EN

Troll Standard

Operating and Assembly Manual for 50mm Switch Range

RolloHomeControl
RADEMACHER

Item No:
3650 03 12 (ultra-white)
3650 03 22 (aluminium)

VBD 592-2 (09.13)

Dear Customer,

With your purchase of a **Troll Standard**, you have chosen a quality product manufactured by RADEMACHER. Thank you for the trust you have placed in us.

The **Troll Standard** has been designed in order to provide optimal convenience and operability as well as to ensure solidity and durability. Having applied uncompromising quality standards and thorough testing, we are proud to be able to present you this innovative product.

It's brought to you by all the highly-qualified personnel here at RADEMACHER.

These instructions...

...describe how to install, connect the electrical system and operate your **Troll Standard**.

Before you begin, please read these instructions through completely and follow all the safety instructions.

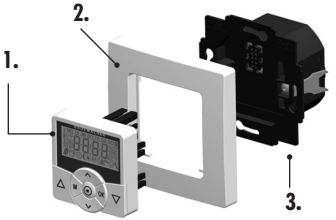
Please store these instructions in a safe place and pass them on to any future owners.

Damage resulting from non-compliance with these instructions and safety instructions will void the guarantee. We assume no liability for any resulting damage.

Table of Contents

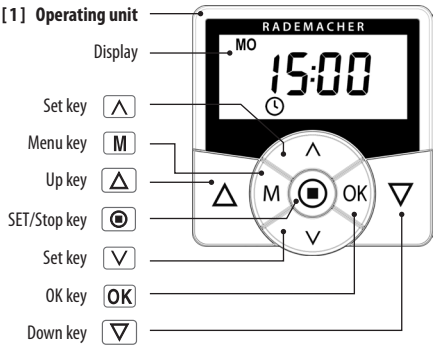
EN

1. Scope of delivery / general view



Legend

1. Operating unit (50 x 50) mm
2. Frame
3. Installation housing
4. 1 x operating manual (not illustrated)



2. The key functions

△ ▽ **The operating keys [up / down]**

- Manual operation **[up △/ down ▽]**.

◉ **SET/Stop key, [◉]**

- Manual roller shutter stop.
- Configuration (setting) of various functions.

M **Menu key, [M]**

- Call up the main menu.
- Go back or return to the standard display.

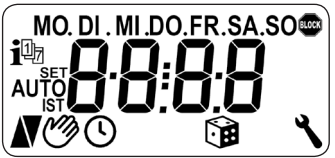
∧ ∨ **The set keys, [∧/∨]**

- Selects the desired menu item.
- Setting the parameters (increase / decrease) / pressing and holding a key for an extended period causes the digits to change more quickly.

OK **[OK] key**

- Confirms and opens the selected menu.
- Confirm entry.
- Continue to next entry.

3. Display symbol legend



[MO ... SO]	Week days (MON...SUN)
88:88	Time / setting parameters
i	Information
	Switching programme
[SET]	Setting
[AUTO]	Automatic operation
[IST]	ACTUAL value
	Direction of travel - up / down
	Automatic mode off
	Timer periods
	Random function
	System settings
BLOCK	Blockage detection

4. Menu overview

Risk of fatal electric shock.

This symbol warns of danger when working on electrical connections, components, etc. It requires that safety precautions be taken to protect the life and health of the person concerned.

This concerns your safety.

Please pay particular attention and carefully follow all instructions marked with this symbol.

NOTE / IMPORTANT / CAUTION

In this way, we wish to make you aware of the following content in order to ensure optimal functionality.

Please read the operating instructions for an external device described at this point, (e.g. a tubular motor).

Danger due to electric shock when working on all electrical systems.

- The electrical connection and all work on electrical systems must only be carried out by a qualified electrician in accordance with the connection instructions in these operating instructions, see page 17.
- Carry out all installation and connection work only in an isolated, de-energised state.

The use of defective equipment can lead to personal injury and damage to property (electric shocks, short circuiting).

- Never use defective or damaged equipment.
  Please contact our Customer Service department in the event of faults, see page 48.

Incorrect use leads to an increased risk of injury.

- Children may not be permitted to play with the Troll Standard.
- Train all personnel to use the Troll Standard safely.
- Avoid allowing persons with limited abilities to operate the equipment and prevent children from playing with fixed controllers.
- Never remove the operating unit from the installation housing during operation.

7. Proper use

EN

Only use the **Troll Standard** for connecting and controlling a tubular motor for Venetian blinds, slats or awnings.

Operating conditions:

- The tubular motor must be fitted with a mechanical or electronic end position switch.
- Only operate the Troll Standard in dry rooms.
- A 230 V / 50 Hz power supply, together with a site-provided disconnecting device (fuse, MCB), must be available at the installation location.

8. Improper use

Using the Troll Standard for purposes other than previously mentioned is impermissible.

- Do not install the Troll Standard outside.

The **Troll Standard** controller is designed for controlling roller shutters, Venetian blinds, slats or awnings by connecting a corresponding tubular motor.

Roller shutter control

The system enables roller shutters to be automated.

Manual operation

It is possible to manually control the connected tubular motor at any time by using the controls.

External controller via the two inputs E1 and E2.

The Troll Standard features two inputs **E1** and **E2** (230 V / 50 Hz) for connecting an external sensor or external controller (e.g. Troll Comfort), see page 17.

Brief description of blockage detection function

The Troll Standard is able to monitor the **torque** of motors equipped with **mechanical end point setting**. This enables the controller to switch off the motor in the event of overloading or blockage, see page 34.

Installation (see page 18)

The Troll Standard can be integrated into most commercially available switch ranges with the help of a corresponding intermediate frame 50 x 50 (DIN 49075). Suitable switch ranges are detailed on the following page.

9.1 Compatible switch ranges.

Manufacturer	switch range
BERKER	Arsys / K1 / S1
BUSCH-JAEGER	Busch-Duro 2000 Si / Reflex Si / alpha exclusive / alpha nea / solo / impuls
GIRA	Standard-System / S-Color System / stainless steel range / Standard 55
JUNG	CD 500 / ST 550 / LS 990 / CDplus and CD, however, with coloured rings
MERTEN	M1 / Atelier / Artec / Trancent / Antik Neu
PEHA	Standard / Dialog / Aura
LEGRAND	Creo / Tenara
VEDDER	Alessa (plus)

NOTE

- It may be necessary to use an intermediate frame 50 x 50 * (DIN 49075), depending on the respective switch range used.

* not included

10. Overview of features

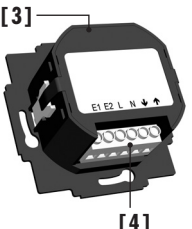
- Installation wizard for easy commissioning.
- Configurable blockage detection for mechanical tubular motors
- Manual operation on site
- AUTO/MANU - switchover
- Easy configuration with menu-driven operation
- Timer periods
  - Configuration of an opening [▲] and closing time [▼] for your roller shutters.
- Switching programme:
  - Weekly switching times
    - One switching time pair [▲/▼] for (MON...SUN) **[MO...SO]**
  - Weekday and weekend switching times
    - One switching time pair [▲/▼] for (MON...FRI) **[MO...FR]**
    - One switching time pair [▲/▼] for (SAT + SUN) **[SA + SO]**
- Random function (random delay of 0 to 30 minutes)
- Key lock
- Memory function (easy acceptance of the current time as switching time)
- Permanent storage of the settings
- Automatic summer / winter changeover
- Reversal of direction of rotation
- External control via the two inputs **E1** / **E2**

Description and configuration of the individual functions

A precise description of the individual functions and settings is included starting on page 19.

Installation and electrical connection of the Troll Standard may only be undertaken with the supplied installation housing [3].

The connecting terminals **[4]** are located at the bottom of the installation housing **[3]**.



NOTE

Installation housings for other variants of the Troll controller are not compatible.

You must configure the end stops for the tubular motor before using for the first time and making the final electrical connection.

- If no end stops are configured, then it is vital that both end points are configured for the tubular motor, as failure to do so can lead to malfunctions.
- In order to do so, follow the information provided in the operating manual for the respective tubular motor.

Parallel connection of electronic tubular motors

A maximum of 3 tubular motors can be connected in parallel to the controller (e.g. RADEMACHER electronic tubular motors).

To do so, please refer to the operating manual for the corresponding tubular motor.

Parallel connection of mechanical tubular motors

A cut-off relay is required in order to connect mechanical tubular motors in parallel.

Requirements for blockage detection

Blockage detection is only operational if **a mechanical tubular motor** is connected.

Function of inputs E1 / E2

E1 = UP
E2 = DOWN

NOTE

The external signals to inputs E1 and E2 are only taken into consideration when the automatic mode is activated.

Danger due to electric shock when working on all electrical systems.

- The electrical connection and all work on electrical systems must only be carried out by a qualified electrician in accordance with the connection instructions in these operating instructions.
- Carry out all installation and connection work only in an isolated, zero-volts state.
- Disconnect all phases of the mains power supply cable and secure it to prevent any reconnection.
- Check the system for a zero-voltage status.
- Prior to connecting, compare the information about voltage / frequency on the device with that of the local electrical grid operator.

Incorrect wiring may lead to short-circuits and destroy the device.

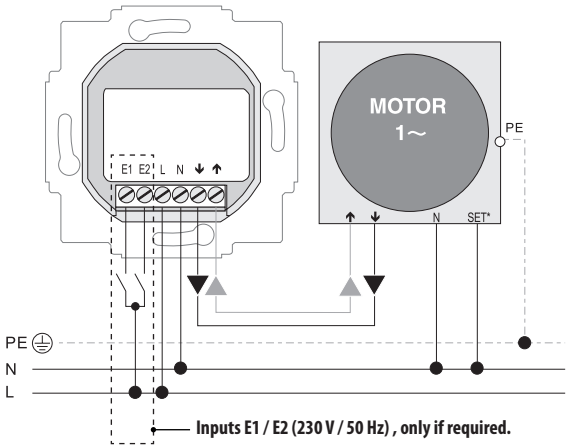
- Follow the pin assignment detailed in the wiring diagram.

- Follow all the electrical connection specifications in the operating instructions of your tubular motor.

Connection of a second phase to E1 or E2 will cause the Troll Standard to be damaged.

- When **inputs E1 / E2** are used, they must always be connected to the **same phase**.

- If another phase is connected, the **incorrect mains voltage (380 V / 50 Hz)** will be applied to the inputs and damage the Troll Standard.

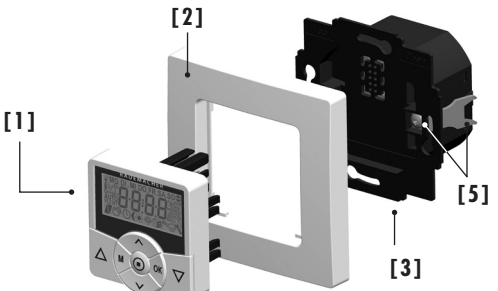


Connecting the white set lead (SET) from RADEMACHER tubular motors

* The **white set lead (SET)** from RADEMACHER tubular motors must be connected to the **neutral terminal [N]** to ensure trouble-free operation of the tubular motor.

The Troll Standard is designed for flush-mounted installation.

For this, you require a **58 mm flush-mounted box**. We recommend using a deep box.



Installation procedure:

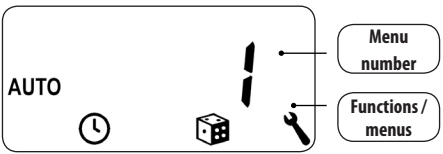
1.	Switch off the mains.
2.	Make the electrical connection according to the wiring diagram (see page 17).
3.	Route the power cables to the flush-mounted box.
4.	Slide the installation housing **[3]** into the flush-mounted box and clamp the claws **[5]** in place with the screws provided.
5.	Fit the frame **[2]**.
6.	Carefully insert the operating unit **[1]** into the installation housing **[3]**.
7.	Switch the mains power again back on again.

15. Brief description of the standard display and main menu

The standard display (example)

- Displays the current day of the week and time.
- Displays the activated functions.
- Manual operation of the Troll Standard is only possible from the standard display.

The main menu



- Enables display and selection of the individual functions and menus.
- Manual operation is not possible from the main menu.
- No automatic control commands will be executed during the configuration process.
- If no key is pressed within 120 seconds, the display automatically changes from the active menu back to the standard display. Changes to settings are nevertheless saved.

15.1 Opening and closing the menus (example: activating the random function)

1. Call up the **main menu**.
   By pressing the **[M]**-key in the standard display.

2. Select the desired **menu** or menu number.

The selected menu is indicated by a **flashing icon**.

3. Open the menu by pressing the **[OK]** button.

4. Select the desired setting and confirm with **[OK]**.

5. Subsequently the **main menu** will be displayed again.

NOTE

Pressing the **[M]**-key from any of the menus will return you to the **standard display**.

16. Initial commissioning with the help of the installation wizard

An installation wizard is available in order to help you configure the Troll Standard quickly and easily. The wizard automatically guides you through the configuration process for **initial** commissioning or after a **software reset** (see page 42).

Quitting the installation wizard

Pressing the **[M]** key for one second causes the installation wizard to be cancelled prematurely.

Readiness for operation

The Troll Standard is ready for use as soon as the installation wizard has finished.

In addition, you can individually customise your settings and make changes at any time from the main menu and the system settings menu.

1. Set and confirm the **time**.

   NOTE

   Pressing the setting key for an extended period causes the numbers to progress more quickly.

2. Set and confirm the **date**.

[Day.Month]

3. Set and confirm the **year**.

4. Set and confirm the **opening time** [▲].

This opening time applies to the entire week (MON...SUN) **[MO...SO]**.

5. Set and confirm the **closing time** [▼].

This closing time applies to the entire week (MON...SUN) **[MO...SO]**.

NOTE

At this point, the closing time is preconfigured as the **weekly switching time** (MON...SUN) **[MO...SO]**.

If necessary, you can subsequently select between three **switching time programmes** from menu **[9.5]**, see page 33.

6. The **standard display** is shown as soon as the final setting is confirmed.

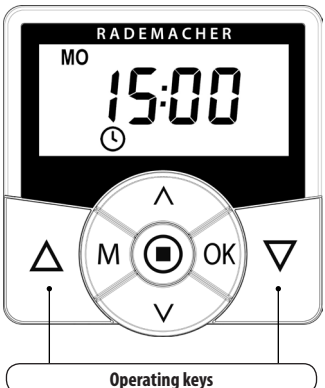
The Troll Standard is now ready for operation.

17. Manual operation

Manual operation is possible from the standard display at any time and has priority over the programmed automatic functions.

Example for manual control of a roller shutter

1.	△	**Open the roller shutters**. Briefly pressing the button causes the roller shutters to move to the **upper end point**.
2.	△ / ▽ or ■	**Causes the roller shutters to stop in the interim.**
3.	▽	**Closing the roller shutters**. The roller shutters move to the **lower end point**.



18. Memory function - accepting the current time as switching time

The memory function enables you to easily adapt the switching times during the course of the year by allowing the current time to be accepted as the switching time, without having to access the switching time menu.

NOTE

If weekday and weekend switching times are activated (MON...FRI / SAT+SUN) **[MO...FR / SA+SO]** the newly accepted switching time will only apply to the current group of days, e.g. for (MON... FRI) **[Mo...FR]**.

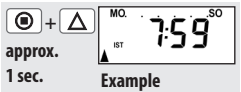
1. Accept the **current time** as the **opening time [▲]**.

   or

1. Accept the **current time** as the **closing time [▼]**.

   In order to do so, simultaneously press the respective keys.

   The display flashes briefly by way of confirmation and the roller shutters move in the respective direction.



M

Main menu

Icon	Menu		Page
AUTO	1	Automatic mode	26
	2	Switching times	28
	6	Random function	30
	9	System settings	31

Standardised menu structure for Troll range

A standardised, cross-variant menu structure has been developed for all Troll models, featuring an identical set of menu numbers for each of the menus.

As a result of this, there are gaps in the menu numbers used for the Troll Standard to maintain the standardised menu structure.

Automatic mode on

All of the activated automatic functions will be executed if the automatic mode is switched on. The corresponding icon is then shown in the standard display.

NOTE

- Manual operation is also possible in automatic mode.

Automatic mode off

Icon in standard display

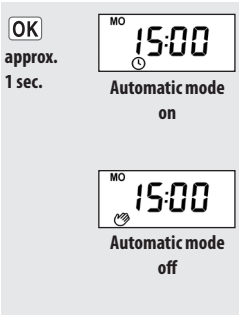
- All automatic functions are deactivated; only manual operation is possible.
- All automatic icons are switched off in the standard display.
- Inputs E1 and E2 will not be taken into consideration.

19.2 Menu 1- Automatic mode on / off

OK Toggling directly to the standard display

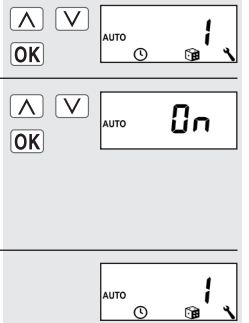
You can also directly toggle automatic mode on and off in the standard display.

1. To do so, press and hold **[OK]** for approx. one second.



Switch on/off in menu 1

1. Call up the main menu. M
2. Select and open menu **1 [AUTO]**. ∧ ∨ OK
3. Select and confirm the desired setting. ∧ ∨ OK
   On = Automatic mode on
   OFF = Automatic mode off
4. Subsequently the main menu will be displayed again.



19.3 Switching times (opening and closing times) [▲/▼]; brief description

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You can configure various **opening [▲] and closing times [▼]** for the Troll Standard in order to open or close your roller shutters at your preferred times.

NOTE

Alternatively, it is also possible to accept the current time as the switching time, see page 24 (Memory function).

For this purpose, there are two switching time programmes available in menu 9.5 [ ] see page 33:

[1] Weekly switching times (factory setting)

- One switching time pair [▲/▼] for (MON...SUN) **[MO...FR]**

[2] Working day and weekend switching times

- One switching time pair [▲/▼] for (MON...FRI) **[MO...FR]**
- One switching time pair [▲/▼] for (SAT + SUN) **[SA + SO]**

19.4 Menu 2 - Configuration of opening and closing times [▲/▼].

EN

1. Please check to see whether the desired switching time programme is configured.

See menu [9.5], page 33

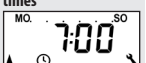
2. Call up the main menu. [M]

3. Select and open menu **2 [ ] Switching times**.

   The header of the display indicates which switching programme is currently active.

[∧] [∨] [OK]

Weekly switching times



Weekday / weekend switching times

The following serves to describe the procedure for setting an **opening and closing time [▲/▼]** as a **weekly switching time.**

4. Set and confirm an **opening time [▲]**.

[∧] [∨] [OK]

5. Set and confirm a **closing time [▼]**.

   The opening and closing time applies to all days of the week (MON... SUN) **[MO...SO]**.

[∧] [∨] [OK]

The random function enables a random delay of the set timer periods ranging between 0 and 30 minutes.

The random function is executed for:

- all automatic opening and closing times.

NOTE

The corresponding icon flashes in the standard display when the random function is activated, during the period that the movement command is being delayed.

1. Call up the main menu. M

2. Select and open menu **6 [ ] Random function**. ∧ ∨ OK

3. Select and confirm the desired setting. ∧ ∨ OK

On = random function on

OFF = random function off

Subsequently the main menu will be displayed again.

20. Menu 9 - System settings [ ]; brief description

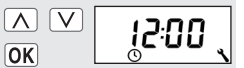
This menu enables you to configure additional devices and system settings to customise your Troll Standard to your individual preferences.

Menu 9 - System settings

1. Select and open menu **9.1 Time and date**.

Setting order

a) Time



NOTE

Pressing the setting key for an extended period causes the numbers to progress more quickly.

b) Date

c) Year

The number of opening and closing times that can be configured depends on the desired **switching programme** selected in this menu.

There are two switching time programmes available:

[1] Weekly switching times (factory setting)

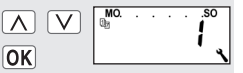
- One switching time pair **[▲/▼]** for (MON...SUN) **[MO...SO]**

[2] Working day and weekend switching times

- One switching time pair **[▲/▼]** for (MON...FRI) **[MO...FR]**
- One switching time pair **[▲/▼]** for (SAT + SUN) **[SA + SO]**

1. Select and open menu **9.5 Switching time programme**.

2. Select and confirm the desired **switching time programme**.



1 = Weekly switching times

2 = Weekend switching times

NOTE

The switching times are configured in menu **[2]**, see page 29.

20.3 Menu 9.6 - Configuration of blockage detection [BLOCK]

The Troll Standard is able to monitor the torque of motors equipped with mechanical end point setting. This enables the controller to switch off the motor in the event of overloading or blockage. As a result, the roller shutters are protected from damage.

NOTE

Blockage detection can only be used in combination with a tubular motor which has **mechanical end point setting**.

1. Select and open menu **9.6 Blockage detection**.

2. Activate / deactivate and confirm **blockage detection**.

On = blockage detection on

> Continue at point 3

OFF = blockage detection off

> Back to system menu

3. Select and confirm the suitable **motor type**.

In order to do so, please refer to the operating manual for the respective tubular motor.

Motor types

	Diameter / Power
1:06	35 mm / 6 Nm
1:10	35 mm / up to 10 Nm
2:10	45 mm / up to 10 Nm
2:20	45 mm / up to 20 Nm
2:30	45 mm / up to 30 Nm
2:40	45 mm / up to 40 Nm
2:50	45 mm / up to 50 Nm

If the installed motor type is unknown, please select:

1:06 for roller shutters with an area up to 1.5 m^2

2:30 for larger roller shutters

4. Set and confirm the **sensitivity** level.

Sensitivity:

1 = low

6 = high

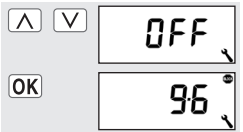
NOTE

- Test runs should be made to ascertain the highest possible level of sensitivity, in order to protect the roller shutters in the event of blockage.
- It may be necessary to customise the **cut-off sensitivity** depending on the properties of the roller shutters (weight, running characteristics, etc.).

5. Activate / deactivate **reversing** after **blockage detection**.

On = reversing on

OFF = reversing off



Automatic reversing in the event of meeting an obstacle.

In the event of blockage, the motor runs in the opposite direction for approx. 2 seconds to relieve the roller shutters.

More information about blockage detection:

- if excessively long connecting leads are used (>5 m), it is possible that the blockage detection system will fail to work correctly due to external interference.
- It is possible that the motor will be switched off by the blockage detection system when moving out of the end points when using mechanical motors with high switching hysteresis. Blockage detection must be deactivated for this type of motor.

NOTE:

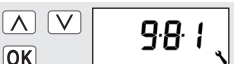
- Some motors can trigger undesired reversing when reaching the end positions (e.g. atypical internal motor wiring, long cables, etc.) In such cases it is recommended to deactivate the reversing function.
- If the motor type cannot be precisely determined, then a suitable setting for motor type and sensitivity must be determined by trial and error.

The Troll Standard features an automatic summer/winter changeover function.

NOTE

If the controller is not being used in Germany, it may be necessary to switch off the automatic summer / winter clock change function.

1. Select and open menu **9.8.1 Summer/winter changeover**.



a) Activate/deactivate **summer/winter changeover** and confirm.

On = Function on

OFF = Function off

20.5 Menu 9.8.2 - Set display contrast

1. Select and open menu **9.8.2 Display contrast**.

a) Set and confirm the desired display contrast.

1 = low contrast

10 = high contrast

20.6 Menu 9.8.4 - Set clock mode

This menu enables you to configure the time base for the internal clock (depending on the local power supply).

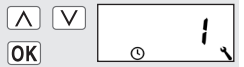
1. Select and open menu **9.8.4 Clock mode**.

a) Set and confirm the clock mode.

1 = 50 Hz mode

2 = 60 Hz mode

3 = quartz mode



> e.g. in Europe

> e.g. in the USA

> for other mains frequencies

You can activate the key lock to protect against unintentional input.

Automatic activation after approx. two minutes.

If the key lock is activated and no keys are pressed within a period of two minutes, the key lock is activated automatically.

1. Select and open menu **9.8.5 Key lock**.

a) Activate or deactivate the key lock.

On = on

OFF = off

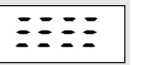
Press and hold the **[SET/Stop]** key for four seconds in order to remove or activate the key lock in the standard display.

NOTE

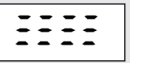
The roller shutters can be moved manually, even with the key lock activated.

approx. 4 sec.

Display:



Display for active key lock.



When pressing the menu key.

20.8 Menu 9.8.7 - Switch reversal of rotation direction on/off

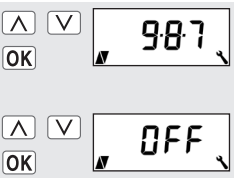
It is not necessary to re-wire the motor if the direction of rotation for the connected motor is wrong (**[Up]** key moves the roller shutters **downwards** and **[Down]** key moves the roller shutters **upwards**). The direction of the motor can be easily changed using the **reversal** of rotation direction function.

1. Select and open menu **9.8.7 Reversal** of rotation direction

a) Activate or deactivate reversal of rotation direction.

On = on

OFF = off



20.9 Menu 9.8.0 - Display software version

This menu enables the current software version for the Troll Standard to be displayed.

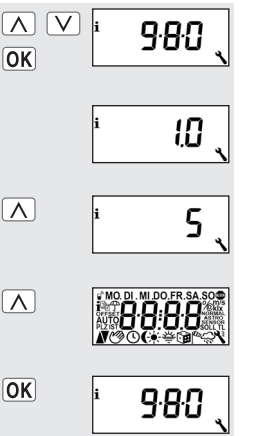
1. Select and open menu **9.8.0 Software version**.

a) Subsequently the **current software version** will be displayed.

b) Pressing once more causes the **device type** to be displayed.

c) Pressing once more causes a **display test** to be carried out.

d) Back to system menu



21. Software reset (restore factory settings).

If necessary, you can erase all of your settings and return the Troll Standard system to its original factory settings.

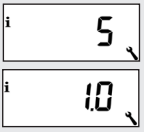
1. Simultaneously press and hold all four keys for 5 seconds, until all of the icons are shown on the display.

approx. 5 sec.

2. Next, the device type (**S = standard**) and software version will be displayed for a few seconds.

   All settings will be erased and reset to the default factory settings.

   Carry out the settings again as specified from page 21 onwards (installation wizard).



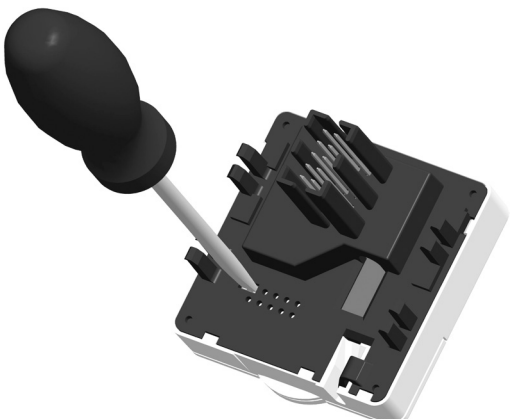
22. Hardware reset

A hardware reset can be carried out in the event that the Troll Standard fails to react to commands. To do so, pull the control unit **[1]** our of the installation housing **[3]**.

The centre section on rear of the control unit **[1]** contains two contacts which should be carefully bridged for a few seconds, for example, with the help of a flat-head screwdriver.

The control unit **[1]** can be replaced into the installation housing **[3]** as soon as the screwdriver has been removed from the contacts.

The time and date will be lost during a hardware reset. All other settings are retained.



During both installation and dismounting of the Troll Standard, there is a risk of fatal electric shocks.

Follow the safety instructions for electrical connection on page 16.

Procedure for dismantling:

1.	Switch off the mains.
2.	Secure the connector against reconnection and check that the system is de-energised.
3.	Carefully remove the operating unit **[1]** from the installation housing **[3]**.
4.	Remove the frame **[2]**.
5.	Release the installation housing **[3]** from the flush-mounted box and disconnect from the mains lead.
6.	Leave the connector so that it is secured against reconnection or fit with a new unit if required.

24. CE Mark and EC Conformity

The **Troll Standard** (item no. 3650 03 12 / 3650 03 22) complies with the requirements of the following European and national directives:

CE

2006/95/EC
Low-voltage directive
2004/108 EC
EMC directive

Conformity has been verified. The corresponding declarations and documentation are available on file at the manufacturer's premises.

RADEMACHER Geräte-Elektronik GmbH

Buschkamp 7

46414 Rhede (Germany)

25. Technical specifications and factory settings

External dimensions control unit **[1]**:	50 x 50 mm x 12 (according to DIN 49075)
Colour:	ultra-white / aluminium
Nominal voltage:	230 V / 50 Hz
Max. switching capacity:	8 (4) A µ (Type 1B)
Standby consumption:	<0.6 W
Extension inputs:	2 (E1 and E2)
Cable size:	1.5 mm^2
Installation depth:	32 mm
Permissible ambient temperature:	0 to 40°C
Power reserve for clock in the event of power failure:	max. 8 hours
Protection class:	II (only for use in dry areas)

Factory settings:

Automatic:	On
Timer periods:	On
Up time:	7:00 hours
Down time:	20:00 hours
random function:	OFF
Switching programme:	1
Blockage detection:	OFF
- Motor type:	2 (45mm / 30 Nm)
- Sensitivity:	2:30
- Reversing:	OFF
Automatic summer / winter changeover:	On

26. Warranty conditions

RADEMACHER Geräte-Elektronik GmbH provides a 24-month warranty for new systems that have been installed in compliance with the installation instructions. All construction faults, material defects and manufacturing defects are covered by the warranty.

The following are not covered by the warranty:

- Incorrect fitting or installation
- Non-observance of the installation and operating instructions
- Improper operation or wear and tear
- External influences, such as impacts, knocks or weathering
- Repairs and modifications by third-party, unauthorised persons
- Use of unsuitable accessories
- Damage caused by unacceptable excess voltage (e.g. lightning)
- Operational malfunctions caused by radio frequency overlapping and other such radio interference

RADEMACHER shall remedy any defects that fall under the warranty period free of charge, either by repairing or replacing the affected parts, or by supplying a new replacement unit or one of equivalent value. There is no general extension of the original warranty period upon delivery of a replacement or due to repair, as per the terms of the warranty.

RADEMACHER
Geräte-Elektronik GmbH
Buschkamp 7
46414 Rhede (Germany)
info@rademacher.de
www.rademacher.de

Service:
Hotline 01807 933-171*
Fax +49 2872 933-253
service@rademacher.de

* 30 seconds free of charge, subsequently 14 cents / minute from German fixed line networks and max. 42 cents / minute from German cellular networks.