mA, Y1 and Y2 freely programmable
Control limit	± 1.2 Y2
Potential isolation	Optocoupler
Burden range	0 ≤ R ≤ 8 V / Y2
Alternating component	< 0.5% of Y2

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

3.8 Display

Display	
LC – Display	128 x 128 displays graphics
Lighting	LED, switches off after 15 min

Reference conditions	
Reference temperature	23°C ± 1 K
Input quantities	U_E = 0 ... 120 V U_{12} = 0.1 ... 230 V I_E = 0 ... 1A / 0 ... 5A
Auxiliary voltage	H = H_n ± 1 %
Frequency	45 Hz...65 Hz
Shape of the curve	Sinusoidal, form factor 1.1107
Burden (only for Characteristics E91...E99)	R_n = 5 V / Y2 ± 1%
Other	IEC 60688 - Part 1

3.9 Electrical safety

Electrical safety	
Safety class	I
Degree of pollution	2

Over-voltage category	II and III
Category III	**Category II**
Input circuits for current and voltage transducer	Control circuits, analogue inputs, analogue outputs, power supply, ELAN, COMs

Operating voltages		
50 V	**120 V**	**230 V**
E-LAN, COM1 ... COM3 Analogue inputs, analogue outputs Inputs 10...50 V	Voltage inputs, current inputs	Auxiliary voltage, sync voltage for binary inputs (E1...E16, Relay outputs R1...R11), status

3.10 Power supply

Power supply		
Characteristic	**H1**	**H2**
AC	85...264 V	-
DC	88...280 V	18...72 V
Power consumption	≤ 33 VA	≤ 15 W
Frequency	50 Hz / 60 Hz	-
Microfuse	T1 250 V	T2 250 V

The following applies to all characteristics:
Voltage dips of ≤ 40 ms result neither in data loss nor malfunctions.

3.11 Electromagnetic compatibility

Electromagnetic compatibility	
EMC requirements	EN 61326-1 Equipment class A Continuous, un-monitored operation, industrial area and EN 61000-6-2 and 61000-6-4
Interference emissions	
Conducted and radiated emission	EN 61326 Table 3 EN 61000-6-4
Harmonic currents	EN 61000-3-2
Voltage fluctuations and flicker	EN 61000-3-3
Conducted and radiated emission	EN 61326 Table 3 EN 61000-6-4
Disturbance immunity	EN 61326 Table A1 and EN 61000-6-2
ESD	IEC 61000-6-5 6 kV/8 kV contact/air
Electromagnetic fields	IEC 61000-4-3 80 – 2000 MHz: 10 V/m
Fast transient	IEC 61000-4-4 4 kV/2 kV
Surge voltages	IEC 61000-4-5 4 kV/2 kV
Conducted HF signals	IEC 61000-4-6 150 kHz – 80 MHz: 10 V
Power-frequency magnetic fields	IEC 61000-4-8 100 A/m (50 Hz), continuous 1000 A/m (50 Hz), 1 s
Voltage dips	IEC 61000-4-11 30% / 20 ms, 60% / 1 s
Voltage interruptions	IEC 61000-4-11 100% / 5s
Damped oscillations	IEC 61000-4-12, Class 3, 2.5 kV

3.12 Climatic conditions

Ambient conditions	
Temperature range Transport and storage function	 -15 °C ... +60 °C -25 °C ... +65 °C
Dry cold	IEC 60068-2-1, - 15 °C / 16 h
Dry heat	IEC 60068-2-2, + 65 °C / 16 h
Humid heat constant	IEC 60068-2-78 + 40 °C / 93% / 2 days
Humid heat cyclical	IEC 60068-2-30 12+12 h, 6 cycles +55 °C / 93%
Drop and topple over	IEC 60068-2-31 100 mm drop height, unpackaged
Vibration	IEC 60255-21-1, Class 1
Shock	IEC 60255-21-2, Class 1
Earthquake resistance	IEC 60255-21-3, Class 1

3.13 Storage

Storage	
Firmware and recorder data Characteristic S2	Flash storage
Device characteris- tics and calibration data	serial EEPROM with ≥ 1000 k write/read cycles
Other data and recorder data Characteristic S1	SDRAM, battery-backed (plug- in lithium battery), backup to flash storage possible

3.14 Mechanical design

Mechanical design plug-in module	
Front panel	Plastic, RAL 7035 grey on aluminium brackets
High Width Printed circuit board Earth	3 U (132.5 mm) 28 T (142.2 mm) 160 mm x 100 mm ≤ 1.5 kg
Protection type – Plug-in module – Female mul- tipoint connector	 IP 00 IP 00
In-panel mounting	in conformity with DIN 41494 Part 5

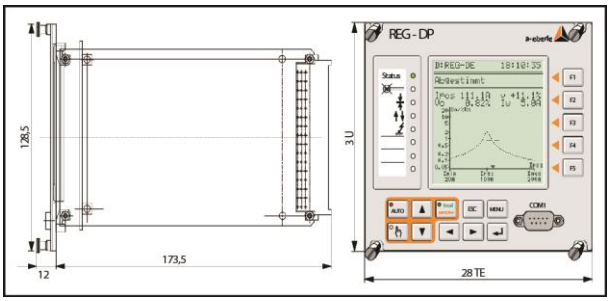

Figure 8: Dimensions REG-DP

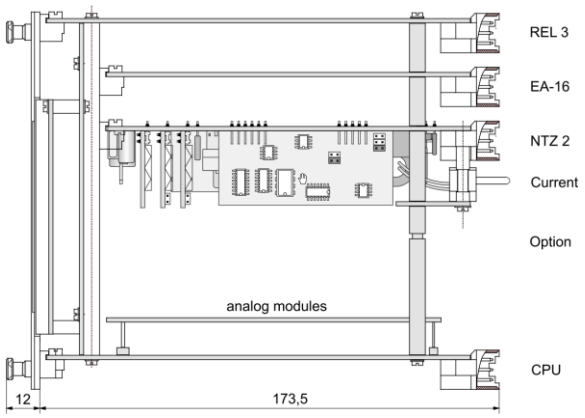

Figure 9: Position of the REG-DP male multipoint connectors

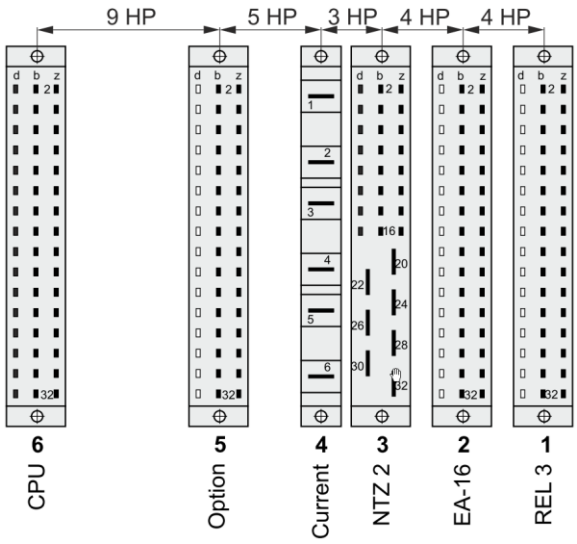

Figure 10: Position of the REG-DP female multipoint connector

In-panel mounting in the module rack

The rack has 84 slots with 84 position numbers. Each slot has a specific position number 'n', which is the reference point for in-panel mounting of the guide holder and connection elements on the back of the module rack.

Position numbers						
Female multipoint connector	1	2	3	4	5	6
Guide holder	N	-	-	-	-	N+ 26
Screws	N	N+4	N+8	N+11	N+16	N+ 25

4. Configuration of the female multipoint connectors

4.1 Female multipoint connector 1 binary outputs REG-REL 3

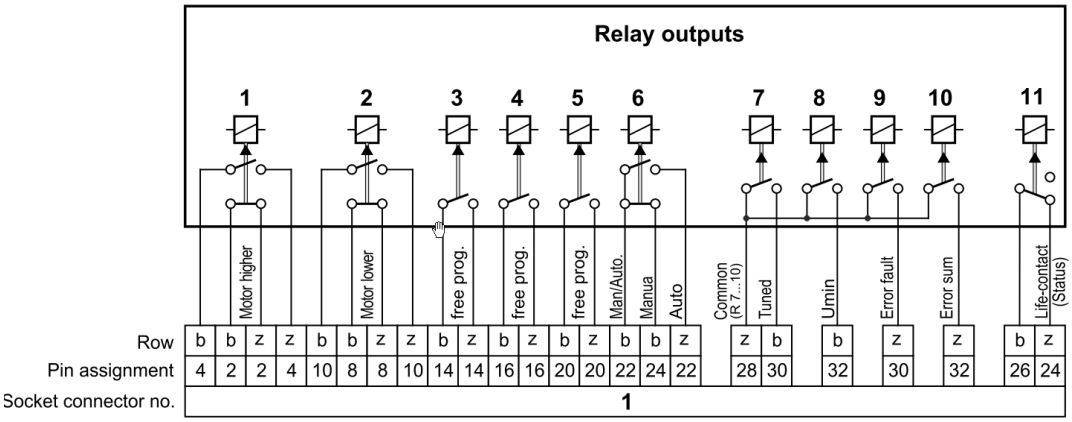

Figure 11: Female multipoint connector 1 binary outputs/relay

Description		Function	Pin	Configuration
Binary output (2 contact pairs) 1 NCC + 1 NOC	R1	NCC	z2	Higher
		Terminal	b2	
		NOC	z4	
		Terminal	b4	
Binary output (2 contact pairs) 1 NCC + 1 NOC	R2	NCC	z8	Lower
		Terminal	b8	
		NOC	z10	
		Terminal	b10	
Binary output	R3	NOC	z14	freely programmable
		Terminal	b14	
Binary output	R4	NOC	z16	freely programmable
		Terminal	b16	
Binary output	R5	NOC	z20	freely programmable
		Terminal	b20	
Binary output (Changeover)	R6	NCC	b24	Man
		NOC	z22	Automatic
		Terminal	b22	
Binary outputs	R7	NOC	b30	Tuned
	R8	NOC	b32	$U_{ne} < U_{min}$
	R9	NOC	z30	$U_{ne} > U_{erd}$
	R10	NOC	z32	Failure
	R7..R10	Terminal	z28	
Binary output	R11	Status	z24	
		Terminal	b26	

All of the REG-DP's are freely programmable, but are preset with default values. The status contact is either NOC or NCC based on Characteristic U. This can be changed at a later stage by soldering a jumper.

4.2 Female multipoint connector 1 binary outputs REG-REL 4 (Characteristic X31)

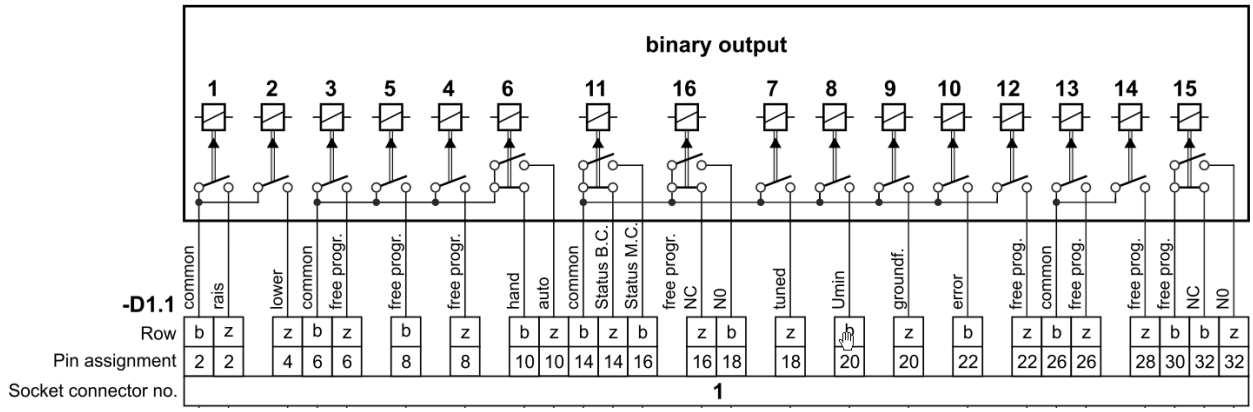

Figure 12: Female multipoint connector 1 binary outputs (REG-REL 4)

Description		Function	Pin	Configuration
Binary output	R1	NOC	z2	Higher
	R2	NOC	z4	Lower
		Terminal	b2	
Binary outputs	R3	NOC	z6	freely programmable
	R5	NOC	b8	freely programmable
	R4	NOC	z8	freely programmable
	R6	NCC	b10	freely programmable
		NOC	z10	freely programmable
		Terminal	b6	
Binary outputs	R11	NOC	b16	Status
		NCC	z14	
	R16	NOC	b18	freely programmable
		NCC	z16	
	R7	NOC	z18	Tuned
	R8	NOC	b20	$U_{ne} < U_{min}$
	R9	NOC	z20	$U_{ne} > U_{erd}$
	R10	NOC	b22	Failure
	R12	NOC	z22	$U_{ne} > U_{erd}$
		Terminal	z28	freely programmable
Binary outputs	R13	NOC	z26	freely programmable
	R14	NOC	z28	freely programmable
	R13..R14	Terminal	b26	
Binary output	R15	NOC	z32	freely programmable
		NCC	b32	
		Terminal	b30	

4.3 Female multipoint connector 2 binary inputs

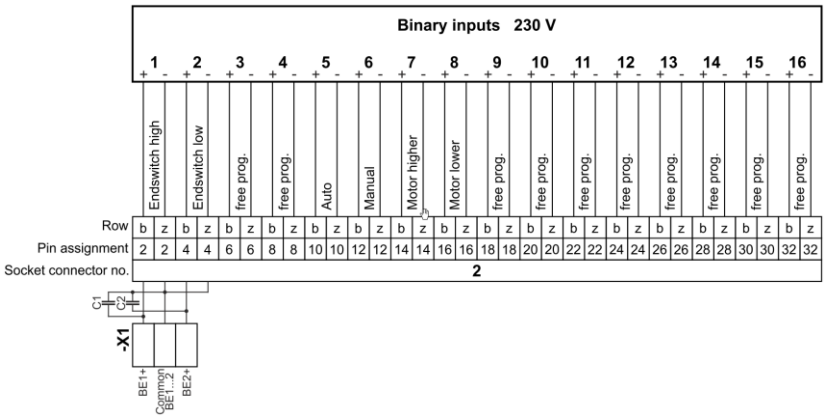

Figure 13: Female multipoint connector 2: Binary inputs

Description		Function	Pin	Configuration
Binary input	E1	+	b2	End switch higher
		-	z2	
Binary input	E2	+	b4	End switch lower
		-	z4	
Binary input	E3	+	b6	freely programmable
		-	z6	
Binary input	E4	+	b8	freely programmable
		-	z8	
Binary input	E5	+	b10	Automatic (impulse)
		-	z10	
Binary input	E6	+	b12	Man (impulse)
		-	z12	
Binary input	E7	+	b14	Motor higher (impulse)
		-	z14	
Binary input	E8	+	b16	Motor lower (impulse)
		-	z16	
Binary input	E9	+	b18	freely programmable
		-	z18	
Binary input	E10	+	b20	freely programmable
		-	z20	
Binary input	E11	+	b22	freely programmable
		-	z22	
Binary input	E12	+	b24	freely programmable
		-	z24	
Binary input	E13	+	b26	freely programmable
		-	z26	
Binary input	E14	+	b28	freely programmable
		-	z28	
Binary input	E15	+	b30	freely programmable
		-	z30	
Binary input	E16	+	b32	freely programmable
		-	z32	

4.4 Female multipoint connector 3: I_{pos} , U_{ne}, U_{Sync} and auxiliary voltage

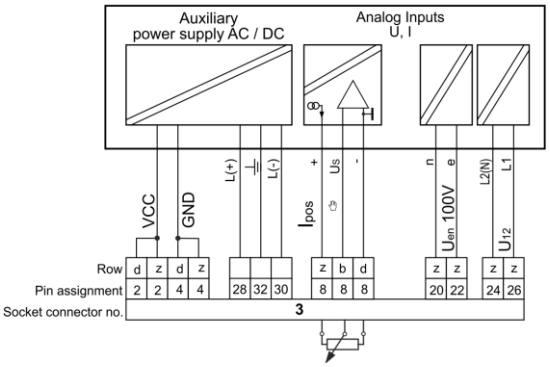

Figure 14: Female multipoint connector 3: Zero sequence voltage U_{ne} , U_{sync} and auxiliary voltage U_H

Description		Function	Pin	Configuration
Position feedback	I_{pos}	Pot +	z8	
		Us	b8	
		Pot -	d8	
Zero sequence voltage	U_{en}	E	20	
		N	22	
Synchronisation voltage	U_{Sync}	L1	24	
		L2	26	
Auxiliary voltage	U_H	L (+)	28	
		L (-)	30	
		PE	32	

4.5 Female multipoint connector 4: Current inputs

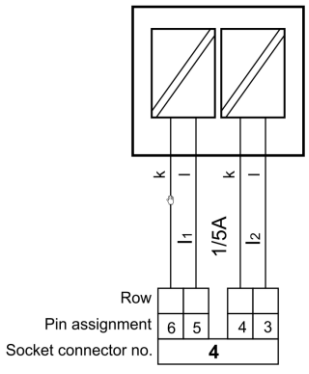

Figure 15: Female multipoint connector 4: Current I_1 (e.g. I_p) and I_2

Description		Function	Pin	Configuration
Current Channel 1	I_1	k	6	
		I	5	
Current Channel 2	I_2	k	4	
		I	3	

Current channel 2 is available as an option (Characteristic X18)

4.6 Female multipoint connector 5: Additional binary inputs/outputs (continued)

4.6.1 8 additional relays (changeover) Characteristic X01

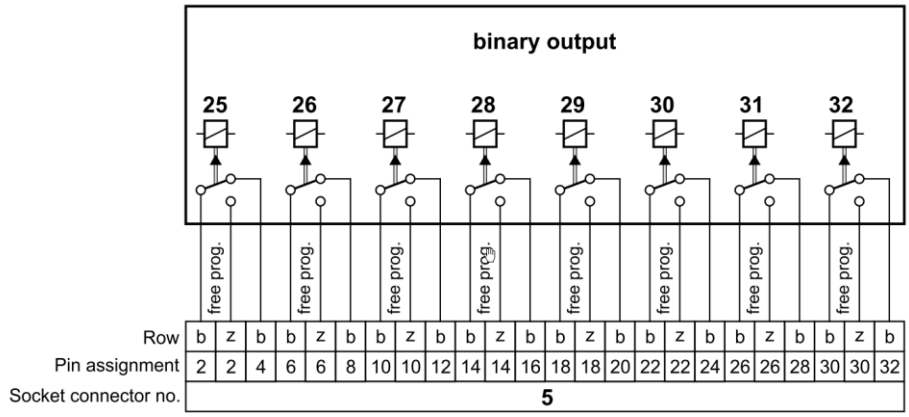

Figure 16: Female multipoint connector 5: feature X01 8 additional changeover relay contacts

Description		Function	Pin	Configuration
Binary outputs	R25	NOC	z2	freely programmable
		NCC	z4	freely programmable
		Terminal	b2	
	R26	NOC	z6	freely programmable
		NCC	b8	freely programmable
		Terminal	b6	
	R27	NOC	z10	freely programmable
		NCC	b12	freely programmable
		Terminal	b10	
	R28	NOC	z14	freely programmable
		NCC	b16	freely programmable
		Terminal	b14	
	R29	NOC	z18	freely programmable
		NCC	b20	freely programmable
		Terminal	b18	
	R30	NOC	z22	freely programmable
		NCC	b24	freely programmable
		Terminal	b22	
	R31	NOC	z26	freely programmable
		NCC	b28	freely programmable
		Terminal	b26	
	R32	NOC	z30	freely programmable
		NCC	b32	freely programmable
		Terminal	b30	

4.6.2 Female multipoint connector 5: 16 additional binary inputs (Characteristic X15, X24, X28, X29)

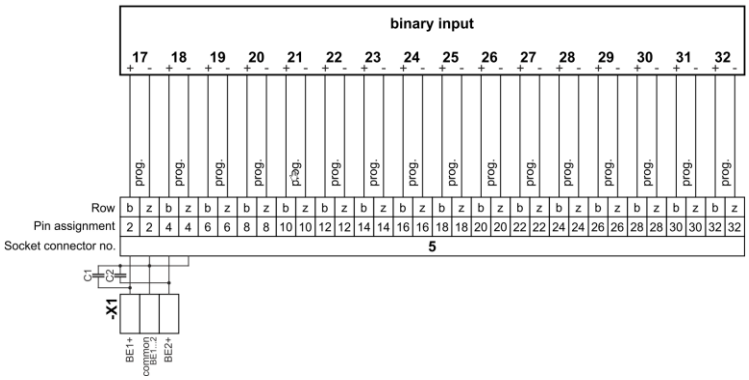

Figure 17: Female multipoint connector 5: 16 additional binary inputs (Characteristic X25)

Description		Function	Pin	Configuration
Binary input	E17	+	b2	freely programmable
		-	z2	
Binary input	E18	+	b4	freely programmable
		-	z4	
Binary input	E19	+	b6	freely programmable
		-	z6	
Binary input	E20	+	b8	freely programmable
		-	z8	
Binary input	E21	+	b10	freely programmable
		-	z10	
Binary input	E22	+	b12	freely programmable
		-	z12	
Binary input	E23	+	b14	freely programmable
		-	z14	
Binary input	E24	+	b16	freely programmable
		-	z16	
Binary input	E25	+	b18	freely programmable
		-	z18	
Binary input	E26	+	b20	freely programmable
		-	z20	
Binary input	E27	+	b22	freely programmable
		-	z22	
Binary input	E28	+	b24	freely programmable
		-	z24	
Binary input	E29	+	b26	freely programmable
		-	z26	
Binary input	E30	+	b28	freely programmable
		-	z28	
Binary input	E31	+	b30	freely programmable
		-	z30	
Binary input	E32	+	b32	freely programmable
		-	z32	

Voltage level for each of the characteristics

Characteristic:

X15 AC/DC 48...250 V

X24 AC/DC 10...50 V

X28 AC/DC 190...250 V

X29: AC/DC 190...250 V

4.6.3 Female multipoint connector 5: 16 additional binary inputs (Characteristic X25)

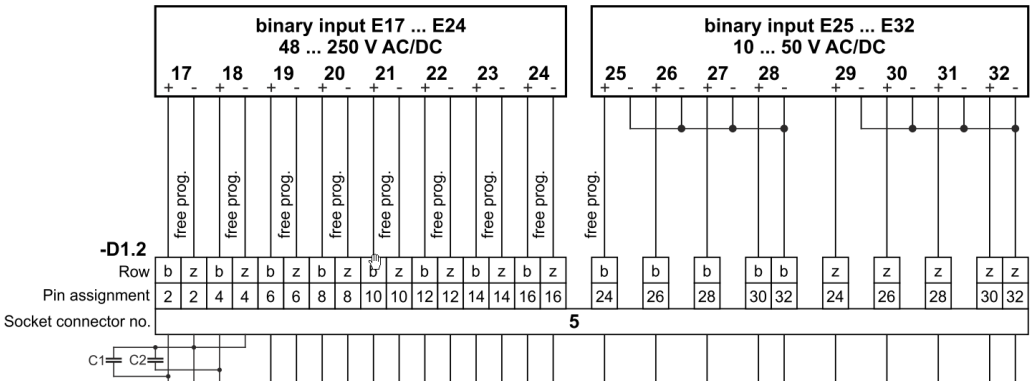

Figure 18: Female multipoint connector 5: 16 additional binary inputs

Description		Function	Pin	Configuration
Binary input	E17	+	b2	freely programmable
		-	z2	
	E18	+	b4	freely programmable
		-	z4	
	E19	+	b6	freely programmable
		-	z6	
	E20	+	b8	freely programmable
		-	z8	
	E21	+	b10	freely programmable
		-	z10	
	E22	+	b12	freely programmable
		-	z12	
	E23	+	b14	freely programmable
		-	z14	
	E24	+	b16	freely programmable
		-	z16	
Binary input	E25	+	b24	freely programmable
	E26	+	b26	freely programmable
	E27	+	b28	freely programmable
	E28	+	b30	freely programmable
		Root E25..28	b32	
	E29	+	z24	freely programmable
	E30	+	z26	freely programmable
	E31	+	z28	freely programmable
	E32	+	z30	freely programmable
		Root E29..32	z32	

4.7 Female multipoint connector 6: COM 1 to 3; E-LAN and 20 mA outputs

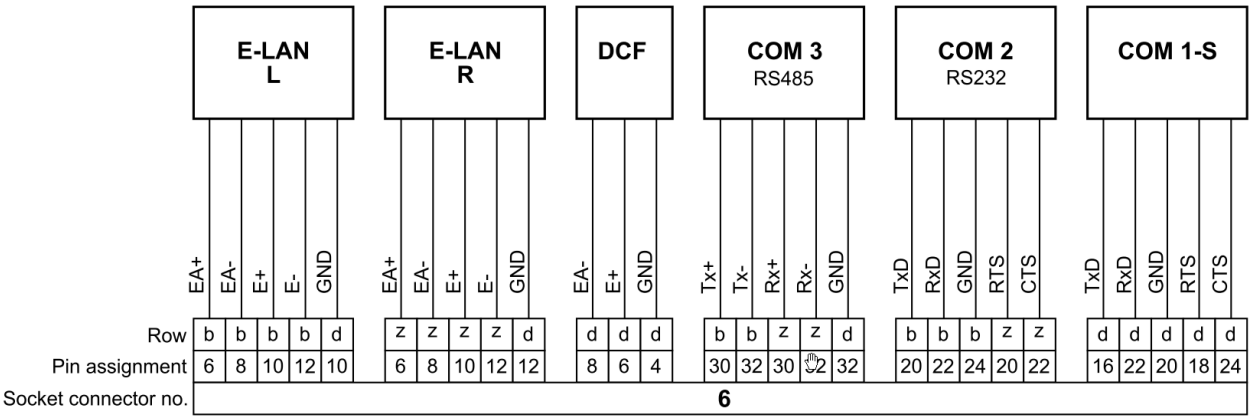

Figure 19: Female multipoint connector 6: COM1-3; E-LAN configuration

Description	Function	Pin	Configuration
COM 1-S	CTS	d24	
	RTS	d18	
	GND	d20	
	RxD	d22	
	TxD	d16	
	+12V	Z24	
COM 2 RS 232	CTS	z22	
	RTS	z20	
	GND	b24	
	RxD	b22	
	TxD	b20	
	+12V	Z24	
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	

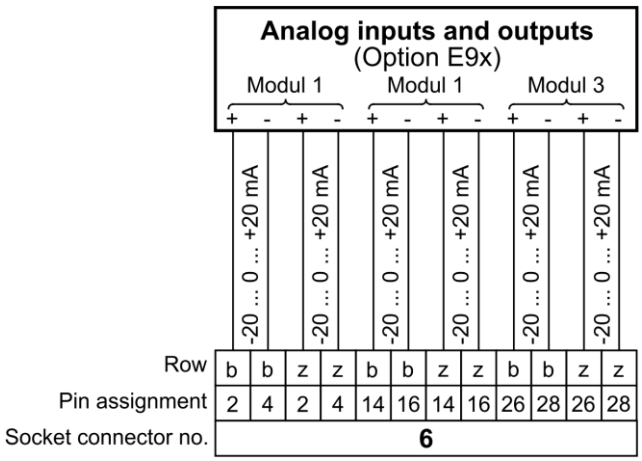

Figure 20: Female multipoint connector 6: Optional configuration with up to 6 mA outputs

Description	Function	Pin	Configuration
20 mA Analogue module 1 (optional)	+	b2	U_{ne}
	-	b4	
	+	z2	I_{pos}
	-	z4	
20 mA Analogue module 2 (optional)	+	b14	I1
	-	b16	
	+	z14	freely programmable
	-	z16	
20 mA Analogue module 3 (optional)	+	b26	freely programmable
	-	b28	
	+	z26	freely programmable
	-	z28	

5. Block diagrams

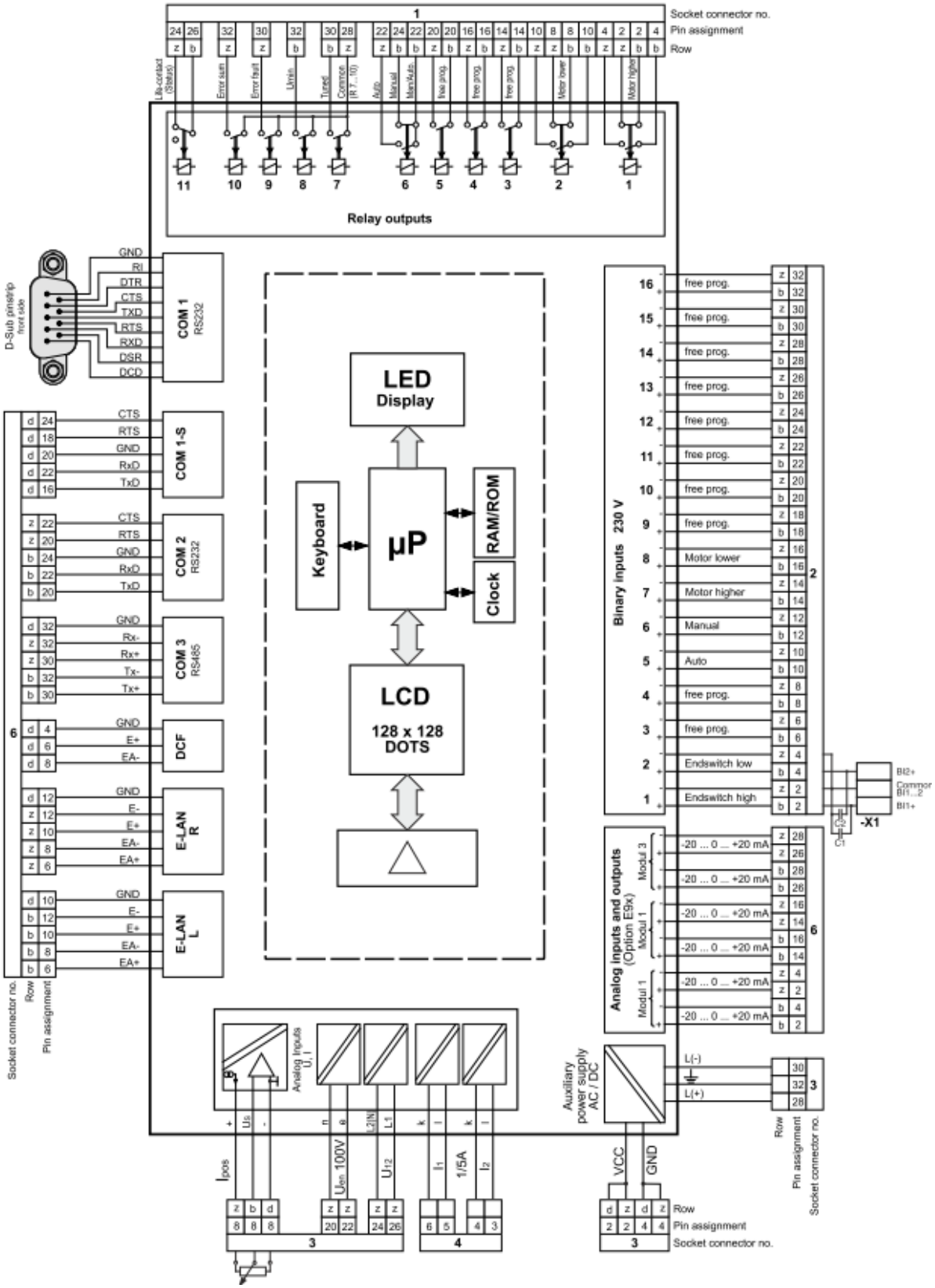

Figure 21: Overview of default configuration of the REG-DP female multipoint connector

6. Housing technology

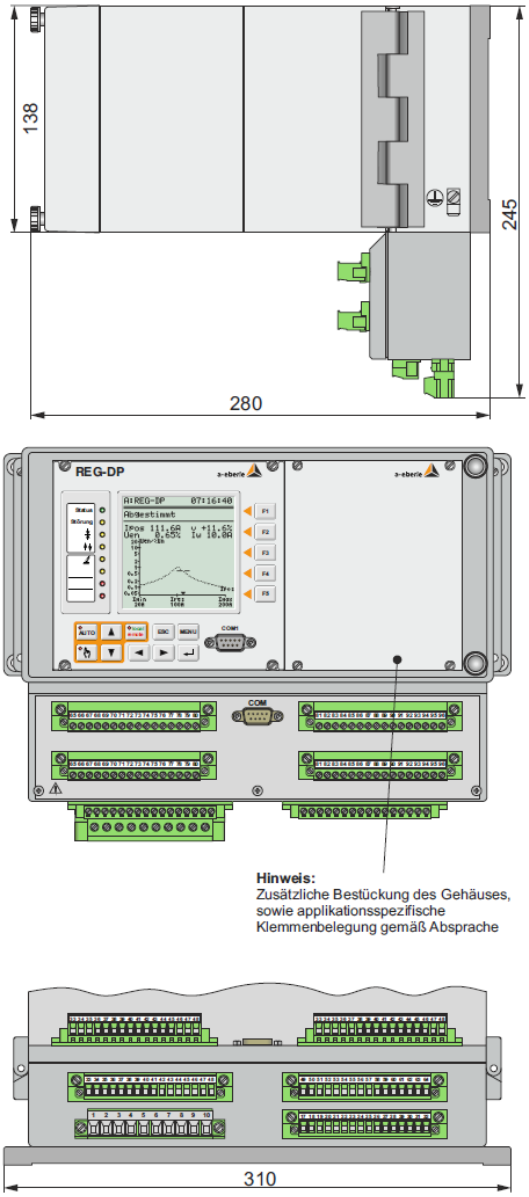

Figure 22: Dimensions REG-DP (Characteristic B02)

Wall mounting housing (B02):	
Material	Polycarbonate (UL 94 V-0)
Protection type	Housing IP 65
Weight	≤ 1.5 kg
Dimensions	See
Connection elements	Screw terminals
Cross section of the connection cables	≤ 4.0 mm^2 solid ≤ 2.5 mm^2 fine wire

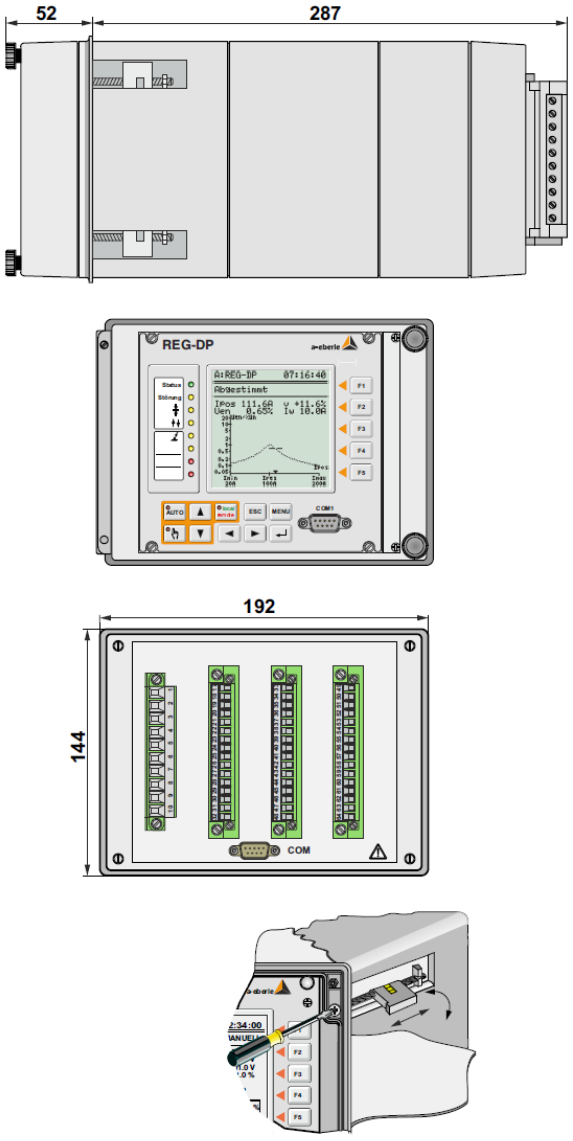

Figure 23: Dimensions REG-DP (Characteristic B03)

Panel mount housing (B03)	
Material	Polycarbonate (UL 94 V-0)
Protection type	Housing IP 65
Weight	≤ 1.5 kg
Dimensions	see Figure 6.
Connection elements	Screw terminals
Cross section of the connection cables	≤ 4.0 mm^2 solid ≤ 2.5 mm^2 fine wire

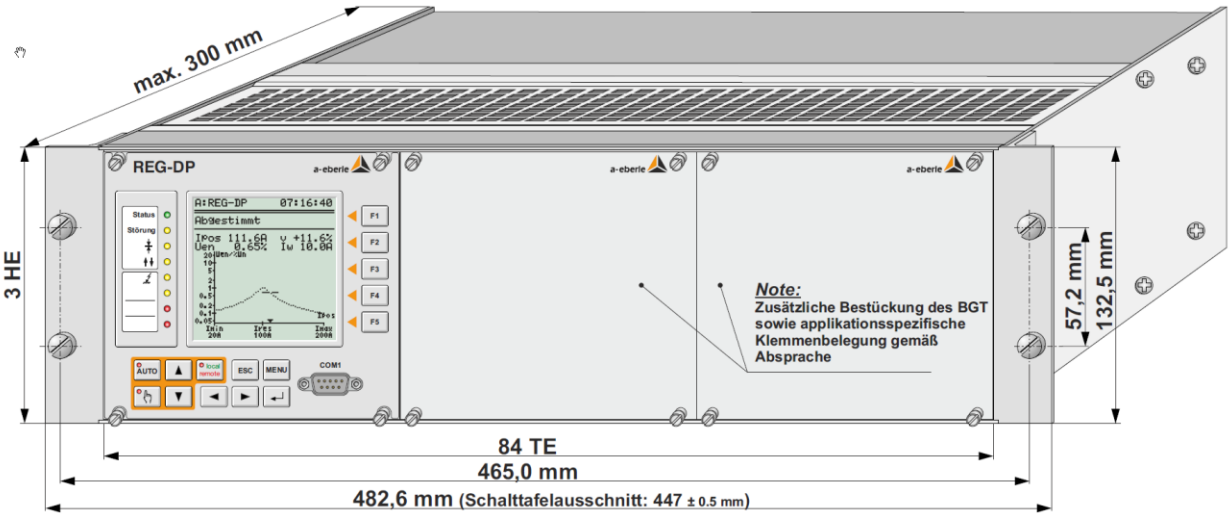

Figure 24: Module rack 84 TE

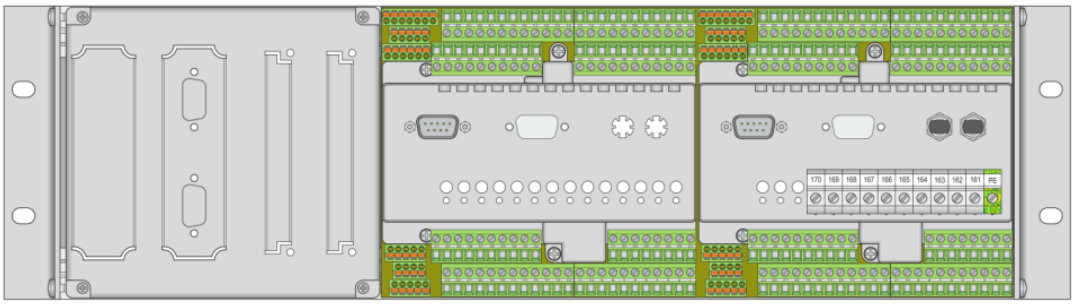

Figure 25: Backplane module rack 84 TE - Rear view - Characteristic B95

Conductor cross-section of the terminals					
Terminal type, grid, application ex.	**Conductor cross-section / mm²**		**Terminal type, grid, application ex.**	**Conductor cross-section / mm²**	
	Flexible	**solid**		**flexible**	**Solid**
Lead-through terminal, measure-ment, auxiliary prog.	4	6	Threaded terminal cou-pling, 5 mm, binary inputs (BI), relays	2.5	2.5
Push terminal (spring loaded), 3.5 mm, COMs	1.5	1.5			

6.1 Backplane terminal configuration for REG-D B95, M3 (M9)

The below default terminal configuration only applies to REG-DP (REG-REL 3).

If the module rack is configured with several REG-DPs, the terminal configuration for each REG-DP does not have to be changed.

If the power supply is bridged from device to device within the module rack, the signal - terminal configuration will shift accordingly!

The terminal block number is incremented for all additional devices (-X1, -X2, -X3) If more devices in the REG-Sys product line (REG-D or PAN-D) are integrated in the module rack, the signal - terminal number configuration will change accordingly!

The backplane is only available for REG-D, PAN-D and REG-DP. All other devices can be integrated in the module rack; the wiring is carried out according to each customer's specifications

	Description		No.
U_H	PE		PE
	L(+)		161
	L(-)		162
Voltage	U_{ne}	N	163
		E	164
	U_{Sync}	N (L2)	165
		L1	166
Current	I_{E1}	s1	167
		s2	168
	I_{E2} *	s1	169
		s2	170

	Signal configuration on the back-plane	No.
Binary inputs	E 1 (+)	22
	E 2 (+)	21
	Root E 1…2 (-)	23
	E 3 (+)	20
	E 4 (+)	19
	E 5 (+)	17
	E 6 (+)	16
	E 7 (+)	15
	E 8 (+)	14
	Root E 3…8 (-)	18
	E 9 (+)	12
	E 10 (+)	11
	E 11 (+)	10
	E 12 (+)	9
	Root E 9…12 (-)	13
	E 13 (+)	2
	E 13 (-)	1
	E 14 (+)	4
	E 14 (-)	3
	E 15 (+)	6
	E 15 (-)	5
	E 16 (+)	8

	Description	No.
	E 16 (-)	7
Binary outputs	Relay 1 (NOC)	66
		65
	Relay 1 (NCC)	64
		63
	Relay 2 (NOC)	70
		69
	Relay 2 (NCC)	68
		67
	Relay 3 (NOC)	43
		42
	Relay 4 (NOC)	45
		44
	Relay 5 (NOC)	47
		46
	Common relay 6	31
	Relay 6 (NOC)	30
	Relay 6 (NCC)	29
	Common relay 7…10	28
	Relay 7 (NOC)	27
	Relay 8 (NOC)	25
	Relay 9 (NOC)	26
	Relay 10 (NOC)	24
	Status **	49
	Status **	48
ELAN-L	EA+	116
	EA-	115
	E+	114
	E-	113
	GND	117
ELAN-R	EA+	109
	EA-	108
	E+	107
	E-	106
	GND	110

	Description	No.
COM 1-S ***	COM 1-S	SUB-D
COM 2 ****	COM2 TXD	97
	COM2 RXD	98
	COM 2 GND	99
	COM 2 RTS	96
	COM 2 CTS	95
COM 3	COM 3 Tx+	89
	COM 3 Tx-	88
	COM 3 Rx+	86
	COM 3 Rx-	87
	COM 3 GND	90
Analogue channels	Analogue channel 1 (+)	105
	Analogue channel 1 (-)	104
	Analogue channel 2 (+)	103
	Analogue channel 2 (-)	102
	Analogue channel 3 (+)	101
	Analogue channel 3 (-)	100
	Analogue channel 4 (+)	112
	Analogue channel 4 (-)	111
	Analogue channel 5 (+)	92
	Analogue channel 5 (-)	91
	Analogue channel 6 (+)	94
	Analogue channel 6 (-)	93

The meaning of * is explained below.

*	Current channel 2 is available as an option (Characteristic X18)
**	** based on Characteristic U, the status contact is either NOC or NCC
***	COM 1-S is only usable with control system and only if COM 1 is not used
****	COM 2 is only usable if it is not used internally

6.2 Additional inputs/outputs for backplane

Additional inputs/outputs				
Binary inputs		Relay	Control system connection:	
X15 48…250 V AC/DC X24 10…50 V AC/DC X28 190…250 V AC/DC X29 80…250 V AC/DC	X25 E17..E24: 48…250 V AC/DC E25..E32: 10…50 V AC/DC	X01	XW1	
E 17 (+)	E 17 (+)	R 10 COM		80
E 17 (-)	E 17 (-)	R 10 NOC	COM1 TXD	81
E 18 (+)	E 18 (+)	R 10 NCC	COM1 GND	82
E 18 (-)	E 18 (-)		COM 1 RTS	77
E 19 (+)	E 19 (+)	R 11 COM		83
E 19 (-)	E 19 (-)	R 11 NOC		84
E 20 (+)	E 20 (+)	R 11 NCC		85
E 20 (-)	E 20 (-)			76
E 21 (+)	E 21 (+)	R 12 COM		56
E 21 (-)	E 21 (-)	R 12 NOC		57
E 22 (+)	E 22 (+)	R 12 NCC		58
E 22 (-)	E 22 (-)			75
E 23 (+)	E 23 (+)	R 13 COM		59
E 23 (-)	E 23 (-)	R 13 NOC		60
E 24 (+)	E 24 (+)	R 13 NCC		61
E 24 (-)	E 24 (-)			74
E 25 (+)		R 14 COM		73
E 25 (-)		R 14 NOC		72
E 26 (+)		R 14 NCC		71
E 26 (-)			RS-485 P (A)*	41
E 27 (+)		R 15 COM	RS-485 GND	40
E 27 (-)		R 15 NOC		39
E 28 (+)	E 25 (+)	R 15 NCC		38
E 28 (-)	E 29 (+)			55
E 29 (+)	E 26 (+)	R 16 COM		37
E 29 (-)	E 30 (+)	R 16 NOC		36
E 30 (+)	E 27 (+)	R 16 NCC		35
E 30 (-)	E 31 (+)			54
E 31 (+)	E 28 (+)	R 17 COM		34
E 31 (-)	E 32 (+)	R 17 NOC		32
E 32 (+)	E 25...28 (-)	R 17 NCC		53
E 32 (-)	E 29…32 (-)			33
			COM1 RxD	79
			COM1 CTS	78
			RS-485 N (B)*	62

7. Interfaces

RS232 interfaces

The REG-DP regulator has two RS 232 serial interfaces (COM1, COM2); COM 1 is accessible on the front panel and COM 2 on the terminal strip. COM 2 is used to connect the regulator system to higher level control systems. Customer-specific protocols can be implemented through COM 2.

Connection element

Connection element	
COM 1 **COM1-S** **COM 2**	Pin strip, sub min D on the front of the device, pin allocation as PC multipoint terminal connector (Printed circuit board 6)
Connection options	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, 115000
Handshake	RTS / CTS or X_{ON} / X_{OFF}

RS485 interfaces

- Connection to E-LAN
- Dual interface RS 485 with repeater function

E-LAN (Energy Local Area Network)

Characteristics

- 255 addressable participants
- Multi-master structure
- Integrated repeater function
- Open ring, bus or a mixture of bus and ring
- Protocol is based on SDLC/HDLC frames
- Transmission rate 62.5 kbit/s or 125 kbit/s
- Frame length 10 ... 30 Bytes
- medium-throughput approx. 100 frames/s

COM3

Use to connect ≤ 15 random interface modules (ANA-D, BIN-D) to the regulator REG-DP.

8. Basic REG-DP connection to Petersen coil

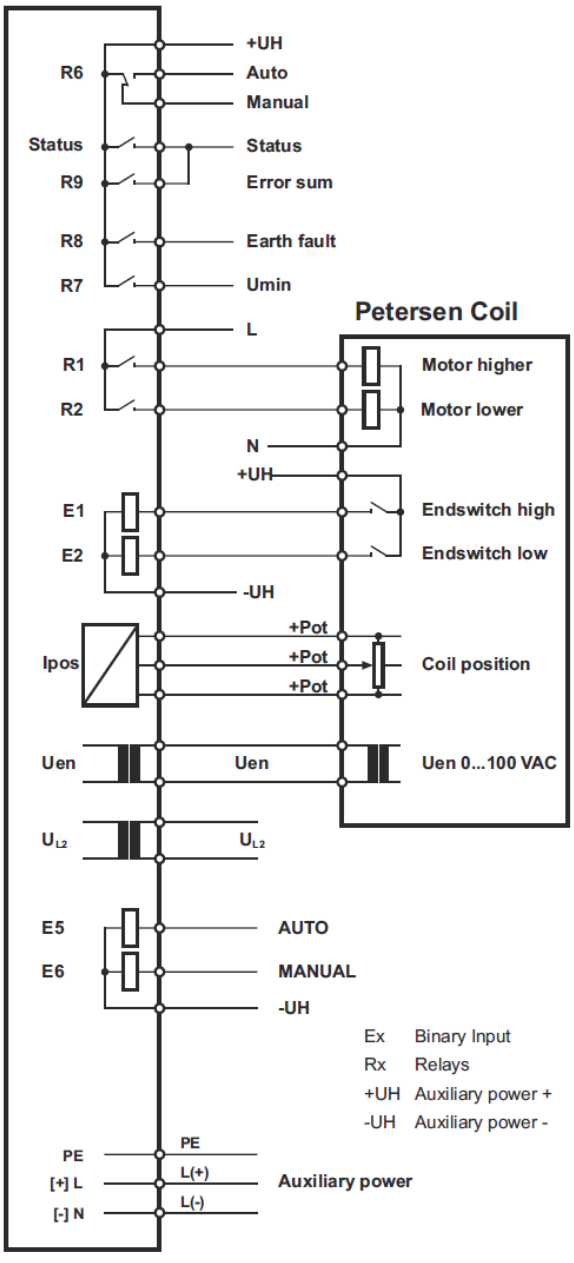

Figure 26: Connecting REG-DP to a Petersen coil

9. Optional current injection

There are situations in the grid in which classic regulation cannot be used to successfully tune the Petersen coil.

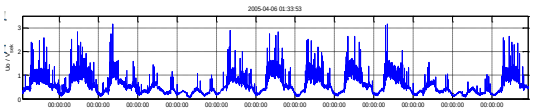

Figure 27: Flickering zero sequence voltage

- Flickering zero sequence voltage
- Very symmetrical grids (balanced)

We developed the optional current injection specifically for these cases.

The current injection creates a signal that is fed into the grid through the power auxiliary winding in the Petersen coil. The REG-DP calculates a resonance curve based on the grid's response (zero sequence voltage).

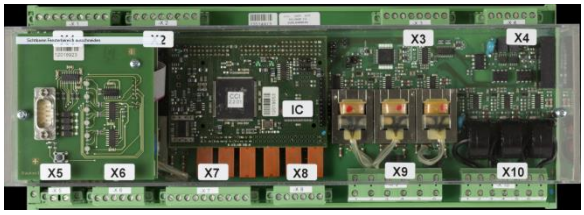

Figure 28: Current feed-in controller (CCI Controller)

9.1 Four connections to retrofit the current injection

The following connections have to be established if the current feed-in is to be retrofitted:

- **Power supply 230 V AC** (internally fused with 16 A)
- **Communication connection** between REG-DP **(COM3)** and CCI controller; 4-wire RS 485 shielded telephone cable; distance CCI to REG-DP up to 200 m
- Connection **to the power auxiliary winding** designed for 16 A; voltage-proof up to 500 V AC
- **U_{en} measurement** parallel to REG-DP; Ex. see next pages

9.2 Technical specifications

9.2.1 CCI Controller power supply

Power supply AC Version	
Nominal voltage (U_n)	100…240 V AC 100…350 V DC
Overload capacity	1.3 * U_n
Overload for 1s	2 * U_n
Power consumption	≤ 15 VA
Frequency	DC or 50/60 Hz
Voltage dip (100%)	< 50 ms

Power supply DC Version	
Nominal voltage (U_n)	110 V DC ±20%
Overload capacity	1.3 * U_n
Overload for 1s	2 * U_n
Power consumption	≤ 15 VA
Voltage dip (100%)	< 50 ms

9.2.2 CCI Controller measurement inputs

AC voltage inputs U1...U3	
Voltage range U_{nom} with jumper without jumper	 0…120 V 0…500 V
Shape of the curve	Sine
Frequency range	45....50....55 Hz
Input resistance with jumper without jumper	 60 kΩ 280 kΩ
Permanent overload	U_{nom} *1.2

AC voltage inputs L1...L3	
Voltage range U_{nom}	0…250 V
Shape of the curve	Sine
Frequency range	45....50....55 Hz
Input resistance	140 kΩ
Permanent overload	U_{nom} *1.2

AC power inputs I1...I3	
Current range I_{nom} with jumper without jumper	 0...5 A 0...25 A
Shape of the curve	Sine
Frequency range	45....50....55 Hz
Power consumption	≤ 0.1 VA
Permanent overload Permanent ≤ 10s ≤ 1s ≤ 5ms	I_{nom} *1.2 10 A 30 A 100 A 500 A

9.2.3 CCI Controller binary inputs

Binary inputs E1...E6	
Input voltage	AC and DC
H - Level E1…E2 E3…E4 E5…E6	 < 80 V AC/DC < 10 V AC/DC < 65 V AC/DC
L - Level E1…E2 E3…E4 E5…E6	 < 40 V AC/DC < 5 V AC/DC < 45 V AC/DC
Signal frequency	DC…65 Hz
Potential isolation	Optocoupler
Input resistance E1, E2 E3, E4 E5, E6	 ca. 100 kΩ ca. 5 kΩ ca. 100 kΩ
Potential isolation	Optocoupler; all inputs galvanically isolated from each other

9.2.4 CCI Controller binary inputs

Relay outputs	
max. switching frequency	≤ 1 kHz
Contact load	AC:250 V, 5 A (cos φ = 1.0) AC:250 V, 3 A (cos φ = 0.4) DC switching capacity: 250 V_{DC}: <= 75 W 30 V_{DC}: <= 150 W
Switching operations	> 10^5 electrical
Potential isolation	galvanically isolated from all device-internal potentials

9.3 Inductance (derating)

Inductance	
Quantity	2
Inductance	104 mH
Nominal frequency:	50 Hz
Voltage range	up to 550 V AC

9.4 Connection options for current injection to REG-DP(A) and Petersen coil

A magnetic coupling between the power auxiliary winding and the measuring transducer for Uo directly on the P-coil can affect the calculation results. We recommend the following interconnection options when measuring Uo in conjunction with the current injection.

Figure 29: Example of in-panel mounting: Current injection mounted directly into the motor drive box of the Petersen coil

9.4.1 Connections to measure U_o at open delta winding

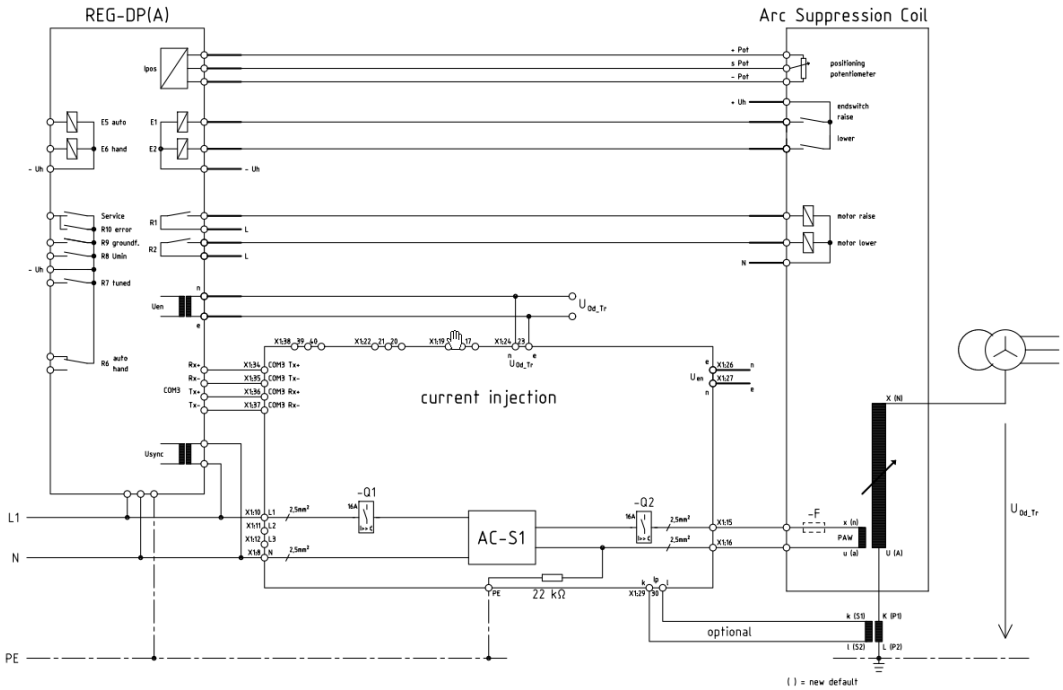

Figure 30: REG-DP(A) connection, current injection and Petersen coil;

9.4.2 Connections to measure U_o through separate/external measuring transducer

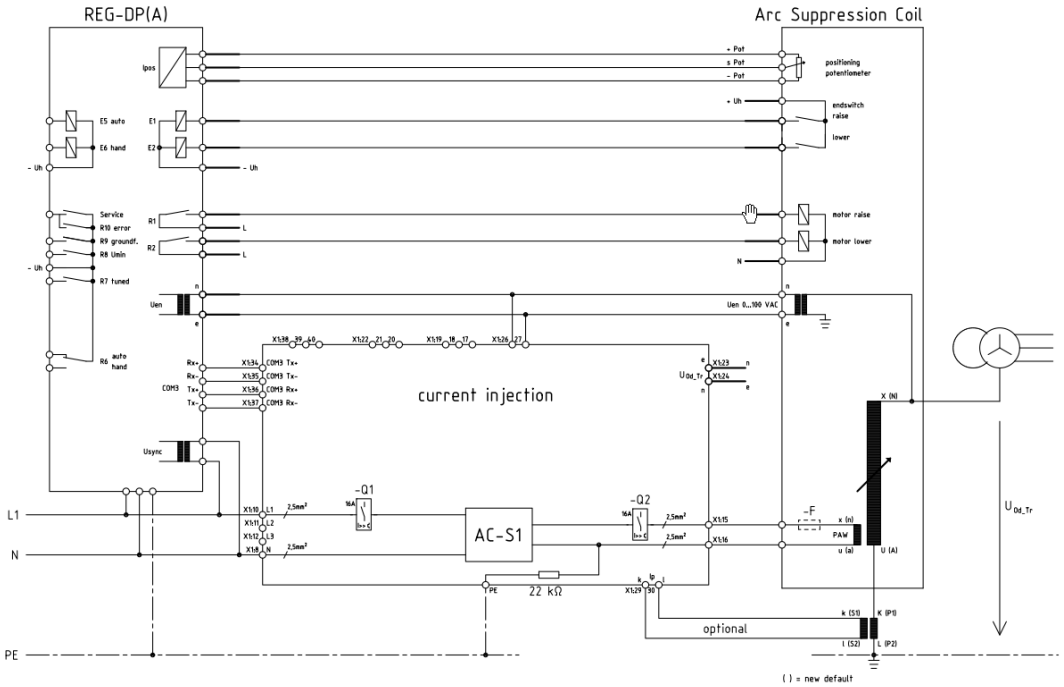

Figure 31: Uo measurement over external or remote voltage transducer

9.4.3 Connections for current injection when the power auxiliary winding is missing

In this case, the power section of the current feed-in is connected to a separate feed-in transducer.

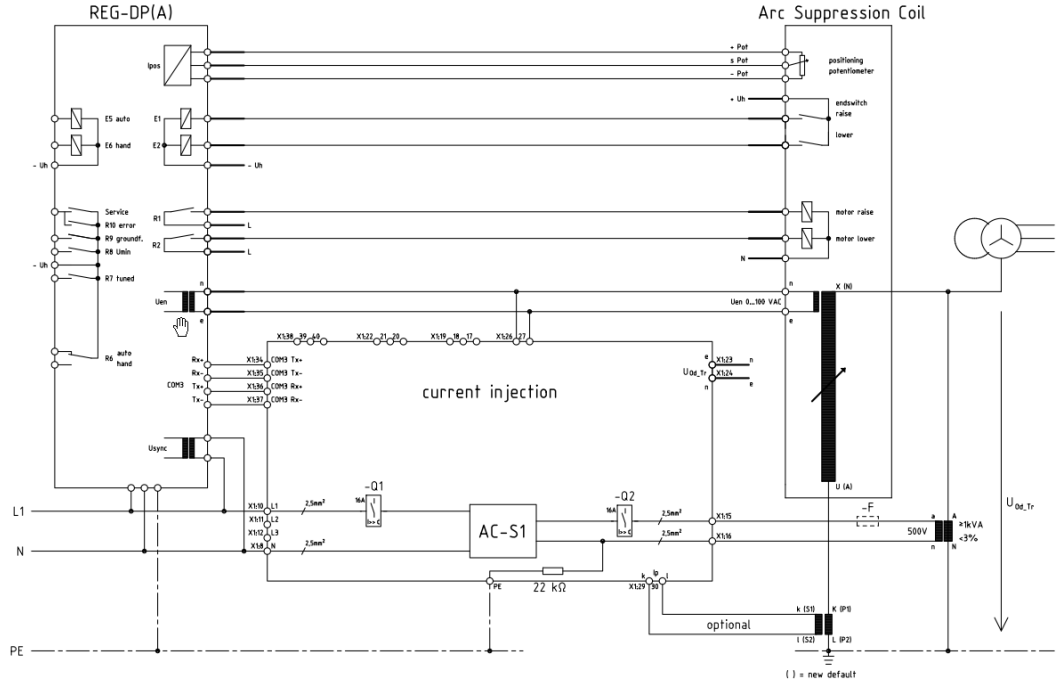

Figure 32: External power auxiliary winding and use of internal voltage transducer for the Petersen coil

9.4.4 Example of external feed-in transducer as spare power auxiliary winding (PAW)

NOTE! This transducer can only be used with the current injection. It is **not** a full replacement for a standard power auxiliary winding.

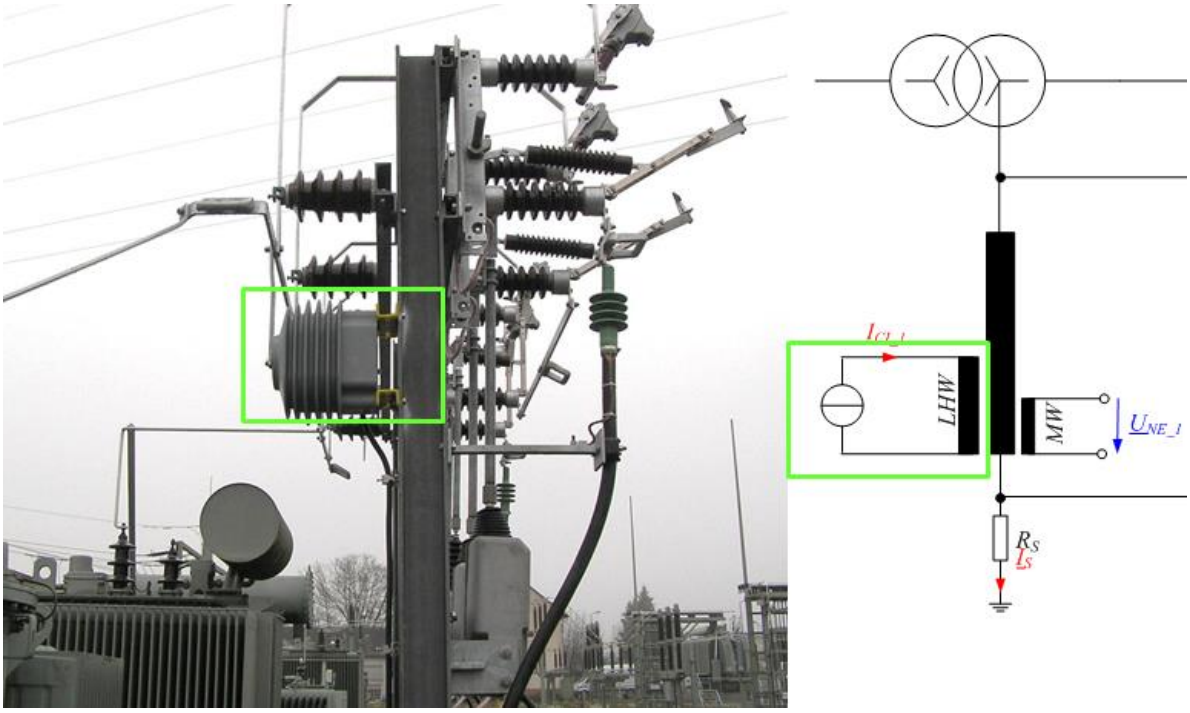

Figure 33: Spare power auxiliary winding (PAW) for current injection

The technical data for the transducer for a 20 **kV grid** are as follows:

Technical data for transducer for spare PAW	
Type	single-phase
Primary nominal voltage	$20\ kV/\sqrt{3}$
Secondary nominal voltage	500 V
Class	3
Nominal output/Nominal burden	1000 VA

9.5 Design of current injection controller (CCI)

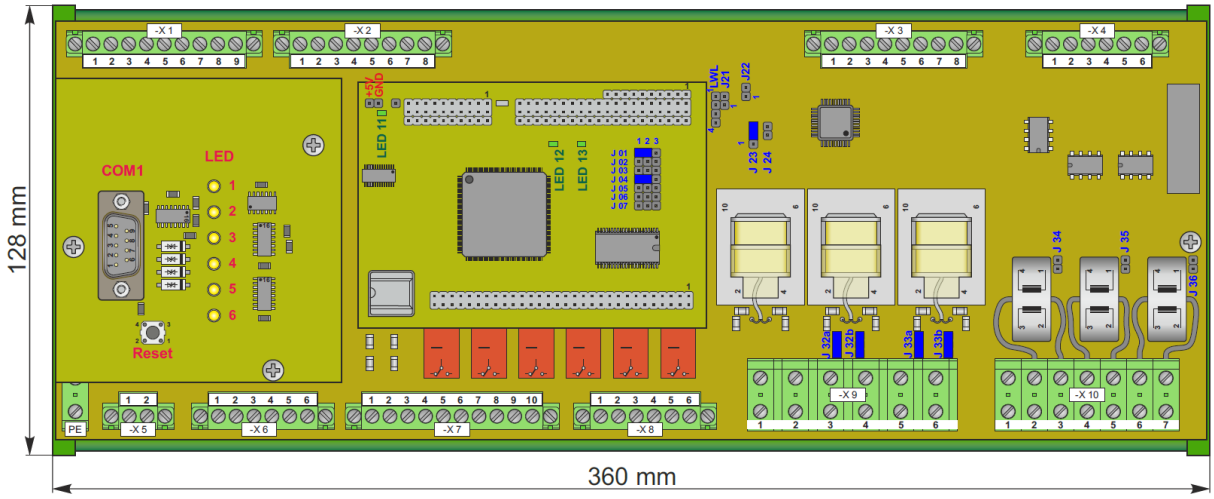

Figure 34: Dimensions of current feed-in controller (CCI)

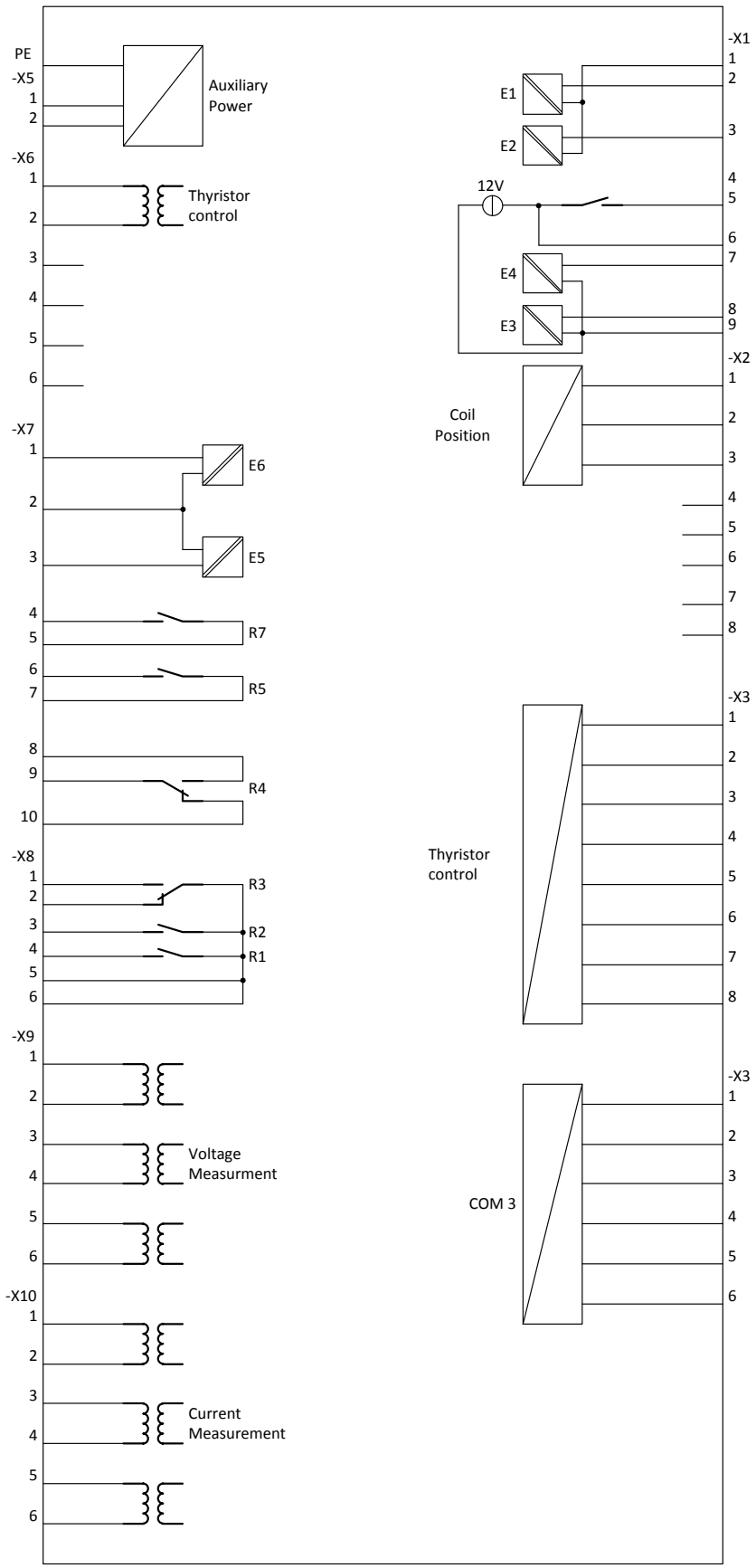

Figure 35: Terminal connections CCI

9.6 Terminal configuration CCI

9.6.1 Terminal strip – X1 binary inputs

Relay 6

Pin	Type	Function	Comments
X1:1	Input	Root E1..E2	Default: OFF
X1:2	Input	E2: SE-FUSE Fuse monitoring	max. 110 V DC
X1:3	Input	E5: End switch low	Default: OFF
X1:4			NC
X1:5	Relay	R6: Binary output	Pot. 12 V DC
X1:6	Relay	+12 V Output	Pot. 12 V DC
X1:7	Input	E4: Binary input	max. 12 V DC
X1:8	Input	E3: Binary input	max. 12 V DC
X1:9	Input	Root E3...E4	

9.6.2 Terminal strip – X2 potentiometer

Pin	Type	Function	Comments
X2:1	AO	Potentiometer +	ca. +3 V
X2:2	AI	Potentiometer loop	
X2:3	AO	Potentiometer -	
X2:4			NC
X2:5	AI	reserved	
X2:6		reserved	
X2:7	AO	reserved	+/- 5 V
X2:8		reserved	

9.6.3 Terminal strip – X3 AC switch (Thyristor)

Pin	Type	Function	Comments
X3:1		L1+	ca. +3 V
X3:2		(L2+)	
X3:3		L1-	
X3:4		(L2-)	NC
X3:5		Phase	
X3:6			
X3:7		+5 V	
X3:8		GND	

9.6.4 Terminal strip –X4 COM3 (RS 485) connection

Pin	Type	Function	Comments
X4:1		GND_1a	Isolated
X4:2	DO	Tx +	
X4:3	DO	Tx -	
X4:4	DI	Rx +	NC
X4:5	DI	Rx -	
X4:6		GND_1	Isolated

9.6.5 LEDs on current feed-in controller

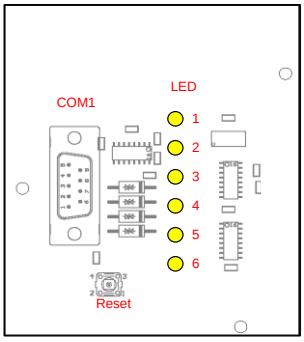

Figure 36: LED definitions current injection controller CCI

LED	Function	Status OK	Status error
1	U_{sync} measurement << 15 V	0	RED
2	U_{sync} Thyristors << 30V	0	RED
3		0	
4	Current injection active	GREEN	
5	PLL synchronized	GREEN	
6	Status current injec-tion controller (CCI)	GREEN flashing	I

9.6.6 PE

Pin	Type	Function	Comments
1		PE	Protective earth

9.6.7 Terminal strip – X5: Power supply

Pin	Type	Function	Comments
X5:1		L1 / +110 V DC	Supply voltage
X5:2		N / -110 V DC	

9.6.8 Terminal strip – X6: Synchronisation voltage Thyristor block

Pin	Type	Function	Comments
X6:1		Connection L1	U_{L1}: 230 V AC
X6:2		Connection N	
X6:3		Not used	
X6:4		Not used	
X6:5		Not used	
X6:6		Not used	

Note:
Cabinets that we prefabricate come equipped with the connections.

9.6.9 Terminal strip – X7 relay range 1

Pin	Type	Function	Comments
X7:1	Input	E6: End switch high	Default: OFF
X7:2	Input	Root end switch signal (E5..E6)	
X7:3	Input	E5: End switch low	Default: OFF
X7:4	Relay	R7: freely pro-grammable	Default: OFF
X7:5		R7: Root	
X7:6	Relay	R5: Motor lower	Default: OFF
X7:7		R5: Root	
X7:8	Relay	R4: Motor higher	Default: OFF
X7:9		R4: Root	
X7:10		R4: Not used	Default: OFF

Note:
The connections to X7 and X8 are redundant to the connections on the REG-DP(A).

The wiring for the end switch and the motor contacts are directly done on the REG-DP(A). This is why the connections for the current injection controller so not have to be configured.

9.6.10 Terminal strip – X8 relay range 2

Pin	Type	Function	Comments
X8:1	Relay	R3: opens upon failure	Default: OFF
X8:2	Relay	R3: closes upon failure	
X8:3	Input	E5: End switch low	Default: OFF
X8:4	Relay	R7: freely pro-grammable	Default: OFF
X8:5		R7: Root	
X8:6	Relay	R5: Motor lower	Default: OFF

9.6.11 Terminal strip – X9 inputs for voltage measurement

Pin	Type	Function	Comments
X9:1		Usync_1	0…100…500 V AC
X9:2		Usync_2	Default: 500 V
X9:3		Une_GND	0…100…500 V AC
X9:4		Une	Default: 100 V
X9:5		Uod_Tr_GND	0…100…500 V AC
X9:6		Uod_Tr	Default: 100 V (Only for extended algorithm)

9.6.12 Terminal strip – X10 current inputs

Pin	Type	Function	Comments
X10:1		PE	
X10:2		I1_a s1_ I_{CI}	0…1…5…10…25 A AC
X10:3		I1_b s2_ I_{CI}	Default: Current measured directly at CCI output
X10:4		I2_a s1_ I_S	0…1…5…10…25 A AC
X10:5		I2_b s2_ I_S	(Only for extended algorithm)
X10:6		I3_a s1_ I_F	0…1…5…10…25 A AC
X10:7		I3_b s2_ I_F	(Only for extended algorithm)

10. WinEDC configuration and configuration software

The WinEDC software is used to configure and program the system. It can be used in three different modes.

In **Panel mode**, the regulator can be displayed and controlled using the mouse. All of the settings, which can be made directly on the regulator using its membrane keyboard, can be carried out centrally in WinEDC.

Parameter mode enables each of the components to be quickly and easily configured. The parameters are set in a straightforward tree structure, saved for later use or transferred to a bus participant. This guarantees an easy and clear operation and is particularly useful when E-coil controllers and EOR-D earth fault detection relays in the REGSys™product line are used together in a plant component.

Terminal mode enables direct communication with the system.

The WinEDC Terminal is much easier to use than conventional terminal programs and makes programming the system a lot easier.

WinEDC runs on all versions of Windows from Windows95 to Windows 8 in 32-bit and 64-bit.

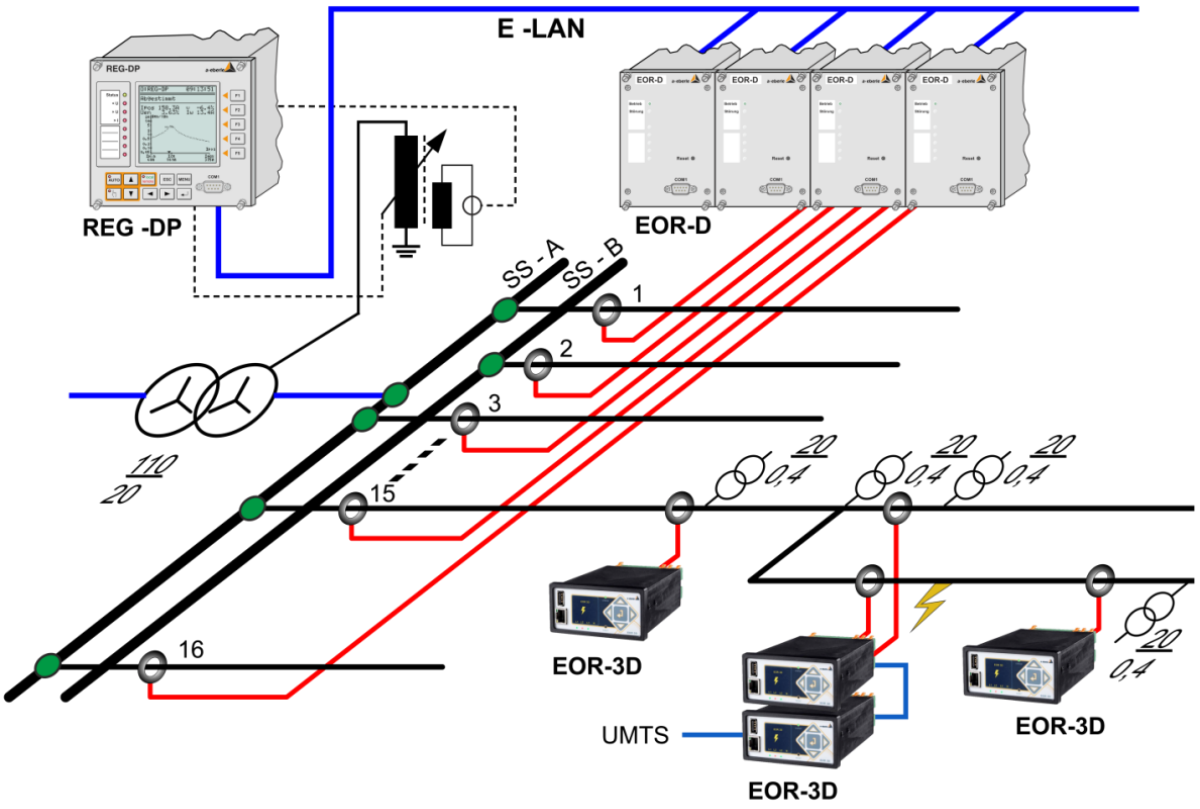

Figure 37: EORSys product range deployment

11. Order specifications

Please observe the following when placing an order:

- Only one unit can be ordered for codes with the same capital letter.
- When a code's capital letter is followed by the number 9, additional information in plain text is required.
- When a code's capital letter is followed only by zeroes the code may be omitted.
- X characteristics such as XL1 cannot be combined with all of the other characteristics. Please read the notes and explanations.

Characteristic	Code
Resonance regulator for Petersen coil (28TE, 3HE) resistance control, parallel control, Long-term recording and log book 16 binary inputs (freely programmable) 10 relay outputs (freely programmable), status relay, Current input (1 A or 5 A), COM 1, COM 2, COM 3 to connect a current injection WinEDC configuration software and connection cable (null modem)	**REG-DP**
Model	
● Plug-in module (28TE / 3HE)	B01
● Wall-mounting housing (49 TE) with wiring	B02
● In-panel mounting housing (30 TE) with wiring	B03
● Wall mounting, panel mounting housing (49 TE) mixed configuration with wiring for e.g. REG-DP with REG-PE or REG-DP with BIN-D, etc.	B91
● 19” module rack - with cabling as agreed	B92
● 19" backplane module rack	B95
Serial interface COM1	
● RS232	I0
● USB	I1
Power supply	
● external AC 85 V ... 110 V ... 264 V / DC 88 V ... 220 V ... 280 V	H1
● external AC 85 V ... 110 V ... 264 V / DC 88 V ... 220 V ... 280 V (20W)	H11
Note: H11 for REG-PE with fibre optic cable connection without REG-NTZ!	
● external DC 18 V ... 60 V ... 72 V	H2
Parallel control	
● communication over E-LAN	K0
● Distributed controller and communication without E-LAN	K1
Measurement input	
● additional current channel I2 (1 A or 5 A)	X18
Analogue outputs	
● without	E00
● with (please specify measurement range or scaling when placing the order) – Output 1: Zero sequence voltage U_o – Output 2: Position of Petersen coil I_{pos}	E90

Characteristic	Code
– Output 3: Current through the P-coil Ip – two analogue inputs, freely configurable	
● two analogue inputs, freely configurable (via background program).	E91
● random combination of modules	E900
Binary inputs (freely programmable)	
● E1...E8: AC/DC 48..250 V, E9...E16: AC/DC 10 ... 50 V	D1
● E1...E16: AC/DC 48 ...250 V	D2
● E1...E16: AC/DC 10 ...50 V	D3
● E1...E16: AC/DC 80 V..250 V	D4
● E1...E16: AC/DC 190 V..250 V	D5
Additional inputs/outputs (freely programmable)	
● Without	X00
Note: Optional characteristics, not in combination with XW1	
Slot 1	
● 15 relay outputs	X31
Slot 5	
● 8 additional relays (changeover)	X01
● 16 additional binary inputs E17...E32: AC/DC 48...250 V	X15
● 16 additional binary inputs E17...E32: AC/DC 10...50 V	X24
● 16 additional binary inputs E17...E24: AC/DC 48...250 V, E25...E32: AC/DC 10 ...50 V	X25
● 16 additional binary inputs E17...E32: AC/DC 190...250 V	X28
● 16 additional binary inputs E17...E32: AC/DC 80...250 V	X29
Control system connection:	
● without (continue with Characteristic group 'Y')	XW0
● integrated coupling (continue with Characteristic group 'XL')	XW1
● with external connection through REG-P/-PE/-PED/ (continue with Characteristic group 'Y')	XW9
Integrated protocol interface card	
● to connect the REG-DP to a control centre	XL1
● to connect several devices to a control centre	XL9
Note: Characteristic XL9 can only be combined with XZ15..XZ19, XZ91	
Connection type:	
● Copper	
– RS 232	XV10
– RS 485 2-wire operation only	XV11
● Fibre optic cable with FSMA connection technology, incl. fibreglass module	
– Fibreglass (Wave length 800...900 nm, range 2000 m)	XV13
– Plastic (wave length 620...680 nm, range 50 m)	XV15
● Fibre optic cable with ST connection technology, incl. fibreglass module	
– Fibreglass (Wave length 800...900 nm, range 2000 m)	XV17
– Plastic (wave length 620...680 nm, range 50 m)	XV19

Characteristic	Code
● Protocol can only be selected with XL1 and XL9	
– IEC 60870-5-103 for ABB	XZ10
– IEC 60870-5-103 for Areva	XZ11
– IEC 60870-5-103 for SAT	XZ12
– IEC 60870-5-103 for Siemens (LSA/SAS)	XZ13
– IEC 60870-5-103 for Sprecher Automation	XZ14
– IEC 60870-5-103 for others	XZ90
– IEC 60870-5-101 for ABB	XZ15
– IEC 60870-5-101 for IDS	XZ17
– IEC 60870-5-101 for SAT	XZ18
– IEC 60870-5-101 for Siemens (LSA/SAS)	XZ19
– IEC 60870-5-101 for others	XZ91
– DNP3	XZ20
– SPABUS	XZ22
– MODBUS RTU	XZ23
Local/remote keyboard switching	
● without	Y0
● with	Y1
Status contact	
● closes in case of malfunction (NC contact)	U0
● opens in case of malfunction (NO contact)	U1
User Manual	
● German	G1
● English	G2
● Russian	G6
● Czech	G8
● other	G9
Display language	
● same as the operating manual	A0
● German	A1
● English	A2
● Russian	A6
● Czech	A8
● other	A9

ACCESSORIES	CODE	
Current injection with two fixed frequencies (Supply voltage AC 230 V)	CIF	
Peak current injection with two fixed frequencies with additional use of pulse locating (Supply voltage AC 230 V)		HPCI
consists of Thyristor actuator, controller and inductance on mounting panel for 19” cabinet mounting	C1	C1
consists of Thyristor actuator, controller and inductance in standard mounting for indoor installation ca. 800 x 800 x 300 mm	C2	C2
consists of Thyristor actuator, controller and inductance in standard mounting for outdoor installation ca. 800 x 800 x 300 mm	C3	C3
consists of Thyristor actuator, controller and inductance in standard mounting for outdoor installation (wall mounting) ca. 800 x 800 x 300 mm	C4	C4
Housing version is negotiable!	C9	C9

NOTE!

The current injection can only be used without restrictions if the measurement for the zero sequence voltage and the current are derived from the coil’s primary winding. This means that the zero sequence voltage should not be measured on the E-coil itself.

ACCESSORIES	CODE
Female multipoint connector 1 (electrical connector model F)	
Female multipoint connector (for power input with advanced contacts)	
Female multipoint connector 3 (mixed connector model F24 + H7)	
Dummy panel 28 TE	
Dummy panel 14 TE	
Dummy panel 7 TE	
Dummy panel 8 TE	
PC connection cable (null-modem cable)	
Modem connection cable	
1 pack microfuses T2 L 250 V	
Time synchronisation:	
Radio clock DFC 77	111.9024.01
GPS radio clock NIS time, RS 485, Uh: AC 85…110 V…264 V / DC 88 V…220 V…280 V	111.9024.45
GPS radio clock NIS time, RS 485, Uh: DC 18…60 V…72 V	111.9024.46
GPS radio clock NIS time, RS 232, Uh: AC 85…110 V…264 V / DC 88 V…220 V…280 V	111.9024.47
GPS radio clock NIS time, RS 232, Uh: DC 18…60 V…72 V	111.9024.48
Communication:	
Develo MicroLink 56Ki analogue modem, DIN rail device incl. 230 V AC power supply	111.9030.03
TCP/IP adapter 10 Mbit REG-COM; DIN rail device including power supply 230 V AC	A01
TCP/IP adapter 10 Mbit REG-COM; plug-in module 8TE, 3HE; Power supply AC 85…110 V…264 V / DC 88 V…220 V…280 V	A02
TCP/IP adapter 10 Mbit REG-COM; plug-in module 8TE, 3HE; Power supply DC 18…60 V…72 V	A03

Notes

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