Radio receiver EXL

4-channel / up to 1000 memory locations

Mounting and operating instructions for qualified electricians

Please keep these instructions so that you have them available if you have any questions later.

Not designed for passing on to end customers (users)!

- Operating instructions must be prepared for the user for "his application".
- A handover document or acceptance certificate must be prepared.
- Potential hazards must be pointed out.
- Operation and maintenance must be explained.

Always read before initial operation!

Contents

Safety instructions

Disregarding these safety instructions can lead to personal and property damage!

Work on the receiver

- Switch off the supply voltage!
- Only switch the voltage on again after you have checked all the connections again.

Mounting, installation, commissioning and maintenance:

These instructions require specialist knowledge which requires vocational training and qualification in at least one of the following professions:

- - Electrical fitter
- - Electrical system fitter
- - Electrical machine fitter
- - Electrician
- - Industrial electrician

or knowledge as a qualified electrician in compliance with the German accident prevention regulation BGV A2 (VBG 4).

Mounting and operation

- Reliable operation is only possible following careful mounting according to these instructions.
- This remote control is only approved for use with devices and systems where a functional problem in the transmitter or receiver does not result in a personal or property hazard or this risk is covered by other safety equipment.
- The remote control of devices and systems which involve an increased risk of accident (e.g. crane systems) is prohibited!
- Observe locally applicable regulations.
- Heed accident prevention regulations, VDE and EVU regulations.
- Information can be obtained from power stations, VDE and employers' liability insurance companies. Reliable operation is only possible following careful mounting according to these instructions.
- No technical modifications may be carried out. Any change will result in a loss of liability and warranty.
- Care must be taken that grounding is in line with ESD requirements during all work on the control unit. Otherwise the control unit could become damaged or destroyed. New goods or repairs may only be dispatched when respective protective measures have been taken (e.g. do not use normal plastic films!). Otherwise the warranty shall be lost. Static charging and discharging must be avoided.

Mounting instructions

Disregarding these mounting instructions can lead to personal and property damage!
Increased inner temperature through direct sun radiation reduces service life.
Water or insects inside the control unit lead to failure or destruction

To avoid damage to the receiver:

- Protect the control unit from influences of the weather.
- Only mount with housing.
- Only use existing attachment bore holes in the housing.
- To prevent housing deformation and leaks, mount on a flat surface, only tighten screws moderately.
- Mount in an upright position, cable feed from below.
- Open the self-sealing grommet using a round screwdriver. Do not cut open with a blade!

Maintenance:

- The receiver is maintenance-free.
- The housing must not be opened by the end customer (loss of warranty)

Storage and transport conditions

Disregard can lead to failure, even after initial operation!

Store dry, dust-free and secure against impact and falling.
Storage temperature -25°C...+70° C at 30 %...60 % rel. humidity.
Transport only with sufficient and well-padded additional packaging.

- The existing packaging is not designed as transport packaging.
- Damage caused by disregard is not covered by the warranty!

Abbreviations used in the instructions

[1]...[15]	= Refers to an illustration in the diagram index
[REC1]	= 15-pole slot for radio module 1 **[6]**
[REC2]	= 15-pole slot for radio module 2 **[7]**
[Kl.1]..[Kl.30]	= Refers to connection terminals **[15]**
[Ta.+]	= Key “+” on the operating panel next to the 7-segment display **[5a]**
[Ta.-]	= Key “-” on the operating panel next to the 7-segment display **[5b]**
[Ta.K1]	= Key “K1” for channel 1 **[1a]**
[Ta.K2]	= Key “K2” for channel 2 **[1b]**
[Ta.K3]	= Key “K3” for channel 3 **[1c]**
[Ta.K4]	= Key “K4” for channel 4 **[1d]**
[LED.K1]	= LED for status display channel 1 **[1a]**
[LED.K2]	= LED for status display channel 2 **[1b]**
[LED.K3]	= LED for status display channel 3 **[1c]**
[LED.K4]	= LED for status display channel 4 **[1d]**

Connections

All connections must be made in accordance with the circuit diagram **[15]** and taking the technical data into consideration.

Work on the control unit may only be carried out with the device voltage-free and grounded in line with ESD requirements!

- 230V mains voltage can be present at [Kl.5]..[Kl.10]. Risk of fatal injury!
- **Never switch mains voltage to [Kl.11] / [Kl.12] and [Kl.25].. [Kl.30] !**
- If this is disregarded, the control unit will be destroyed immediately and the warranty loses its validity!
- All the connection cables to [Kl.9]..[Kl.30] must not exceed a max. length of 30 m!

[Kl.1]..[Kl.4] Protective earth conductor (PE)
Internally connected to the protective earth conductor wiring

[Kl.5] + [Kl.6] Mains voltage 230V / AC
Terminal 5 = L-conductor
Terminal 6 = N-conductor
- The safety conditions valid on site or the valid VDE regulations must be kept.

[Kl.7] + [Kl.8] Mains output 230V / AC
Terminal 7 = N-conductor (connected internally directly with [Kl.6])
Terminal 8 = L-conductor, via internal fuse Si1, T200mA
- This output is used to supply consumers which are switched via the receiver.

[Kl.9] + [Kl.10] External input 12...250V / AC / DC
Terminal 9, terminal 10 = Internally dc-insulated via optocoupler.
- Potential-free to mains and low voltage.
- The applied voltage provokes the same reaction as pressing a key on a hand-held transmitter.

[Kl.11] + [Kl.12] Low voltage 12V / DC
Terminal 11 = 0V (ground)
Terminal 12 = +12V DC, stabilised, max. 0.1A, internal self-resetting fuse
- This output is used to supply consumers which are switched via the receiver.

[Kl.13], [Kl.14], [Kl.15] Relay output channel 1
Terminal 13 = changeover
Terminal 14 = relay break contact (normally closed contact)
Terminal 15 = relay make contact (normally open contact)
- Potential-free relay output
- Switching power see “Technical Data”

[Kl.16], [Kl.17], [Kl.18] Relay output channel 2
Terminal 16 = changeover
Terminal 17 = relay break contact (normally closed contact)
Terminal 18 = relay make contact (normally open contact)
- Potential-free relay output
- Switching power see “Technical Data”

[Kl.19], [Kl.20], [Kl.21] Relay output channel 3
Terminal 19 = changeover
Terminal 20 = relay break contact (normally closed contact)
Terminal 21 = relay make contact (normally open contact)
- Potential-free relay output
- Switching power see “Technical Data”

[Kl.22], [Kl.23], [Kl.24] Relay output channel 4
Terminal 22 = changeover
Terminal 23 = relay break contact (normally closed contact)
Terminal 24 = relay make contact (normally open contact)
- Potential-free relay output
- Switching power see “Technical Data”

[Kl.25], [Kl.26], [Kl.27] Aerial connection
Terminal 25 = Aerial for receiver 1 (radio module [REC1])
Terminal 26 = 0V, shield
Terminal 27 = Aerial for receiver 2 (radio module [REC2])
- Connection of wire aerial or coax-cable

[Kl.28], [Kl.29], [Kl.30] Serial interface RS-232
Terminal 28 = GND (0V)
Terminal 29 = Tx (transmit)
Terminal 30 = Rx (receive)
- For more details see “Operation with PC” in these instructions

Scope

A wide range of versatile applications result from the 4 potential-free relay outputs, one universal input (12-250V AC / DC) for external keys and up to 1000 radio memory locations. The receiver is suitable as a multi-purpose remote control for electrical consumers in the private or industrial sector, e.g. access control for underground car parks or campsites without safety function.
The remote control of devices with safety function (crane systems) is ***not*** permitted!

Functions

- Radio codes that can be used:
  - 12-bit dual code
  - 18-bit tri-state
  - KeeLoq with manufacturer code.
  - Further coding according to agreement
- Supply voltage 230V AC, 50Hz
- Individual programming / deletion of memory locations
- Individual blocking / release of memory locations
- Switch-off timer 1s – 999s, can be programmed for each of the 4 channels
- 4 Light emitting diodes [LED.K1]...[LED.K4] for channel display **[1]**
- 2 keys [Ta. +] and [Ta. -] for selecting memory location **[5]**
- 3-digit 7-segment LED display for indicating memory location **[2]**
- Special functions: surge current, specific on and off switchable via DIP switch
- 2 x 15-pole. socket strip for radio modules **[6], [7]**
- 3-pole threaded terminal for aerial connection radio modules **[8]**
- Multi-purpose input (12...250V, AC/DC) **[10a]** internally dc-insulated, can be programmed for external key like transmitter key, but only at memory location “E_0”
- 12V DC output, **[10b]** max. 0.1A (resetting fuse), can be switched to external input via bridge.
- RS232 interface **[14]** for logging and remote control via a Windows-PC.
- Status display via LEDs: “Power”,**[4a]** “Memory location assignment”,**[4b]** “cleared”**[4c]** and “blocked” **[4d]**

Modes of operation

Pulse mode: The output switches as long as the transmitter key selected is actuated.

Surge current: The state of the output changes every time the transmitter key is actuated.

Specific on/off: A transmitter key is assigned the function “on” or “off”.

- Special functions: surge current, specific on and off switchable via DIP switch

Technical data

Parameter	Symbol	Limits			Unit	Test condition
		Min.	Typ.	Max.		
Voltage supply						
Mains voltage	U_{Netz}	200	230	255	V_{AC}	To terminals 5 / 6 at rest/under full load
Mains frequency	f_{Netz}	48	50 / 60	62	Hz	
Internal logic voltage	U_V	4,8	5,0	5,2	V	
Current consumption standby operation	$I_{R\text{-}Netz}$		18	25	mA	No radio module, standby operation, no load
Current consumption max. load	$I_{L\text{-}Netz}$		34	40	mA	2 radio modules, K1-K4 active, 100mA @ 12V
Power consumption	P_{Prim}		4,5	5,5	VA	Primary, incl. 1 radio module, standby operation
Start time voltage / 1st start	t_{Start}		7	8	s	@ U_{Netz} = 230V_{AC}
Inputs						
External output not actuated	$U_{Inp\text{-}0}$		0,0	3,0	V	To terminals 9 / 10
External input actuated (AC)	$U_{Inp\text{-}1\text{-}AC}$	9,0	24	255	V	To terminals 9 / 10 @ 50 Hz
External input actuated (DC)	$U_{Inp\text{-}1\text{-}DC}$	8,0	12	48	V	To terminals 9 / 10
Ext. input input current (AC)	$I_{Inp\text{-}1\text{-}AC}$		3,8	5,0	mA	To terminals 9 / 10 @ 230V_{AC}
Ext. input input current (DC)	$I_{Inp\text{-}1\text{-}DC}$		0,4	0,5	mA	To terminals 9 / 10 @ 24V_{DC}
Ext. input debouncing	t_{Inp}	70	100	300	ms	
Outputs						
Power 230V output	P_{230}			40	VA	To terminals 7 / 8
Voltage 12V output	U_{12V}		12		V_{AC}	Full load / standby operation
Current 12V output	I_{12V}			100	mA	To terminals 11 / 12
Switching voltage K1...K4	$U_{K1\text{-}K4}$			250	V_{AC}	
Switching current K1...K4	$I_{K1\text{-}K4}$			8	A_{AC}	With Ohmic load
Switching current K1...K4	$I_{K1\text{-}K4}$			4	A_{AC}	With inductive load
Reaction time radio output	t_{Funk}	0,15		1,0	s	Actuation radio until reaction K1...K4
RS232-interface						
Baud rate			38400		bps	
Data bit			8			
Stop bit			1			
Parity			None			
Max. cable length				100	m	Cable type: min. 3-pole, shielded
Radio						
Radio modules that can be used						Dickert pin assignment, 15-pole socket strip
Programmable stations (keys!)	$n_{Sendertasten}$			1000	Qty	Transmitter keys
Coding system			None			12-bit dual, 18-bit tri-state, KeeLoq
Environmental conditions						
Operating temperature	T_{Betr}	-20		+70	°C	Inside the housing, normal installation position
Storage temperature	T_{Lag}	-25		+80	°C	
Relative air humidity	RH	20		90	%	No condensation permitted!
PCB						
Controller frequency	f_{Cont}		20,000		MHz	
Length	L_{LP}		137		mm	
Width	B_{LP}		164		mm	
Height	H_{LP}		38		mm	
Weight	m_{LP}		405		g	Incl. radio module, no further plug-in cards
Housing						
Length	L_{Geh}		175		mm	Without cable entry
Width	B_{Geh}		175		mm	
Height	H_{Geh}		76		mm	
Weight	m_{Geh}		820		g	Incl. electronics
Material						ABS, self-extinguishing
Protective rating						IP54
Connection terminals						
Mains connection				4	mm²	Fixed threaded terminals
Low voltage				4	mm²	Plug-in screw-type terminals

Fuses						
Si1			T1.6°	230	V_{AC}	Melt fuse 5x20 mm
Si2	m_{LP}		150mA	12	V_{DC}	self-resetting

Switch-on signal on the receiver

Display: all LEDs and 7-segment display switch on, **[1], [2], [4a - 4d]**
7-segment display shows software version first (e.g.: 013), = V1.3
then the occupied memory locations (e.g.: 000) **[2]**
Then all the LEDs go off, only the “Power” LED remains on. **[4a]**
[LED.K1]...[LED.K4] indicate the switching status of the respective channel.

Programming

- Press [Ta. K1]…[Ta. K4] 1x briefly for the respective channel **[1a-1d]**
- Pulse mode: [LED.K1]…[LED. K4] flashes 1x, pause, 1x, ...
- Special functions: Put DIP switch S1 into ON position: **[3]**

Type of operation	Programming	LED display
Pulse	Press the programming key 1x briefly Press transmitter key for 3 s	flashes 1x – pause - flashes 1x… flashes quickly
Surge current	Press the programming key 2x briefly Press the transmitter key for 3 s	flashes 2x – pause - flashes 2x… flashes quickly
Specific on	Press the programming key 3x briefly Press the transmitter key for 3 s	flashes 3x – pause - flashes 3x… flashes quickly
Specific off	Press the programming key 4x briefly Press the transmitter key for 3 s	flashes 4x – pause - flashes 4x… flashes quickly

- Display comes on, indicates the next possible free memory location, starting from “000”. **[2]**
- Memory location can be changed manually using [Ta.+] / [Ta. -] (only free locations are displayed) **[5a/b]**
  – Yellow LED “memory”: Memory location is free **[4b]**
- Only the external input can be programmed to memory location “E_0”!
  E_0: Press [Ta. -] 1x until E_0 appears on the display
- If [Ta. +] / [Ta. -] is pressed permanently: Fast run-through of the memory locations. **[5a/b], [2]**
- Press transmitter key or external input **[10a]**
- After programming has been completed, the respective [LED.K1]...[LED.K4] will flash quickly
- The number of the memory location lights up permanently as long as the transmitter key or external input is being pressed. LED **[4b]** goes off and LED **[4c]** appears
- Then the number of the next free memory location appears (can be changed using [Ta.+] / [Ta. -])

- The receiver remains in programming mode for the respective channel or channels for another 30s. This means that several transmitter keys can be programmed in succession for the same function without pressing keys on the receiver.
- End programming mode (only after the word “End” has appeared in the display for 3s):
  – No more free memory
  or...
  – Press [Ta.+] as long as required until the last free memory location is displayed (display no longer increases), then release [Ta.+] and press again 1x, display changes to “End”
  – Put the programming mode for all channels to “0” by pressing [Ta.K1]…[Ta.K4]
  – >30s no new programming command and no transmitter key actuation
- If the set memory location number changes when the station key is pressed, this means that this transmitter key has already been programmed to another memory location. The previously occupied memory location (no matter whether released or blocked) is overwritten with the new function and is then released. Each transmitter key always retains the assigned memory location number!
- Each transmitter key can only occupy **one** memory location.

Reception

- If a **released transmitter key** is received:
  – The respective channel LED [LED.K1]...[LED.K4] flashes quickly as long as a radio signal is being received
  – Green LED “released” lights up for 3s **[4c]**
  – Display of memory location number lights up for 3s in the display **[2]**
- If a **blocked transmitter key** is received:
  – The channel LED [LED.K1]...[LED.K4] flashes quickly as long as a radio signal is being received.
  – Display of memory location number in the display **[2]**
  – Red LED “blocked” flashes quickly **[4d]**
  – Display goes off 3 seconds after reception

Blocking / releasing stations / memory locations

- Press [Ta.+] or [Ta. -] **[5a/b]**
- The last memory location used / programmed is shown on the display **[2]**
- Use [Ta.+] or [Ta. -] to choose the required memory location (only the occupied memory locations are shown)
- Green LED “active” on: The respective memory location is released. **[4c]**
- Red LED “blocked” is on: The respective memory location is blocked.**[4d]**
- Brief simultaneous actuation (<3s) of the keys [Ta.+] and [Ta. -] switches between “released” and “blocked”. **[5a/b]**
- The display goes off after 30 seconds without a key being actuated **[2]**
- If ALL is selected as memory location number, (press [Ta. -] until ALL appears on the display) all the memory locations are released or blocked. **[2]**

Delete

Deleting an individual memory location

- Press [Ta.+] or [Ta. -] **[5a/b]**
- The last memory location used / programmed appears on the display **[2]**
- **Use [Ta.+] or [Ta. -] to choose the required memory location.** (only the occupied memory locations are shown)
- When the keys [Ta.+] and [Ta. -] are pressed simultaneously (>3s) the yellow memory LED flashes, after a further 5s the yellow memory LED stays on permanently.**[4b]** .**[4c** or**. 4d]** gone out
- Now release [Ta.+] or [Ta. -], the memory location is deleted.

Deleting a complete channel

- Keep the programming key [Ta.K1] ... [Ta.K4] for the required channel permanently pressed.
- The LED for this channel will flash quickly after 3s. [LED K1] ... [LED K4]
- The display shows “CH1”... “CH4” (**Ch**annel) for the respective channel **[2]**
- After a further 5s the flashing stops, **all** stations of this channel have now been deleted.
- Now release the programming key [Ta.K1] ... [Ta.K4]

Deleting the whole receiver

- Press [Ta.+] or [Ta. -] **[5a/b]**
- The last memory location used / programmed appears on the display
- **Use [Ta. -] to select “ALL”**
- When the keys [Ta.+] and [Ta. -] are pressed simultaneously (>3s) the yellow memory LED flashes, after a further 5s the yellow memory LED goes out.**[4b]** **(4c and/or 4d also go out)**
- Now release [Ta.+] and [Ta. -], the whole receiver is deleted.

External input

[10a]

- Potential-free input (optocoupler) input voltage for actuation (ON) 12...250V AC/DC
- To be programmed like transmission key, but only to memory location “E_0” ! (“ALL” -> “E_0” -> “000” ->“001” etc.)
- Reaction only to increasing flank (application of voltage).

Time function

- A time can be programmed for each channel.
- In the operating modes “pulse”, “current surge” and “specific on” the channel switches off automatically after the respective time has expired.

Programming the time function

– Program the transmission key or input normally
– Switch S2 (🕒) to “ON” **[3]**
– Press the programming key [Ta.K1]…[Ta.K4] for the desired channel 1x **[1a-d]**
– In the display, “060” appears for “time function = 60 seconds”, adjustable with [Ta.+] / [Ta. -] from “001...999”, i.e. max. ca. 17 minutes. **[5a/b]**
– Switch S2 to OFF, time is blocked for this channel. **[3]**
– After receiving a station or input, the memory location number appears for 3s when the time function has been programmed, then the time “countdown”. 7-segment display flashes.
– [LED.K1] ... [LED.K4] of the channels affected flashes in step with the 7-segment display.

Deleting the time function

– Switch S2 (🕒) to “ON” **[3]**
– Press the programming key [Ta.K1]…[Ta.K4] for the desired channel 1x **[1a-d]**
– Switch the display value to “000” using [Ta. -].**[5b]**
– Switch S2 to OFF, time is deleted for this channel. **[3]**
– When deleting a channel or the whole receiver, the time functions are automatically deleted at the same time.

RS232 serial interface

Output of the following data to a PC:

- Radio reception: memory location number and channel number
- Programming: memory location number, channel number, serial number and function
- Activate / deactivate memory locations
- Delete memory locations
- Program a time function / delete a time function

Reception of the following commands from a PC:

- Status query
- Read-out of all memory locations (for data backup)
- Delete one / all memory locations
- Activate / release memory location
- Program / delete time automatically
- Release programming mode
- Switch on channel
- Switch off channel

Notes on the operating instructions

- The programming / deletion of transmitter keys may only be carried out by authorised persons (e.g. caretaker)! For this reason, the receiver must be mounted in an inaccessible spot!

The remote control of devices with safety function (crane systems) is ***not*** permitted!

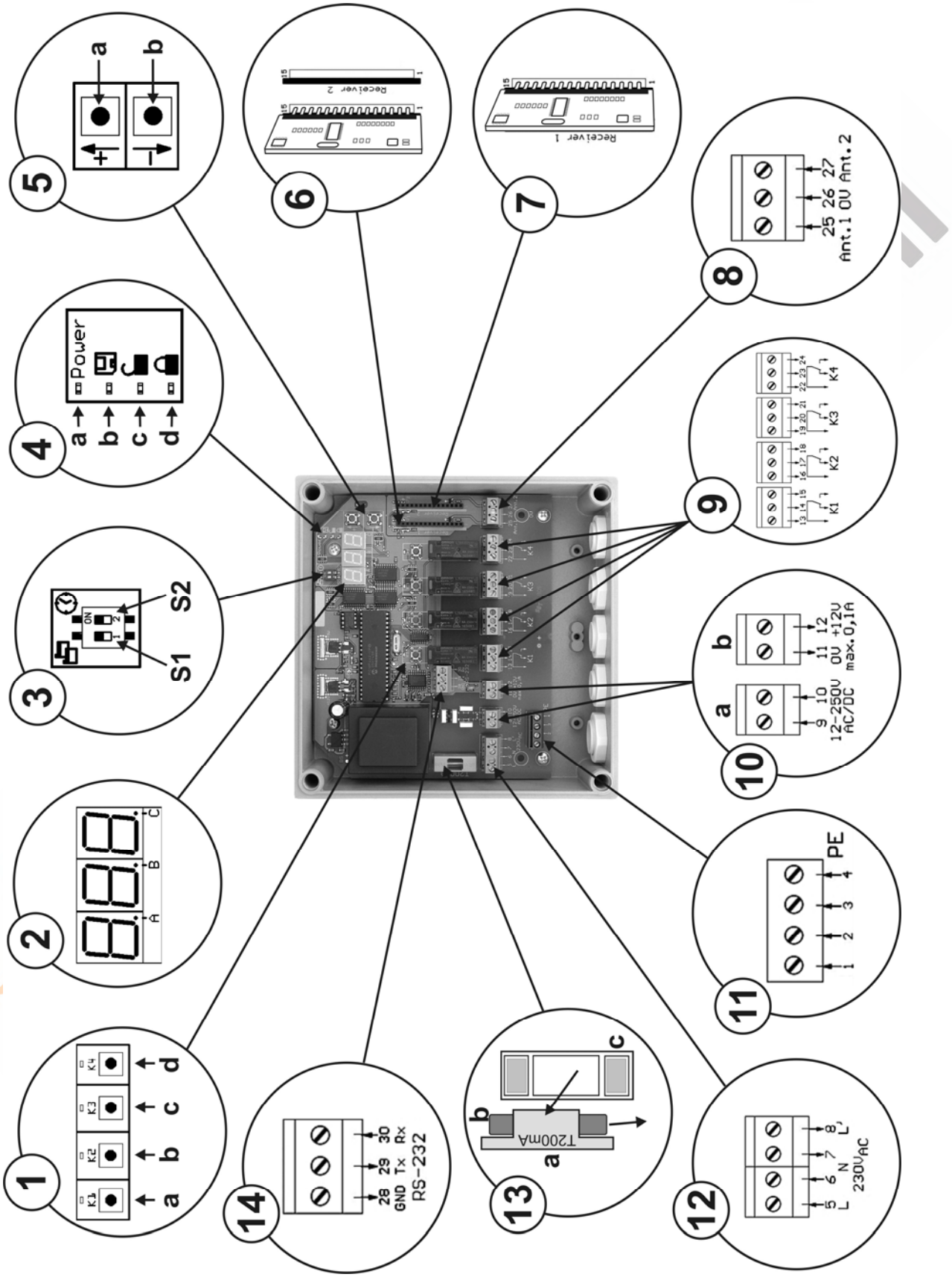
Care must be taken that grounding is in line with ESD requirements during all work on the control unit. Otherwise the control unit could become damaged or destroyed. New goods or repairs may only be dispatched when respective protective measures have been taken (e.g. do not use normal plastic films!). Otherwise the warranty shall be lost. Static charging and discharging must be avoided.

Replacing the radio module

If problems should occur in the frequency range used, the receiver can be converted to a different frequency by replacing the radio module. The transmitter and radio module must have the same frequency and the same modulation e.g. AM or FM.

- Switch operating voltage off! **(wait about 30s)**
- Pull the radio module carefully out of the plug-in socket. **[6/7]**
- Insert the radio module with the required frequency in “the right way round”, heed the printing on the PCB.
- Left slot for receiver 1
- Right slot for receiver 2
- Switch operating voltage on again.
- Delete radio
- Program new transmitters.

Diagram index



Block diagram