

Transformer-Monitoring Relay

Model REG-DMA

- Wall-mounting housing
- Panel mounting housing
- DIN-rail mounting



1. Application

Power transformers are key components of an electrical supply grid. The failure of a transformer not only has major economic consequences for the energy supplier, it can also lead to serious losses for consumers. For this reason, it makes sense to monitor the transformer as intimately as possible, to take its "temperature curve" (the thermal image) so as to collect information about the current load and the expected remaining life. This task can - based on IEC standards - be solved by electronic measuring and computing facilities.

The winding's hot-spot temperature is determined by the current that runs through the windings and the oil temperature, which can be fed into the REG-DMA as a mA-signal or directly as a PT 100 signal. Appropriate input modules are available for both signal forms. The appropriate analogue channels must be available in order to record the fill levels and other quantities such as the humidity or the oil's gases (H₂, CO, CO₂, CH₄, C₂H₂, C₂H₄, C₂H₆) content.

Monitoring consists of acquiring the transformer's main parameters. For instance, the oil temperature is recorded in addition to the current. Further, the hot-spot temperature is determined from the oil temperature and the current in accordance with IEC 60354 or IEC 60076 and extrapolated to the transformer's service life consumption. Depending on the winding temperature, up to six cooling stages can be activated. The system monitors the operating times of the fans and controls the individual fan groups so that an operating time as balanced as possible is achieved over the whole operating life. If desired, individual fans can also be permanently assigned to a certain cooling stage. Additional alarms such as Buchholz pre-warning and/or Buchholz triggering can be fed into the controller as digital signals, displayed and sent to a SCADA system for further processing.



The following protocols are available for transmission to process control equipment :

- IEC 60870-5-101
- IEC 60870-5-103
- IEC 60870-5-104
- DNP 3.0 (serial and over Ethernet)
- IEC 61850
- LON (on request)
- MODBUS RTU / TCP
- PROFIBUS
- SPABUS

2. **REG-DMA Characteristics**

- Large backlit LCD (128 x 128 pixels) with all important data (temperatures, voltage etc.)
- Measurement functions (U, I, P, Q, S, cos φ, φ, I*sin φ, f, Temp.)
- Basic recorder function (3-channel line recorder)
- Additional recorder with 4 x 64 channels and 108 MB repository
- Record operating hours for the transformer and the tap changer
- Determine the switching load (I²t value) for the tap charger
- Determine the hot-spot temperature for a maximum of three windings
- Calculate the service life consumption
- Evaluation of the moisture content in cellulose and the risk of bubble formation
- Control up to six fan groups
- Control a heater
- Control up to two oil pumps
- Record the run-time of the individual fan groups and oil pumps
- Cyclical control of the fan groups (same operating times)
- Smart fan control (control fans based on the predicted hot-spot temperature)
- Record and monitor limit values for gas and water, as well as the oil's H2 and CO content
- Overload prediction
- 16 freely programmable binary inputs (with extension modules up to 128)
- 11 freely programmable binary outputs (with extension modules up to 128)
- Freely programmable analogue inputs or outputs (mA)
 PT100 direct input
- PT100 direct input
- Limit-value monitoring for all measured quantities
- Programmable rated U and I values
- AE Toolbox parameterisation software to set parameters, program devices and view data, and to evaluate and archive data on the PC
- Free programmability enables implementation of control tasks
- RS485 (COM3) peripheral bus for additional interface modules (ANA-D, BIN-D, COM3/Modbus converter)
- Modbus RTU Master; direct communication with sensors and devices that have a Modbus interface (COM3/Modbus converter)
- UL certification (same hardware as the REG-DA voltage regulator)

3. Description



REG-DMA functions (maximum configuration)

- 1 3 x current and 2 x voltage transducer
- 2 Analogue inputs, PT100 (optional)
- 3 Binary inputs
- 4 Input for resistance-coded tap-position indicator (optional)
- 5 Auxiliary voltage
- 6 Indicator and processing unit
- 7 Analogue outputs
- 8 Binary outputs
- 9 E-LAN connection (2 x RS485 with repeater function)
- 10 COM1, RS232
- 11 COM1-S, RS232 (can be used alternatively to COM1)
- 12 COM2, RS232
- 13 COM3, RS485
- 14 Status notification (relay)



3.1 Transformer Monitoring

The transformer's main parameters are acquired in monitoring mode. The oil temperature can be entered through a mA signal or by entering it directly in PT100. The hot-spot temperature is determined in accordance with IEC 60354 and IEC 60076 and extrapolated to the transformer's remaining lifetime.



Fans can be switched in up to six groups as well as two oil pumps to regulate the temperature. The oil levels can be monitored and the operating hours of the fans and pumps counted.

The REG-DMA comes with ability to read mA-inputs. These inputs enable the oil temperature of a temperature transducer, for example, to be read as mA signal.

If other combinations are needed, for example, the temperature as PT100 direct connection and the hot-spot temperature as an mA output, the desired combination can be selected from characteristic groups 'E' and 'C'.

3.2 Transducer mode

The values of all relevant quantities of an equally or arbitrarily loaded three-wire three-phase system are calculated from the sample values and further displayed.



Current I_{eff} Active power P Reactive power Q Apparent power S $\cos \varphi$ Phase angle φ Reactive current I*sin φ Frequency f

All of the measured and calculated values can be transferred by analogue signal or through SCADA.



3.3 Recorder mode (S1)

The time-dependent progress of up to two selectable measured quantities is continuously displayed as a line chart. For this chart the time grid for the recording is adjustable. The measured quantities are recorded with the current date and time (time-stamped). This enables the data to be queried by date and/or time. The average storage duration for a channel is about six weeks.

The stored quantities can be displayed and viewed using the keyboard or the WinREG operating software with the RegView module.



Time grid dt 14 s, 1, 5, 10, 30, min / Division

Regardless of the selected time grid dt (feed rate), all of the measurements are stored in an adjustable time grid (stand-ard=1 s).

Each second value represents the arithmetic mean of 10 measurements that were generated at 100 ms intervals.

Storage behaviour in the	Overwrite with FIFO
case of an overflow	(F irst In First O ut)
Storage time	< 18.7 days worst case
(voltage)	on average > 1 month

3.4 Recorder mode (S2)

Recorder mode S2 provides a total of 4 recorders, each fitted with 64 channels. The recording interval can be set separately for each recorder. The data can only be parameterized and viewed through the A. Eberle Toolbox. The stored values cannot be displayed on the REG-DMA's screen.



4. Technical specifications

Regulations and standards

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

UL Certificate Number 050505 - E242284

CE



AC voltage inputs (U _E)	
Measuring voltage U _E	0 160 V
Shape of the curve	Sinusoidal
Frequency range	16 <u>5060</u> 65 Hz
Internal consumption	\leq U ² / 100 k Ω
Overload capacity	230 V AC continuous

AC input I _E)	
Measuring current In	1 A / 5 A
	(can be selected in the software)
Shape of the curve	Sinusoidal
Frequency range	16 <u>5060</u> 65 Hz
Control range	0 ln 2.1 ln
Internal consumption	\leq 0.5 VA
Overload capacity	10 A continuous
	30 In for 10 s
	100 In for 1 s (max. 300A)
	500 A for 5 ms

Analogue inputs (AI)	
Quantity	See order specifications
Input range	
Y1Y2	-20 mA020 mA
	Y1 and Y2 programmable
Control limit	± 1.2 Y2
Voltage drop	≤ 1.5 V
Potential isolation	Optocoupler
Common-mode rejec-	> 80 dB
tion	
Series-mode rejection	> 60 dB / Decade from 10 Hz
Overload capacity	≤ 50 mA continuous
Error limit	0.5%

The regulator comes with an analogue input (e.g. for the oil temperature).

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

Temperature input PT100	
Quantity	one PT100 input at
	Level III possible
	two PT100 inputs at
	Level II possible
Type of connection	Three-wire circuit
Current through sensor	< 8 mA
Potential isolation	Optocoupler
Line compensation	No compensation required
Transmission behaviour	linear

These inputs have an open circuit monitoring.

Resistance input (tap change potentiometer, WidMod)		
Quantity	See order specifications	
Connection	Three-wire, convertible to four-wire	
Total resistance in the	R1: 2 kΩ	
resistor chain	R3: 20 kΩ	
Resistance per tap	adjustable	
	R1: 5100 Ω/tap	
	R3: 502000 Ω/tap	
Number of taps	≤ 38	
Potential isolation	Optocoupler	
Current through resistor chain	max. 25 mA	

These inputs have an open circuit monitoring.

We take care of it.

Analogue outputs (AO)	
Quantity	See order specifications
Output range	
Y1Y2	-20 mA020 mA Y1 and Y2 programmable
Control limit	± 1.2 Y2
Potential isolation	Optocoupler
Load range	$0 \le R \le 8 V / Y2$
Alternating component	<0.5% of Y2

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

Binary inputs (BI)	
Inputs E1 E16 (E22, E2	8)
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 charac- teristic Dx
Shape of the permissible curve	Rectangular, sinusoidal
48 V250 V	
H - LevelL - Level	≥ 48 V < 10 V
10 V50 V	
 H - Level L - Level Input resistance 	≥ 10 V <5 V 6.8 kΩ
80 V 250 V	
H - LevelL - Level	≥ 80 V < 40 V
190 V 250 V	
 H - Level L - Level 	≥ 176 V < 88 V
Signal frequency	DC, 40 70 Hz
Input resistance	108 kΩ, except 1050 V
Potential isolation	Optocoupler; Groups of four, each galvanically isolated from each other.
Debouncing	Software filter with inte- grated 50Hz filter



Simplified diagram of a binary input

Binary outputs (BO)	
R 1 R13 (R19, R25)	
max. switching frequency	≤ 1 Hz
Potential isolation	Isolated from all device-
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	$\geq 5.10^5$ electrical

Display	
LC - Display	128 x 128 can display graphics
Lighting	LED, switches off after 15 min

Indicator elements		
The regulator has 14 light-emitting diodes (LED)		
LED Service	Normal operation	Green
LED Blocked	Faulty operation	Red
LED 1 LED 8	Freely programmable	Yellow
LED 9 LED 12	Freely programmable	Red

Each LED can be labelled on site.

If the labelling wishes are known at the time of order placement, labelling can be done at the factory.

Analog/Digital Conversion	
Туре	12 Bit successive approximation
Resolution	+/- 11 bit
Sampling rate	24 samples per period, e.g. 1.2 kHz for a 50Hz signal *

*The measurement inputs have an anti-aliasing filter.

Real-time clock (RTC)	
Accuracy	+/- 20 ppm
Buffering	Lithium button cell

Limit-value monitoring		
Limit values	programmable	
Response times	programmable	
Alarm indicators	LEDs are programmable	



Measured quantities (optionally as mA value)		
TRMS voltages	U ₁₂ , U ₂₃ , U ₃₁ (≤ 0.25%)	
Current TRMS	l ₁ , l ₂ , l ₃ (≤ 0.25%)	
Active power	P (≤ 0.5%)	
Reactive power	Q (≤ 0.5%)	
Apparent power	S (≤ 0.5%)	
Power factor	cos φ (≤ 0.5%)	
Phase angle	φ (≤ 0.5%)	
Reactive current	l · sin φ (≤ 1%)	
Frequency	f (≤ 0.05%)	

Reference conditions	
Reference temperature	23°C ± 1 K
Input quantities	U _E = 0 160 V I _E = 0 1A / 0 5A
Auxiliary voltage	H = Hn ± 1%
Frequency	45 Hz65 Hz
Shape of the curve	Sinusoidal, form factor 1.1107
Load (only for characteris- tics E91E99)	Rn = 5 V / Y2 ± 1%
Other	IEC 60688 - Part 1

Electrical safety	
Safety class	1
Degree of pollution	2
Measurement category Measurement category	IV/150 V III/300 V

Operating voltages			
50 V	150 V	230 V	
E-LAN,	Voltage	Auxiliary voltage,	
COM1 COM3	inputs,	binary inputs	
Analogue inputs,	current	(E1E16, relay	
Analogue outputs	inputs	outputs	
Inputs 1050 V		R1R13), Status	

Transmission behaviour of the analogue outputs		
Error limit	0.05% / 0.25% / 0.5% / 1% related to Y2 (see 'Measured quantities')	
Measurement cycle time	≤ 10 ms	

Electromagnetic compatibility		
EMC requirements	EN 61326-1 Equipment class A Continuous, unmonitored operation, industrial location 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	
Disturbance immunity	EN 61326 Table A1 and EN 61000-6-2	
ESD	IEC 61000-6-5 6kV/8kV contact/air	
Electromagnetic field	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	

Test voltages*	Description	Test voltage / kV	Feedback control loops
Auxiliary voltage	U _h	2.3	COMs, AI, AO
Auxiliary voltage	U _h	2.3	BI, BO
Measuring voltage	U _e	2.3	COMs, AI, AO
Measuring voltage	U _e	3.3	U _h , ВІ, ВО
Measuring voltage	U _e	2.2	۱ _e
Measuring current	l _e	2.3	COMs, AI, AO
Measuring current	l _e	3.3	U _h , BI, BO
Interfaces, COMs	COMs	2.3	BI, BO
Analogue outputs	AO	2.3	BI, BO
Analogue outputs	AO	0.5	COMs, Al
Analogue inputs	AI	2.3	BI, BO
Analogue inputs	AI	0.5	COMs, AO
Binary inputs	BI	2.3	BI
Binary inputs	BI	2.3	во
Binary outputs	BO	2.3	во

* All test voltages are AC voltages in kV that can be applied for 1 minute. The COMs are tested against each other with 0.5 kV.

Power supply		
Characteristic	HO	H2
AC	85 264 V	-
DC	88 280 V	18 72 V
Power consump- tion AC	≤ 35 VA	-
Power consump- tion DC	≤ 25 W	≤ 25 W
Frequency	45 400Hz	-
Microfuse	T1 250 V	T2 250 V

The following applies to all characteristics:

Voltage dips of \leq 25 ms result neither in data loss nor malfunctions.

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

Storage	
Firmware and recorder data characteristic S2	Flash memory
Device characteris- tics and calibration data	serial EEPROM with ≥ 1000 k write/read cycles
other data and recorder data characteristic S1	MRAM, Backup to flash memory possible

The backup battery on these devices is only used to buffer the real time clock if the aux. power supply is off.

5. Mechanical design

Housing	Sheet steel, RAL 7035 light-grey		
 Height 	325 mm incl. PG connectors		
 Width 	250 mm		
 Total depth 	114 mm		
 Mounting depth 	87 mm		
 Weight 	≤ 6.0 kg		
Housing doors	with silicate glass		
Front panel	Plastic, RAL 7035 grey on aluminium brackets		
Control panel cut-out			
 Height 	282 mm		
- Width	210 mm		
Protection type	IP 54		
Protection type with brush sealing	IP 12		

Conductor cross section and clamping torque						
Level	Function/	Conduct	or / mm ²	Torque		
	Clamp no.	flexible	solid	Nm		
I	Measurement inputs 110	4	6	0.6		
I	Bls, relays, aux. voltage 1160	2.5	2.5	0.6		
11	SCADA, all except XW9093+97+98 8798	0.5	0.5			
11	SCADA, only XW9093+97+98 8794	2.5	2.5	0.6		
II	Add-ons C9099 100113	2.5	2.5	0.6		
III	COMs, AEs 6186/200211	1.5	1.5	0.25		





Mechanical dimensions, panel mounting

We take care of it.



Mechanical dimensions, DIN-rail mounting, in mm



Mechanical dimensions, wall-mounting, in mm



General information about the connection technology

The regulator has three printed circuit boards or connection levels.



The auxiliary voltage, the input voltage and the currents, as well as the relay outputs, binary inputs etc., are connected on **Level I**.

The hardware for all control system connections is on Level II.

The corresponding connection elements on Level II must be used for RS232 and RS485 connection technology.

When working with an Ethernet connection (coupling required for IEC 61850, IEC 60870-5-104 or DNP 3.0 over Ethernet!), the corresponding plug connection is also accessible on Level II (RJ45 and/or fibreglass ST or LC).

For fibre optical connections up to a baud rate of 19200 (e.g. IEC 60870-5-101 or 103), the connection elements (send and receive diode as ST or FSMA connection) are directly mounted on the flange plate where they can be connected without opening the device.

Additional binary inputs and outputs, and mA inputs and outputs can be installed on Level II.

There are two slots that can be equipped with the following modules:

Module 1 : 6 binary inputs AC/DC 48 V...250 V

- Module 2 : 6 relay outputs
- Module 3 : 2 mA inputs
- Module 4 : 2 mA outputs
- Module 5 : PT100 input

The connections for each of the COMs, the E-LAN, the analogue inputs and outputs and for PT100 direct input (E91 + E94) are on **Level III**.

Optical interfaces

The REG-DMA regulator can also be directly connected through a fibre optic interface.

Transmission and receiver equipment is available for fibreglass and synthetic fibre optic cables.

It is also possible to choose between different mechanical connection options (ST, FSMA and LC connection technology).

Please refer to the list of characteristics for an overview of the available options.



Fibre optical connection (ST connection technology, V17, V19)



Fibre optical connection (FSMA connection technology V13, V15)



Fibre optical connection (1 x Ethernet ST, XW93)

Optical transmitter

Serial communication up to 19200 baud (Characteristics V13 ... V19)

Product	Wave	Fibre	Pmin	Pmax
	length		[dBm] ₁₎	[dBm] ₁₎
Fibreglass ST	λ = 820 nm	50/125 μm NA=0.2	-19.8	-12.8
Fibreglass FSMA		62.5/125 μm NA=0.275	-16.0	-9.0
		100/140 μm NA=0.3	-10.5	-3.5
		200 μm HCS NA=0.37	-6.2	+1.8
All-plastic	λ = 650 nm	1 mm POF	-7.5	-3.5
ST		200 µm HCS	-18.0	-8.5
All-plastic	λ = 650 nm	1 mm POF	-6.2	0.0
FSMA		200 µm	-16.9	-8.5

Communication over Ethernet 100 Mbit (100 Base Fx) (Characteristics XW92, XW93.x, XW95.x, XW96.1 and XW98)

Product	Wave length	Fibre	Pmin [dBm] ₁₎	Pmax [dBm] ₁₎
Fibreglass ST Fibreglass LC	1310 nm	62.5/125 μm NA=0.275	-20	-14

1) TA = 0..70°C, IF = 60 mA, measured after 1 m fibre optic cable

Optical receiver

Serial communication up to 19200 baud (Characteristics V13 ... V19)

Product	Wave length	Fibre	Pmin [dBm] ₂₎	Pmax [dBm] ₂₎
Fibreglass ST Fibreglass FSMA	λ = 820 nm	100/140 μm NA=0.3	-24.0	-10.8
All-plastic	λ = 650 nm	1 mm POF	-20.0	0.0
ST		200 µm HCS	-22.0	-2.0
All-plastic	λ = 650 nm	1 mm POF	-21.6	-2.0
FSMA		200 µm	-23.0	-3.4

Communication over Ethernet 100 Mbit (100 Base Fx) (Characteristics XW92, XW93.x, XW95.x, XW96.1 and XW98)

Product	Wave length	Fibre	Pmin [dBm] ₂₎	Pmax [dBm] ₂₎
Fibreglass ST Fibreglass LC	1310 nm	62.5/125 μm NA=0.275	-14	-32

2) TA = 0...70°C, VCC = 5 V±5%, output level LOW (active)



6. Terminal configuration

No.							
		Option	M1*		M2*		M9*
	2 5	Measuring voltage	U1a U1b		U_{L1} U_{L2}		U1a U1b
_	8 10	Measuring voltage	-		U _{L3}		U2a U2b
Level	1 3	S1 S2	Curren	t i	nput I_1		
	4 6	\$1 \$2	Curren	t i	nput I ₂		
	7 9	S1 S2 1/(+) Current input I ₃					
21 L/(+) U_H = Auxiliary voltage 22 L/(-) U_H = Auxiliary voltage 63 mA input + A1				e			
	63	mA input			+ A1		
	64	mA input			- A1		
_	61	mA input or output			+ A2		
el II	62	mA input or output			- A2		
Lev	65	mA input or output			+ A3		65
	66	mA input or output			- A3		66 -
	67	mA input or output			+ A4		
	68	mA input or output			- A4		68
	11	Binary input 1		F	reely pro	gra	ammable
	12	Binary input 2		F	reely pro	ogra	ammable
	13	Binary input 3 Binary input 4			reely pro	ogra	
	14	Binary input 4		GND			
	16	Binary input 5		Freely programmable			
•	17	Binary input 6		Freely programmable			
	18	Binary input 7		Freely programmable			ammable
	19	Binary input 8		Freely programmable			
	20	Binary input 58		GND			
	23	Binary input 9		F	reely pro	gra	ammable
	24	Binary input 10		Freely programmable			
	25	Binary input 11		Freely programmable			
	26	Binary input 12	<u>-</u>	Freely programmable			
	27	Binary input 91 Binary input 13	Ζ	Ereely programmable			
	29	Binary input 13 Binary input 14		Freely programmable			
	30	Binary input 15		Freely programmable			ammable
/el l	31	Binary input 16		Freely programmable			
Lev	32	Binary input 13	16	Ģ	SND		
	33			F	reely		D
	34			р	rogramn	nat	ole ^{R₅}
	35		_	F	reely		
	36	/		р	rogramn	nak	ole ^R 4
	37			F	reely		R.
	38	/		р	orogramm	nak	ole ^{N3}
	39						
	40			F	reely		B.
	41			р	rogramm	nat	ble ¹¹²
	42						
	43					_	
	44			F	reelv		_
	45			р	rogramn	nat	ole R ₁
	46	·					
	0						



*Option M1 Used for standard applications.

Three-wire networks are generally considered as symmetrical (11 = 12 = 13).

Option M2 Only used in randomly loaded three-phase networks ($|1 \neq |2 \neq |3$).

Option M9 For three-winding applications, two galvanically isolated voltage inputs are needed for U1 and U2.

The allocation of terminals 23 to 32 changes depending on characteristic D. The allocation for D0 / D1 / D3 / D7 / D9 is displayed.









6.1 Terminal Configuration Level II

Characteristics: C90...C99

Characteristic C90 – (e.g. 2 x PT100, other combinations are possible)

	No.			
2	100		lk+	
alı	101	DT100	Ue+	410
odı	102	P1100	Ue-	AIU
ž	103		lk-	
10	104		lk+	
le	105	DT100	Ue+	
npc	106	PT100	Ue-	A12
ž	107		Ik-	

Characteristic C91 – 6 additional binary inputs AC/DC 48 V ... 250 V

	No.		
	100	Binary input	E17
	101	Binary input	E18
e 1	102	Binary input	E19
qul	103	Binary input	E20
Μ	104	Binary input	E21
	105	Binary input	E22
	106	GND	E17 E22

Characteristic C92 – 12 additional binary inputs AC/DC 48 V ... 250 V

	No.		
	100	Binary input	E17
	101	Binary input	E18
le 1	102	Binary input	E19
qu	103	Binary input	E20
ъ	104	Binary input	E21
	105	Binary input	E22
	100	CND	F17 F22
	106	GND	E17 E22
	106	Binary input	E17 E22 E23
	106 107 108	Binary input Binary input	E17 E22 E23 E24
e 1	106 107 108 109	Binary input Binary input Binary input	E17 E22 E23 E24 E25
dule 1	106 107 108 109 110	Binary input Binary input Binary input Binary input	E17 E22 E23 E24 E25 E26
Module 1	106 107 108 109 110 111	Binary input Binary input Binary input Binary input Binary input	E17 E22 E23 E24 E25 E26 E27
Module 1	106 107 108 109 110 111 112	Binary input Binary input Binary input Binary input Binary input Binary input	E17 E22 E23 E24 E25 E26 E27 E28

Characteristic C93 – 6 additional relay outputs (NOC)

	No.		
	100	/	R12
	101		R13
e 2	102		R14
qul	103		R15
Ъ	104		R16
	105		R17
	106		GND R12 R17

Characteristic C94 - 12 additional relay outputs (NOC)

	No.		
	100		R12
	101		R13
e 2	102		R14
qul	103		R15
Ъ	104		R16
	105		R17
	106		GND R12 R17

	107		R18
	108		R19
e 2	109		R20
qul	110		R21
Mo	111	_ _	R22
	112	_ _	R23
	113		GND R18 R23

Characteristic C95– 6 additional binary inputs AC/DC 48 V ... 250 V and 6 additional relay outputs (NOC)

	No.			
	100	Binary input	E17	
	101	Binary input		E18
e 1	102	Binary input		E19
qul	103	Binary input		E20
Μo	104	Binary input	E21	
_	105	Binary input	E22	
	106	GND	E17 E22	
	107	/		R12
	108			R13
e 2	109			R14
Modul	110			R15
	111			R16
_	112			R17
	113			GND R12 R17

Characteristic C96 – 2 additional analogue inputs

	No.			
Module 3	100	analogue input	+	Δ10
	101	analogue input	-	AIO
	102		+	
	103	analogue input	-	A11

Characteristic C97 - 4 additional analogue inputs

	No.			
8	100	analogue input	+	A10
lle	101		-	/10
npc	102		+	
Ň	103	analogue input	-	A11
e 3	104	analogue input	+	Δ12
	105	analogue input	-	712
Inp	106		+	
Mo	107	analogue input	-	A13

Characteristic C98 - 2 additional analogue outputs

	No.			
t	100	analogue output	+	Δ10
le 2	101		-	A10
npo	102		+	
M	103	analogue output	-	A11

Characteristic C99 – 4 additional analogue outputs

	Nr.			
4	100	analogue output	+	A10
ule	101	and Bac output	-	, 120
odı	102		+	A11
Σ	103	analogue output	-	AII
odule 4	104	analogue output	+	A12
	105	and Bac output	-	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
	106		+	A12
Σ	107	analogue output	-	A13

6.2 Terminal Configuration for Control System Level II

Characteristics: Z10..15, 17..23, 90, 91, 99, XW90...98

Characteristics Z10..15, 17..20, 90, 91 – REG-P communication interface

	No.						
M1 85	87	RS485-N (B)					
COI RS4	88	RS485-P (A)	RS485-P (A)				
	89	RS232-TxD					
5 7	90	RS232-RxD					
0M	91	RS232-RTS	RS232-RTS				
2 2	92	RS232-CTS					
	93	RS232-GND					
PE	94	PE					
0	95	Fibre optic cable In					
11 pti	96	Fibre optic cable Out	Fibre optic cable Out Eibre optic				
e o N	97	Fibre optic cable GND	Fibre optic cable GND cable module				
C fibr	98	Fibre optic cable VCC		cable			

Characteristics Z22..23 – REG-PM communication interface

	No.					
с ю	92	RS485-P (A)				
DM 548	93	RS485-N (B)				
0 %	94	RS485-GND				
	87	RS232-TxD				
5 1	89	RS232-RxD				
523 S23	88	RS232-RTS				
0 2	90	RS232-CTS				
	91	RS232-GND	232-GND			
	96	Fibre optic cable In				
bre ble	97	Fibre optic cable Out				
M1 fi	95	Fibre optic cable GND	cable module Fibre opt			
영 · 6 · 98 · Fibre o		Fibre optic cable VCC	ptic cable VCC cable			
PARAM (SUB-D)		Parameter Interface				

Characteristic Z21 – REG-LON communication interface

	No.			
		Fibre optic cable In		1
op. ble		Fibre optic cable Out	Fibre optic	↓
ere ca		Fibre optic cable GND cable module		
Fit tio		Fibre optic cable VCC		cable

Characteristic Z99 – Profibus-DP communication interface

characteristic 255 Trombus Dr communication interface			
	No.		
	1	RS232-GND	
11) AN	2	RS232-GND	
RI (RI	3	RS232-RxD	
<u>ц</u>	4	RS232-TxD	
	3	B-Line (Rx/Tx +)	
ofibus-DP SUB-D)	4	RTS	
	5	GND BUS	
Pre)	6	+5 V BUS	
	8	A-Line (Rx/Tx -)	

Characteristic XW90..93+97+98 – REG-PE communication interface

	No.				
1	87	RS232-RxD			
Σ	88	RS232-TxD			
AR/	89	RS232-GND			
<u>م</u>	90	RS232-GND	RS232-GND-SCR		
2	91	RS232-RxD			
Σ	92	RS232-TxD			
٨RA	93	RS232-GND			
P/	94	RS232-GND	-SCR		
Ethernet	RJ45	connector	or	Fibre optic cable (ST or LC)	

Characteristic XW94..96 - REG-PED communication interface

	No.					
	87	RS485-P (A)				
1	88	RS485-N (B)				
	89	RS232-TxD				
No	90	RS232-RxD				
Ũ	91	RS232-RTS				
	92	RS232-CTS				
	93	RS232-GND				
FE	94	PE/Shield				
~	95	PARAM-RxD)			
ARAN	96	PARAM-TxD				
P4	₽ 97 PARAM-GN		D			
Ethernet 1	RJ45 connector		or	Fibre optic cable (ST or LC)		
Ethernet 2	RJ45 connector		or	Fibre optic cable (ST or LC)		



6.3 Block diagram - Characteristics D0, D1, D4, D7, D9



*) The dual module comes as a dual mA input module or a dual mA output module. The position is occupied by a PT100 module if the temperature is to be recorded directly.



6.4 Block diagram - Characteristics D2, D3, D5, D6, D8

*) The dual module comes as a dual mA input module or a dual mA output module. The position is occupied by a PT100 module if the temperature is to be recorded directly.





7. Interfaces & Software

Several REG-DMAs can be combined into a network of monitoring systems. Each of the devices in the network can access the data on the other devices. For example, two REG-DMAs can be connected to the control system through a control technology connection. A network also enables other A. Eberle devices such as the REG-D(A) voltage regulator to be accessed and all of the connected devices to be configured from one connection point.

If an interconnection does need to be established over long distances, the E-LAN can be redirected through the fibre optic cable or the Ethernet.

7.1 Serial interfaces

The REG-DMA has two RS232 serial interfaces with three connections (COM1, COM1-S, COM2). COM1 is the parameterization interface, while COM2 is mainly used to connect the REG-DMA to the higher control units. COM1-S is an alternative connection option for COM1. COM1 has priority, meaning that when COM1 has a connection, COM1-S is switched off. Devices connected to COM1-S do not have to be disconnected. This enables COM1-S to function as an alternative remote parameterisation interface that is only active when parameters are not set locally. COM1 can also be configured as a USB connection (optional).

If a control system module is not installed, COM2 in the terminal compartment can be used to connect a modem, a COM server or a PC.

Connection Elements

COM1	Sub-D 9-pin male (optionally as mini-USB) in the connection compartment
COM1-S	Terminal connection in the connection compartment
COM2	Terminal connection in the connection compartment
Connection options	PC, terminal, modem, PLC
Number of data bits/protocol	8 / even, none
Transmission rate bit/s	9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600
HANDSHAKE	RTS / CTS, XON / XOFF, delay, none

E-LAN (Energy Local Area Network)

Every REG-DMA has two E-LAN interfaces that are used to communicate with other REG-DM(A)s or other A. Eberle devices (e.g. voltage regulator REG-D(A)).

Characteristics

- 255 addressable participants
- Multi-master structure
- Integrated repeater function
- Open ring, bus or point-to-point connection possible
- Transmission rate 15.6 ... 375 kbit/s

COM3 (peripheral interface)

To connect up to 16 interface modules (BIN-D, ANA-D) to a REG-DMA in any combination. COM3 is an RS485 interface.

Optionally, a fibre optic cable can be used to connect COM3 devices that are not in the vicinity of the REG-DMA.

The COM3/Modbus converter can also be connected in order to establish direct serial communication with other Modbus devices. This enables the REG-DMA to acquire values such as the winding temperature or the gas-in-oil ratio from other devices and transmit them to the control technology or record them in the recorder.

Time synchronisation input (DCF input)

The time synchronisation input enables the time on the REG-DMA to be synchronised using a DCF77 signal. The input is designed for an RS485 (5 V) and can be wired to several devices as time synchronisation bus. The termination (terminating resistor) can be switched on and off by using jumpers on the CPU board. If a DCF signal cannot be received, a GPS clock or control system card that emulates a DCF signal can be used. Time can also be synchronised through the control system.

7.2 A.Eberle Toolbox - Parameterization and configuration software

The A.Eberle Toolbox is used to parameterize and programme the system, and to archive and view recorded data. The A.Eberle Toolbox runs on the following operating systems:

- Windows XP SP 3
- Windows Vista
- Windows 7
- Windows 8

Parameter	Setting range
Rated current for each cooling stage	03000A
Thermal time constant for each cooling stage	050000 s
Hot-spot temperature in- crease Hgr	090К
Winding exponent y	03
Basis of the control (Cooling stage control)	Oil Winding SmrtCtrl
Temperature limit for each cooling stage	-30200 °C
IEC equation	IEC 60354 IEC 60076
Type of air cooling	AN AF

	Daramotore	(coloction)	•
REG-DIVIA -	Parameters	(selection)	

Parameter	Setting range
Type of oil cooling	ON OF OD ON/OF ON/OD
Fan assignment	fixed cyclic
Number of fans	16
Transformer oil temperature alarm	0150 °C
Tap changer oil temperature alarm	0150 °C
Winding temperature alarm	0200 °C
Winding temperature trigger	0200 °C
Transformer oil level alarm	0 150 %
Tap changer oil level alarm	0 150 %
Gas-in-oil alarm	01000000 ppm
Water-in-oil alarm	01000000 ppm
H2-in-oil alarm	01000000 ppm
CO-in-oil alarm	01000000 ppm
Operating hours transformer	0999999h
Service life consumption transformer	0999999h
Operating hours fans	0999999h
Operating hours oil pumps	0999999h
Operating hours tap changer	0999999h
Switching load tap changer	090000000000 A ² s
max. Winding temperature	-30200 °C
Time to max. temperature	17200 s
Time delay limit values (adjustable for every limit value)	0900 s



8. Order specifications

- 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 may be required.
- When a code's capital letter is followed only by zeros, the code may be omitted.
- X characteristics such as XE91 cannot be combined with all of the other characteristics. Please read the notes and explanations.

CHARACTERISTIC	CODE
Transformer Monitoring System – REG-DMA	REG-DMA
• with dual E-LAN interface COM2, COM3 and an mA input channel, e.g. to measure the oil temperature	
• Comes with 16 binary inputs and 12 relay outputs plus a status output, and includes the parameterization	
software to set parameters, program and view all data. Includes connection cable	
 Digital 3-channel line recorder 	
 additional recorder function with 4 x 64 channels and 108 MB internal memory 	
Note: COM2 is only freely accessible when operated without control system.	
Model	
• Panel mounting or wall mounting (H x W x D) 307 x 250 x 102 mm including flange plate with brush element	BO
 with DIN-rail adapter 	B1
Serial interface COM1	
 RS232 with SUB-D connector (9-pin male), standard if characteristic I is not specified 	10
USB (Mini USB connector)	11
Power supply	
external AC 85 V 110V 264 V / DC 88 V 220V 280V	HO
• external DC 18 V 60V 72V	H2
Input current (can be changed at a later stage)	
• I _{EN} 1A	F1
• I _{EN} 5A	F2
Voltage and current measurement	
Three-wire three-phase system with equal load	M1
 Three-wire three-phase system with random load (ARON connection) 	M2
 other transducer applications (2 x I, 2 x U, e.g. triple-wound) 	M9
additional analogue inputs and outputs	
• without	E00
 with one PT100 input 	E91
 with two mA inputs 	E92
 with two mA outputs 	E93
 with one PT100 input and one mA output 	E94
 with two mA inputs and one mA output 	E95
• with three mA outputs	E96
• Tap change potentiometer input total resistance 180 Ω 2 k Ω , min. 5 Ω /tap	E97
• Tap potentiometer input total resistance 2 k Ω 20 k Ω , min. 50 Ω /tap	E98
 other combinations of inputs and outputs 	E99
Binary inputs and tap change potentiometer input	
• 16 units binary inputs AC/DC 48250 V (E1E16)	D0
• 8 units binary inputs AC/DC 1050 V (E1E8) and 8 units AC/DC 48250 V (E9E16)	D1
• 16 units binary inputs AC/DC 1050 V (E1E16)	D4
• 16 units binary inputs AC/DC 190250 V (E1E16)	D7
• 16 units binary inputs AC/DC 80250 V (E1E16)	D9
• 1 tap change potentiometer input (total resistance 180 2k Ω) and 8 binary inputs AC/DC 48250 V	D2
• 1 tap change potentiometer input (total resistance >2 20 k Ω) and 8 binary inputs AC/DC 1050 V	D3
• 1 tap change potentiometer input (total resistance 180 2 k Ω) and 8 binary inputs AC/DC 1050 V	D5
• 1 tap change potentiometer input (total resistance >2 20 k Ω) and 8 binary inputs AC/DC 48250V	D6
• 1 tap change potentiometer input (total resistance >2 20k Ω) and 8 binary inputs AC/DC 80250 V	D8

CHARACTERISTIC	CODE
Level II: additional inputs and outputs as well as the standalone monitoring function PAN-A2	
• without	C00
with 6 binary inputs AC/DC 48 V250 V	C91
with 12 binary inputs AC/DC 48 V250 V	C92
with 6 relay outputs	C93
 with 12 relay outputs 	C94
 with 6 binary inputs and 6 relay outputs 	C95
 with 2 analogue inputs 	C96
 with 4 analogue inputs 	C97
 with 2 analogue outputs 	C98
 with 4 analogue outputs 	C99
 other combinations 6 inputs, 6 outputs, 2 analogue inputs, 2 analogue outputs or PT100 input 	C90
Note for C90: Two slots are usually available on Level II.	
Each slot can be equipped with 6 binary inputs, 6 binary outputs or with an analogue module.	
COM3 interface	
 RS485 (standard, characteristic specifications can be omitted) 	R1
 RS485 and for remote components fibre optic cable (fibreglass) with ST connector 	R2
Note: COM3 is needed for ANA-D, BIN-D and COM3/Modbus converter!	
Integrated control system connection in conformity with: IEC 61850, IEC 60870-5-104, DNP 3.0 over Ethernet	
or Modbus TCP/IP (RTU)	XI.V.00
 Without (continue with characteristic group 'L') USC 60870 5, 404 (b) 45 (continue with characteristic group 'L') 	XVV00
IEC 60870-5-104/RJ 45 (continue with characteristic group G) IEC 60870 E 104 with fibre optic cable connection (continue with characteristic group 'C')	XW90
• TEC 00870-5-104 with Tible Optic cable connections in accordance with IEC 608E0 E 104 Note: Diagona chapter that target system for connections in accordance with IEC 608E0 E 104	XW92
Note. Please specify the target system for connections in accordance with IEC 60850-5-104	_
 IEC 61850/RJ 45 (continue with characteristic group 'G') 	XW91
IEC 61850 with fibre optic cable with ST connection (continue with characteristic group 'G')	XW93
• IEC 61850 with fibre optic cable with LC connection (continue with characteristic group 'G')	XW93.1
EC 61850 with 2 x RJ45 connection (continue with characteristic group 'G')	XW94
IEC 61850 with 2 x fibre optic cable with ST connection (continue with characteristic group 'G')	XW95
IEC 61850 with 2 x fibre optic cable with LC connection (continue with characteristic group G) IEC 61850 with 1 x DIAE and 1 x fibre optic cable with ST connection (continue with characteristic group G)	XW95.1
IEC 61850 with 1 x RJ45 and 1 x fibre optic cable with ST connection (continue with characteristic group 'G') IEC 61850 with 1 x RJ45 and 1 x fibre optic cable with LC connection (continue with characteristic group 'C')	
• TEC 61850 with 1 X RJ45 and 1 X TIDE Optic cable with LC connection (continue with characteristic group G) Note: Place specify the target system for connections in conformity with LEC 61850.	XVV90.1
Note. Please specify the target system for connections in comornity with LC 01850	
 DNP 3.0 over Ethernet with 1 x RJ45 connection (continue with characteristic group 'G') 	XW97
• DNP 3.0 over Ethernet with 2 x RJ45 connection (continue with characteristic group 'G')	XW94.1
• DNP 3.0 over Ethernet with 1 x fibre optic ST connection (continue with characteristic group 'G')	XW98
• DNP 3.0 over Ethernet with 1 x fibre optic LC connection (continue with characteristic group 'G')	XW98.1
• DNP 3.0 over Ethernet with 2 x fibre optic ST connection (continue with characteristic group 'G')	XW95.2
• DNP 3.0 over Ethernet with 2 x fibre optic LC connection (continue with characteristic group 'G')	XW95.3
• DNP 3.0 over Ethernet with 1 x RJ45 and 1 x fibre optic ST connection (continue with characteristic group 'G')	XW96.4
• DNP 3.0 over Ethernet with 1 x RJ45 and 1 x fibre optic LC connection (continue with characteristic group 'G')	XW96.5
Note: Please specify the target system for connections in conformity with DNP 3.0	
	XXX 0 4 0
 MODBUS TCP/IP with 2 X RJ45 connection (continue with Characteristic group 'G') MODBUS DTL with DS 495 (and with 10 D145 (10 50) connection (continue with Characteristic group 'G') 	XW 94.2
MODBUS RTU With RS485 (and with 1X RJ45/1X FO) connection (continue with Characteristic group 'G)	XVV96.2
Integrated control system connection in conformity with: IEC 60870- 5-101/103,DNP	
without (continue with characteristic group 'G')	LÜ
to connect the KEG-DA to a control centre	
Note: L9 can only be combined with characteristics Z15 to Z19 and Z91	L9



CHARACTERISTIC	CODE
Connection type	
Copper	
– RS232	V10
 RS485 2-wire operation only 	V11
Fibre optic cable with FSMA connection technology	
 Fibreglass (wave length 800900 nm, range 2000 m) 	V13
 Plastic (wave length 620680 nm, range 50 m) 	V15
Fibre optic cable with ST connection technology	
 Fibreglass (wave length 800900 nm, range 2000 m) 	V17
 Plastic (wave length 620680 nm, range 50 m) 	V19
► IFC60870-5-103 for ABB	710
■ IEC60870-5-103 for Areva	711
■ IEC60870-5-103 for SAT	712
 IEC60870-5-103 for Siemens (ISA/SAS) 	713
 IEC60870-5-103 for Sprecher Automation 	714
 IEC60870-5-103 for others 	Z90
 IEC60870-5-101 for ABB 	Z15
• IEC60870-5-101 for IDS	Z17
• IEC60870-5-101 for SAT	Z18
IEC60870-5-101 for Siemens (LSA/SAS)	Z19
• IEC60870-5-101 for others	Z91
• DNP 3.00	Z20
LONMark (on request)	Z21
SPABUS	Z22
MODBUS RTU	Z23
 Profibus-DP (always with V11!) (on request) 	Z99
Operating instructions	
German	G1
English	G2
Other (On request)	G9
Display language	
German	A1
English	A2
Spanish	A4
Other (On request)	A11
Use of IEC 61850 GOOSE applications	GOOSE
IEC 61850 with bonding in active backup mode	Bonding
DCF simulation over NTP and E-LAN extension over Ethernet (CSE)	DCF/E-LAN
Note: Only in combination with XW94.x, XW95.x, XW96.x	

We take care of it.

REG-DMA accessories	ID No.
Fuses, batteries:	
1 pack microfuses T1 L 250 V, 1 A, for auxiliary voltage range H0	582.1002
1 pack microfuses T2 L 250 V, 2 A, for auxiliary voltage range H2	582.1019
1 lithium battery (pluggable)	570.0003.00
1 lithium battery (solderable)	on request
1 button cell CR1632	on request
Connection technology:	
PC connection cable (null-modem cable)	582.020B.00
USB cable (USB A <-> USB B Mini)	582.020U.00
Modem connection cable	582.2040
RS232 10 m extension cable	582.2040.10
USB/RS232 adapter with integrated null-modem cable (FDTI), 1.5m	111.9046.01
E-LAN interface -> fibreglass, (RS485 conversion to fibre optic cable), ST fibre optic cable connection, 2 units needed for each line	111.9030.10
E-LAN interface -> fibreglass, (RS485 conversion to fibre optic cable), LC fibre optic cable connection, 2 units needed for each line	111.9030.11
E-LAN booster, Uh: DC 2075 V, DIN-rail mounting housing 22.5 mm width, if necessary with mains adapter H1 111.9030.36	111.9027.02
E-LAN router, one outgoing circuit with booster, Uh: DC 2075 V, DIN-rail mounting housing 22.5 mm width, if necessary with mains adapter H1 111.9030.36	111.9027.03
Time synchronisation:	
Radio clock (DFC 77)	111.9024.01
GPS radio clock NIS time, RS485, Uh: AC 85 V 110V 264 V / DC 88 V 220V 280V	111.9024.45
GPS radio clock NIS time, RS485, Uh: DC 18 V 60V 72V	111.9024.46
GPS radio clock NIS time, RS232, Uh: AC 85 V 110V 264 V / DC 88 V 220V 280V	111.9024.47
GPS radio clock NIS time, RS232, Uh: DC 18 V 60V 72V	111.9024.48
Modems:	
Develo MicroLink 56Ki analogue modem, tabletop device incl. 230 V AC mains adapter	111.9030.02
Develo MicroLink 56Ki analogue modem, DIN-rail mounting device incl. 230 V AC mains adapter	111.9030.03
Industrial analogue modem that can be used as dial-up modem or dedicated line; (Uh: AC 20260 V/DC 14 V280 V) with DIN-rail mounting adapter; can be used with the PC and the device.	111.9030.17
Insys industrial analogue modem that can be used as a dedicated line; Supply voltage DC: 1060 V, can be used with PC and device!	111.9030.20
ISDN modem for DIN-rail mounting mount; Uh: DC 10 60 V	111.9030.27
ISDN modem as tabletop device; incl. 230 V AC mains adapter	111.9030.37
GPRS modem (Insys) for DIN-rail mounting mount; incl. magnet foot antenna and parameterisation software; Uh: DC 1060 V	111.9030.29
Power supply:	
Phoenix mains adapter for DIN-rail mounting: In: AC 120 V230 V, DC 90 250 V, Out: DC 24 V	111.9005.02
Mains adapter for DIN-rail mounting: In: AC 80 V250 V; Out: DC 24 V	111.9030.31
Mains adapter for DIN-rail mounting: In: DC 18 V60 V72 V; Out: DC 24 V	111.9030.32
Mains adapter for E-LAN router or booster: In: AC 100 to 240 V, Out: 24 V/1.3 A	111.9030.36
UPS HighCAP2403-1AC, In: 230 V AC Out: 24 V DC, max. 3 A, 1000 Joule (1 kW), DIN-rail	111.9030.38



REG-DMA accessories	ID No.
Additional input and output module:	
Analogue input module (2 inputs)	320.0004.00
Analogue output module (2 outputs)	320.0003
Input module for tap-potentiometer total resistance 1802 k Ω , min. 5 Ω /tap	320.0002.01
Input module for tap-potentiometer total resistance 220 k Ω , min. 50 Ω /tap	320.0002.03
Input module for PT100 in conformity with DIN 43760 in three-wire circuit	320.0005.01
Operating instructions:	
Additional operating instructions for REG-DMA (please specify the language)	GX

Software for REG-DMA	CODE
REGView as CD-ROM Parameter software enhanced with Collector and RegView functions to archive and view data recorded with REG-DM(A).	REGView

General add-ons	CODE
Profibus-DP module	Profi-DP
Includes RS485 interface with connection cable; for external power supply with 24 V DC	
Model	
• Can be mounted on DIN-rail mounting (120 x 75 x 27 mm) ext. 24 V power supply adapter	BO
TCP/IP adapter	REG-COM
 10 Mbit mountable on DIN-rail mounting with mains adapter for Uh AC 230 V 	A01
• 100 Mbit	A90
COM3 converter	COM3-MOD
COM3 to Modbus converter to connect external devices with Modbus interface to the transformer moni-	
toring module. For example, to analyse the gas-in-oil ratio online, directly measure the winding	
temperature, etc.	
 Auxiliary voltage 	
AC 85264 V, DC 88 280 V, DC 18 72 V	H1
DC 18 72 V	H2
IRIG-DCF77 converter	IRIG-DCF
AC 85 V 110 V264 V / DC 88 V 220 V 280 V	H1
DC 18 V 60 V 72 V	H2
 as wall-mounting housing 20 TE 	B2

Notes



Notes		



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