Measuring - Controlling - Regulating
All from the same source

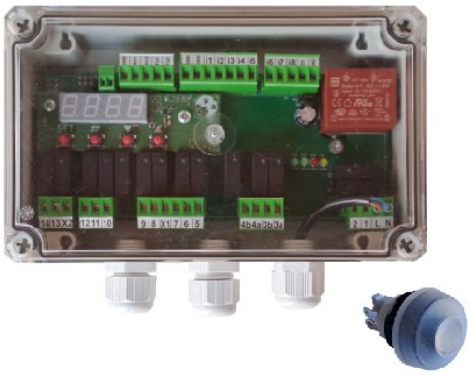
welba.de

Universal replacement control for milking systems

RM-30

Installation and operating instructions
for plant engineering companies,
installers and service engineers

Firmware V2.5



Programmable via configuration software WELBA „KONSOFT"

Publisher:
Welba GmbH
Electronic Control Engineering
Gewerbepark Siebenmorgen 6
D-53547 Breitscheid

Fon: +49 (0)2638 / 9320-0
Fax: +49 (0)2638 / 9320-20
info@welba.de
www.welba.de

1. Introduction

1.1 Information about these operating instructions

These operating instructions are intended for the use by plant engineers, installers or service technicians of the RM-30 replacement control. This manual includes all necessary suggestions, information, recommendations and advice for the safe and proper installation and commissioning of the replacement control. It is only with the knowledge of this operating instruction that faults in the replacement control system can be avoided and a trouble-free operation is guaranteed.

Read the assembly instructions carefully and adhere to the recommendations described in order to ensure proper operation. In addition, the local accident prevention regulations and general safety regulations are to be observed for the field of application of the tank control.

⚠ WARNING

When delivered, the parameterization of the RM-30 does not necessarily correspond to the intended use. This must be adjusted accordingly during the installation.

Basically, the installer of the system is responsible for the commissioning of the control.

**Various user manuals are available on the Welba website.*

Operation instruction for the operator

The installer or the service technician must prepare operating instructions for the operator of the RM-30 *. In this case the parameterization of the delivery state must be clearly documented. We recommend to only document those parameters which the operator of the replacement control needs.

When preparing the operating instructions for the operator the local regulations have to be observed – see chapter “Safety”.

NOTICE

These operating instructions include important technical and safety information. It is vital to carefully study all these instructions prior to the installation of the control or in case of any other work with the control!

The manufacturer accepts no liability for faults and reserves the right to make technical changes at any time. All rights reserved.

NOTICE

NOTICE for storing the operating instruction

This instruction manual is part of the product and must always be readily available for the service technician.

WELBA „KONSOFT"

The control system can be easily parameterized and updated and the collected data can be conveniently evaluated by the KONSOFT configuration software provided free of charge by Welba.

See also chapter 6.

1.2 Device description

The RM-30 control is intended as a **replacement control for automatic cleaning systems in milking systems from various manufacturers**. The cleaning process can be adapted to different milking systems by appropriate parameterization.

The control is also suitable for replacing time relays, level controls and mechanical thermostats. When replacing mechanical thermostats, a temperature sensor must be provided.

The RM-30 can be assembled and operated in various ways, depending on the model. Depending on the version used, the included start button or the separate control panel must be installed to start the cleaning process. In both cases, the electronic display is advantageous.

See section 1.7

Overview: The RM-30 replaces

- switchgears / electronic control
- time relays
- mechanical thermostats
- level controls
- selector switch “Cleaning / Milking”

1.2.1 Function overview

Milking functions

- Control of the vacuum pump
- Manual start of the milk pump to empty the collection container
- Control of a sponge valve

Cleaning functions

- integrated, fully automatic cleaning control
- water fetching can be regulated either by time or level
- various rinsing programs
- all running times (heating, pump, detergent) can be set separately
- adjustable heating temperature
- adjustable acidic/alkaline detergent switch
- automatic control of up to two drain valves
- control of the vacuum increase valve
- adjustable rinse cycles to increase the cleaning effect
- disinfection
- stopping of cleaning process after pre-rinsing

Numerous monitoring functions

- washing temperature
- hose position (cleaning or milking position) via safety switch
- sensor monitoring
- level monitoring
- display of active processes via LEDs

1.2.2 Universally adaptable

Program sequence

The RM-30's program sequence can be adapted to all common cleaning machines by appropriate parameterization.

Parameterization can be performed either via the PC (Konsoft) or by the programming buttons on the control or the operating panel.

Predefined program sequences* help to quickly adapt to your cleaning machine. Minor adjustments can be made later, on-site, directly by the buttons of the control.

** are available for download as wdd. files on the Welba website or contact us.*

Relays

14 switching relays (in four potential groups) are available to control the system components. An output position can be individually assigned to each of the relays.

See section 8.7: „Assigning output functions to relays“

Digital inputs

Eight digital inputs are available for connecting system sensors. Three of the eight digital inputs can be switched between NPN and PNP inputs.

Each input can be individually assigned an input function.
See section 8.7: „Function assignment of digital inputs“

Level inputs

Two level inputs are available for connecting level electrodes or level switches.

Temperature sensor inputs

Two temperature sensor inputs are available for connecting temperature sensors (PT-1000) or thermostat switches.

(Parameter for switching between sensor and switch = [A50])

Additional

- Existing elements, such as the milking/cleaning *selector switch*, can be reused or replaced by the optional control panel.
- *Safety switches* in various designs are also supported.
- Special inputs for temperature and level can also be used optionally. This allows to replace potentially defective external thermostats by a modern control system.
- Temperature sensors for the flow and return temperature are available as an option.
- Fill levels in the cleaning tank can be controlled either via electrodes or external sensors.

1.3 Limitation of liability

WARNING

The proper function of the RM-30 depends on many external factors on which the manufacturer does not have any influence. The manufacturer accepts no liability for damages at the milking system or the connected components

All information and instructions in this manual have been compiled taking into account the applicable standards and regulations, the state of the art and our long-term experiences.

WELBA GmbH does not accept any liability for damages due to:

- non-observance of the installation instruction
- improper use
- assembly by unqualified staff
- non-professional installation by third parties
- unauthorized modifications
- technical modifications

Otherwise, our general terms and conditions as well as the terms of delivery of WELBA GmbH and the legal regulations valid at the time of conclusion of the contract are applicable.

We reserve the right to make technical changes in the context of improving the properties of use and further developments.

1.4 Disposal

For the purposes of disposal, the device is classified as waste electronic equipment within the meaning of European Directive 2002/96/EC (WEEE) and must not be included in household waste. It must be disposed of through the correct channels.

Local and current legislation must be observed.

1.5 Warning notices in these operating instructions

Important safety information in these assembly instructions is identified by symbols. These instructions on occupational safety must be strictly observed. In these cases, behave particularly carefully in order to avoid accidents, personal injury and property damages.

In addition to the information in these assembly instructions, the general and local safety and accident prevention regulations must also be observed and instructed!

Nature and source of danger

This warning sign warns of an imminent danger to health and life of people. Failure to comply with this warning will result in extremely serious injuries, including death.

Nature and source of danger

This warning sign warns of a possibly dangerous situation for the health of people. Failure to observe these warning notices can result in serious injuries, including death.

Nature and source of danger

This warning sign warns of a possibly dangerous situation for the health of people. Failure to observe these warnings can lead to minor or moderate injuries.

Notice

General notes contain application tips and particularly useful information, but no warnings about dangers.

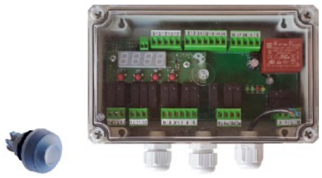
1.6 Cleaning instructions

The enclosure front (front foil) can be cleaned with standard detergents.

ATTENTION: The enclosure front is not resistant to aggressive acids and alkalis, abrasive cleaners and cleaning with high-pressure cleaners!

The use of these cleaners and cleaning methods may lead to damages!

1.7 Versions / Scope of delivery



RM-30 P

Item supplied
- RM-30 P replacement control in a housing with a transparent cover
- start button with protective cap
- any accessories ordered (e.g., PT-1000 temperature sensor)

RM-30 F

Item supplied
- RM-30 F replacement control in a housing with a transparent cover
- (for concealed installation in the cleaning machine)
- control panel for wall mounting or for installation in dishwashers
- optional accessories ordered (e.g., PT-1000 temperature sensor)

RM-30 R

Item supplied
- RM-30 R replacement control for mounting on a 35 mm DIN rail
- start button with protective cap
- any accessories ordered (e.g., PT-1000 temperature sensor)

RM-30 G

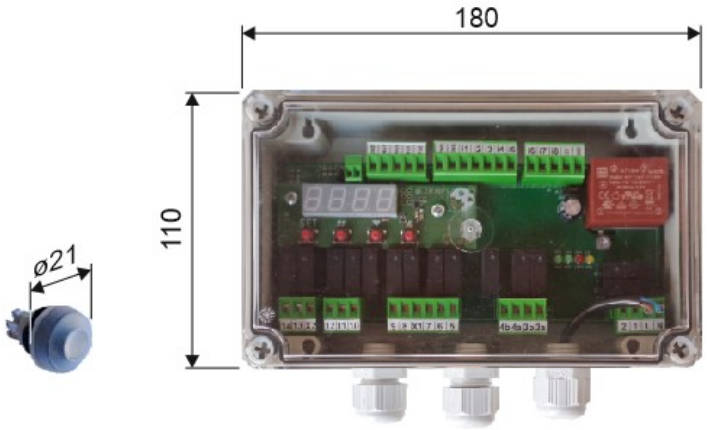
Item supplied
- RM-30 G replacement control in a control box for wall-mounting
- the control box offers sufficient space for the installation of additional components such as contactors or motor protection switches.
- any accessories ordered (e.g., PT-1000 temperature sensor)

For the use of the Welba-Konsoft Software, a USB to RS485 converter is required (e.g., Welba adapter cable USB-RS485-001).

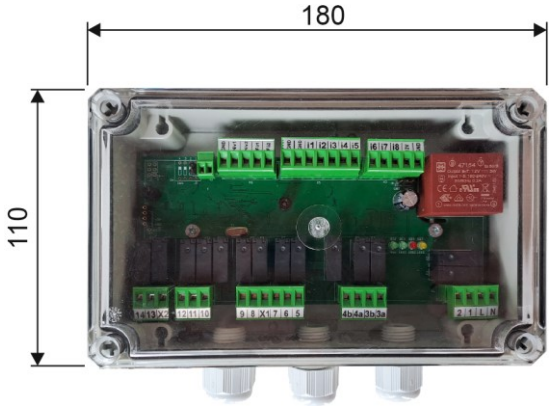
See chapter 6.

1.8 Dimensions

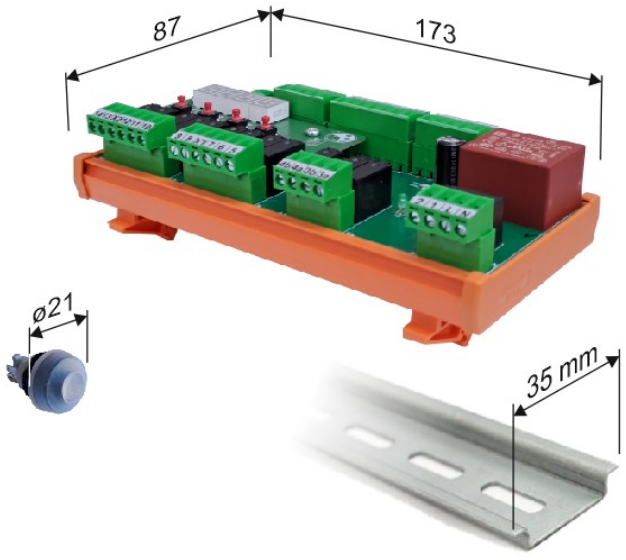
RM-30 P



RM-30 F

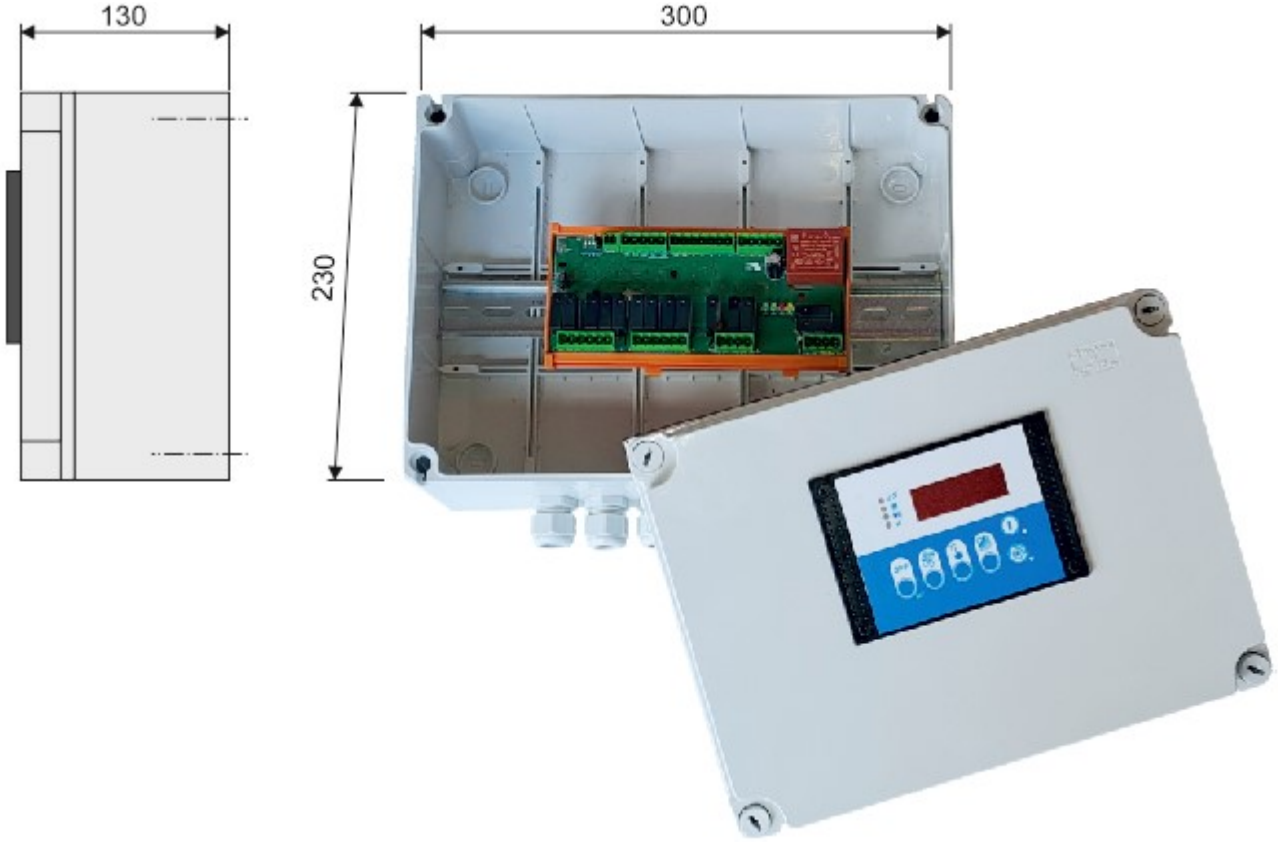


RM-30 R



to section 1.8: Dimensions

RM-30 G



Control panel FB-RM

1.9 Technical data RM-30

Operating voltage	110..240V AC, 50/60 Hz
Relay contacts	14 power relays (normally open) divided into 4 potential groups
Max. switching current	5A AC1 each at 230V AC
Max. switching voltage	250V AC - 50..60 Hz
Display	4-digit LED display, 13 mm digit height
Display range	-999 to 9999
Sensor inputs	2 PT-1000 relays
Measuring range	-10° up to +100°C
Temperature resolution	0.1°C
Water detection	via 2 electrodes (optional)
Digital inputs	8 (via optocoupler)
Connection	Plug-in screw terminals for cables up to 2.5 mm²
Interface	RS-485
Enslosure	See section 1.8
Protection class - RM-30 P - RM-30 F - RM-30 R - RM-30 G - Control panel	 IP 54 IP 54 Open design IP 54 IP 54
Electrical safety	Protection class II, Overvoltage category III, pollution degree I
Degree of pollution	Conductive contaminations must not enter the enclosure.
Rated impulse voltage	1500V
Ambient temperature - operating temperature - storage temperature - max. humidity	 0° up to +50°C -20° up to +70°C 75% (no condensation)

Subject to technical changes.

2. Safety

2.1 General Information

WARNING

The plant engineering company, the installer or the service engineer must prepare operating instructions for the operator of the system, whereby the parameterisation of the delivery status must be taken into account.

We recommend to only document the parameters which the end user needs for a safe operation.

When preparing the operating instructions for the end user, especially the chapter on "Safety", the local regulations must be observed.

NOTICE

The parameter settings of the control supplied do not necessarily correspond to the intended use. This may lead to undefined behaviour by individual components when the system is commissioned.

WARNING

These operating instructions contain important technical and safety information. Please read the instructions carefully prior to the installation and any work on or with the control.

It is the duty of the party commissioning the system to ensure compliance with the following guidelines.

The control may only be installed by an authorised specialist, observing all local safety requirements

Access to the connected environment is only permitted for specialised personnel!

The control contains live parts. It must be installed into the device in such a way that contact with such live components is impossible!

The control is not suitable for the installation into explosive atmospheres. Danger of explosion. The control can only be used outside potentially explosive atmospheres.

The control must not be used if the housing or connection terminals are damaged.

No liquid may enter the inside of the housing.

The control may only be exported to the USA with the explicit permission of the manufacturer!

2.2 Intended use

NOTICE

This operating instruction contains important technical and safety information. Please read them carefully prior to the installation and prior to any work on or with the control!

The RM-30 replacement control is used to control heaters, valves, pumps and other components in milking systems. Any other use of the control is permitted only with the written approval of the manufacturer.

In the RM-30 R version (for mounting on a 35 mm DIN rail), the control is designed for installation in devices or switch cabinets, etc., and thus complies with protection class 2 when installed (double or reinforced insulation). This version may only be operated when installed. The use of the control is permitted in protection class 1 and 2 devices.

The entire control must not be changed or modified!

The control is ready for use only when the parameters have been set appropriately. Commissioning without the appropriate parameter settings is not advisable and can also result in damages to the milking system.

Responsibility for the proper functioning of the connected components lies with the plant engineer or the installer or the service engineer who has installed and commissioned the control.

The control is designed for operation with a resistance temperature sensor.

The RM-30 replacement control is not suitable for the use in explosive atmospheres. Danger of explosion. The control can only be used outside potentially explosive atmospheres.

CE

The RM-30 replacement control fulfils the EC-requirements for electromagnetic compatibility (EMC) and the Low Voltage Directive (LVD).

The safety components meet the VDE regulations.

2.3 Wiring, shielding, earthing

When selecting wiring materials during the installation and the electrical connection of the control the regulations of DIN VDE 0100 “installation of low-voltage systems” or the relevant national regulations (e.g. based on IEC 60364) have to be observed.

- Wherever possible, keep input, output, supply lines and sensor cable physically separated from each other and do not lay them parallel to each other.
- Mains voltage cables and low-voltage cables must not be laid in one cable.
- Use screened and twisted interface and sensor cables.
- Earth the screening of temperature sensors unilaterally in the switch box.
- Ensure correctly wired potential equalisation.

2.4 Electrical safety

- The control itself and the associated control circuits and load circuits must be protected separately and in accordance with the local regulations.
- The separate protection of the control- and load circuit must be carried out according to local conditions!
- In order to prevent destruction of the relay or semiconductor relay outputs in the event of a short-circuit, the load circuit should be fused to the maximum permissible output current.
- In addition to faulty installation, incorrect parameterization of the control can also affect the proper functioning of the desired process. In this context, local safety regulations must be observed.
- The load circuit (relay outputs) must be fused in accordance with the connected components.
- The connection of external voltages to the digital input can lead to the damage of the control.
- Attention: All cables to the digital inputs must be shielded and kept as short as possible. EMC.

2.5 Sensor assembly

- A non-abrasive and kink-free installation of the sensor cable is important!
- Avoid a strong mechanical pressure on the sensor sleeve!
- Do not install sensor cable and high-voltage cable in the same cable channel (not even within the switch box).
- Pay attention to the permitted temperature range for sensor cable.

3. Installation

3.1 Location and climatic conditions

It is essential not to install the device under the following conditions:

- severe shocks, vibrations or magnetic fields
- permanent contact with water
- relative humidity of more than 75%
- sharply fluctuating temperatures (condensation water)
- permanent and direct ultraviolet irradiation
- dust, flammable gases, vapours, solvents
- operation in an aggressive atmosphere (ammonia or sulphur fumes) - risk of oxidation
- operation in the immediate vicinity of radio transmitters with increased interference emission

A physical separation between the control and inductive consumers is recommended.

3.2 Unpacking and storage

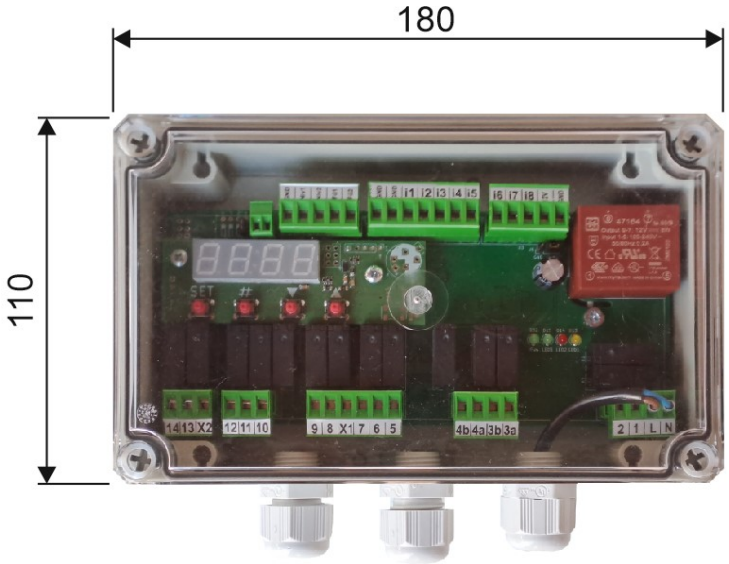
If the packaging is damaged or something is missing, do not use the control. Please contact Welba.

If you store the control for a period before using it, store it in a clean dry place at a temperature of between -20°C and +70°C.

3.3 Installation of housing

3.3.1 Plastic housing

- Drill holes. Hole size 165 x 95 mm.

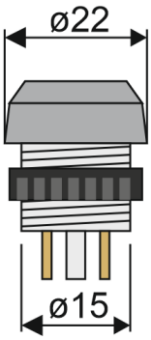


3.3.2 Start button with protective cap

WARNING

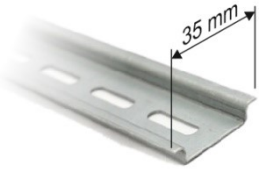
The start button must be installed in a closed housing – preferably in the cistern of the milking system!

The start button must be installed in such a way that contact with live parts is impossible!



- Drill a 15 mm diameter hole.
- Insert the start button with the protective cap into the hole and secure it with the corresponding plastic nut.
- Connect the electrical wiring.

3.3.3 RM-30 ‚R‘ (for DIN rail)

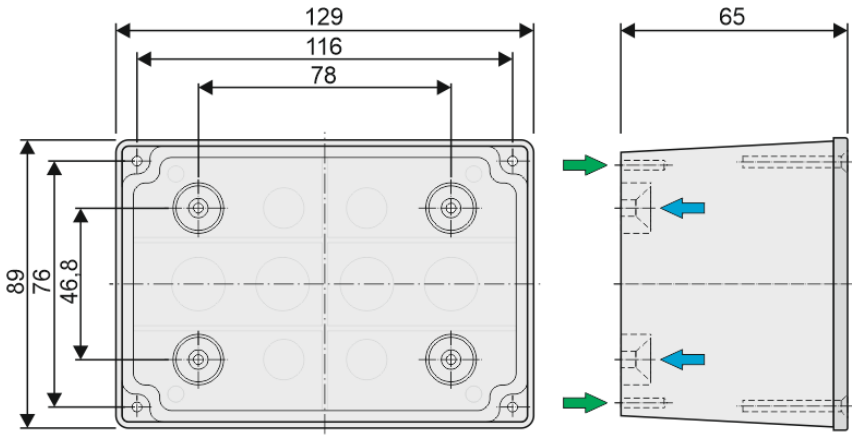


The RM-30 'R' control must be installed in a closed housing!!

The control must be installed in such a way that contact with live parts is impossible!

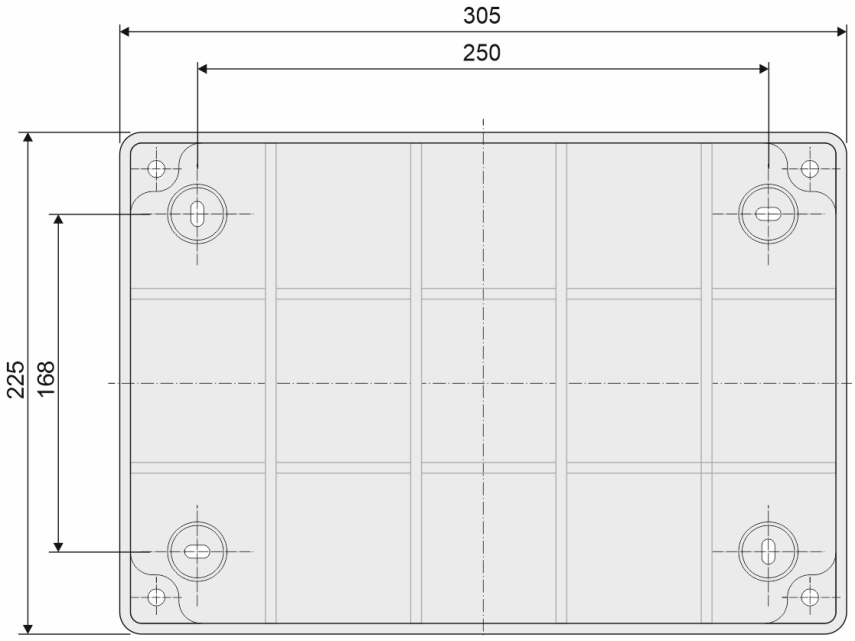
- Mount the control on a 35 mm DIN rail.
- Make the electrical connections.

3.3.4 Control panel FB-RM



- Loosen the front screws and remove the front panel from the housing base.
- Screw the housing base into the desired location:
  - Inside mounting (blue arrows) – mounting dimensions 78 x 46.8 mm
  - Outside mounting (green arrows) – mounting dimensions 116 x 76 mm
- Insert the cable through the PG-screwings into the housing and make the electrical connection.
- Insert the front panel into the housing base and secure it with the front screws.

3.3.5 RM-30 ‚G‘



- Loosen the front screws and remove the front panel.
- Screw the housing base into the desired location:
  Mounting dimensions 250 x 168 mm.
- Insert the cable into the housing through the PG-screwings and make the electrical connections.
- Assemble the front panel and secure it with the front screws.

4. Electrical connection

4.1 Safety during installation

⚠ WARNING

Before connecting ensure that the mains voltage is the same as indicated on the type plate of the control!

An incorrect electrical connection can lead to damage to the control and the connected systems!

The control may only be operated when installed.

When connecting the system components or the sensor, the control must be disconnected from the mains voltage

No components with current levels in excess of the maximum values indicated in the technical data should be connected to the relay contacts.

No other consumers may be connected to the mains terminals of the control.

4.2 Procedure

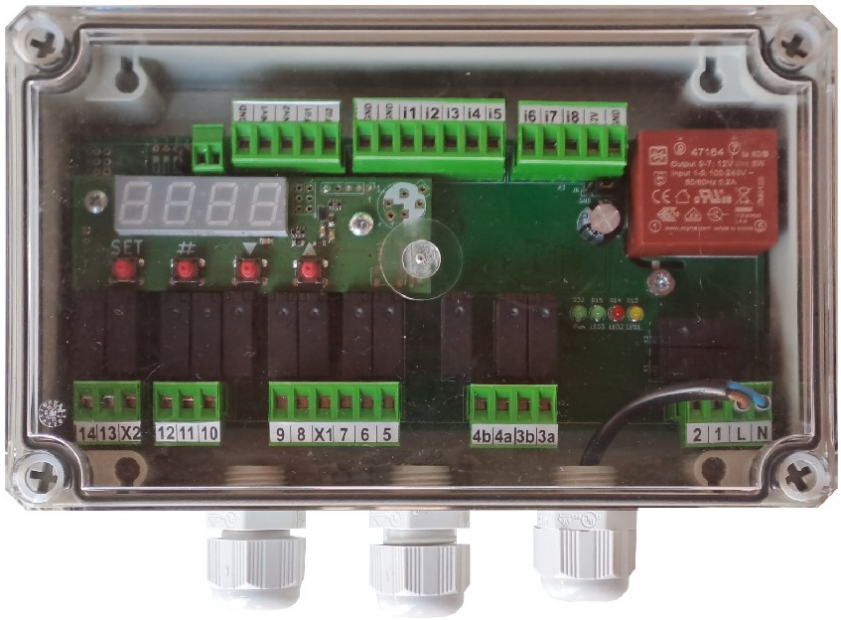
WARNING

To avoid personal injury, the following connection-sequence must be observed!

- De-energize the system
- Pull out all plug-in terminals of the control
- Connect all components, sensors and the mains wiring according to the wiring diagram (section 4.3) to the plug-in terminals

ATTENTION

- Insert the plug-in terminals into the control
  Make sure that you do not insert the plug-in terminals into the sockets in a twisted position! See photo for correct position



- Close the housing, then switch on the mains voltage
  The control is now ready for parameterization
- Parameterize the control as described in chapter “operation”
  (possibly with the optional WELBA-KONSOFT configuration software).

4.3 Wiring / circuit diagram

Correct wiring in accordance with the information in the accompanying description and local regulations is essential.

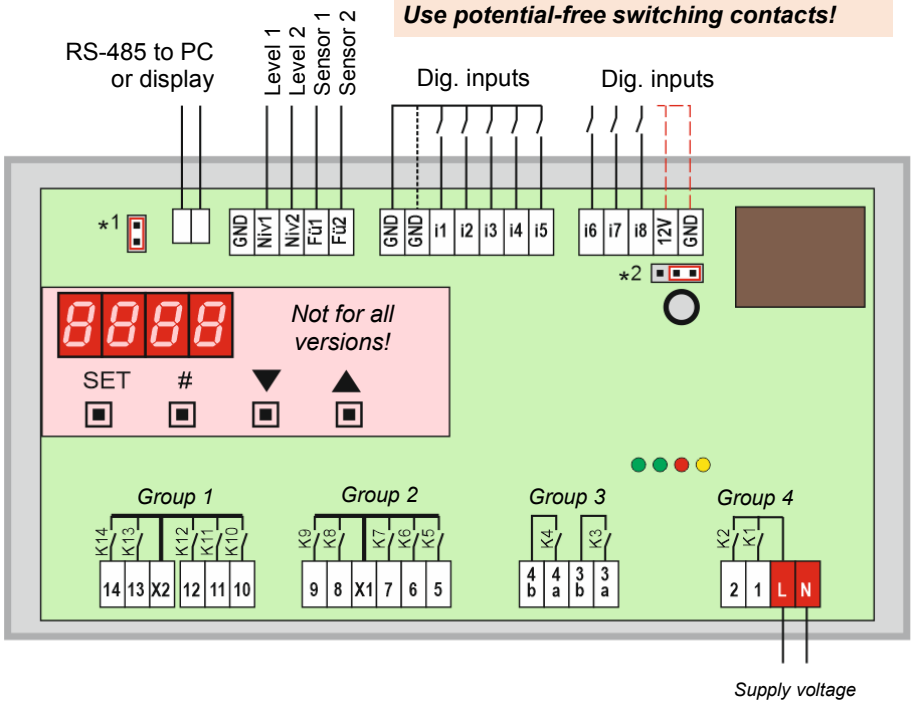
⚠ WARNING

Please note the following information:

- Use cable-end sleeves
- Lay all cables in a non-abrasive way
- Pay special attention to ensure that the AC power supply is not connected to the sensor input or other low voltage inputs or outputs
- When connecting the control and selecting the cable material used, the applicable regulations of VDE 0100 "Regulations for the installation of power systems with nominal voltages below 1000 V" or the national regulations applicable at the place of use must be observed

NO EXTERNAL VOLTAGE may be applied to the digital inputs.

Use potential-free switching contacts!



⚠ ATTENTION

The relays in each group may only be connected to a single voltage!

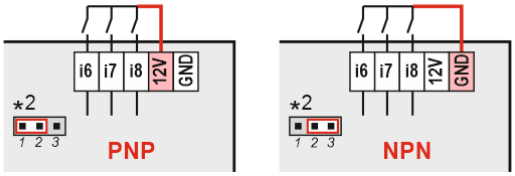
Group 4 may only be connected to 110..230 V AC, 50/60 Hz!

The others are free.

Attention: In order to control the RC-30 via remote control, the parameter A51 must be set = 2!!

Jumper *1 for terminating the interface

Jumper *2 for switching polarity "i6 – i8"



to section 4.3: Wiring / circuit diagram

Digital inputs

e.g., can be used for:

- Safety switch
- Start button
- Selector switch input 'Milking'
- Selector switch input 'Cleaning'
- etc.

Relays K1 - K14 (divided into 4 potential groups)

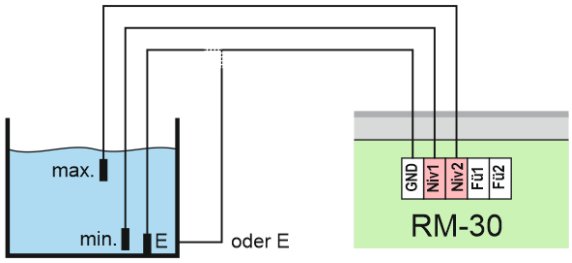
e.g., can be used for:

- Cold water
- Hot water
- Alkaline detergent
- Acid detergent
- Heater
- Drain valve
- etc.

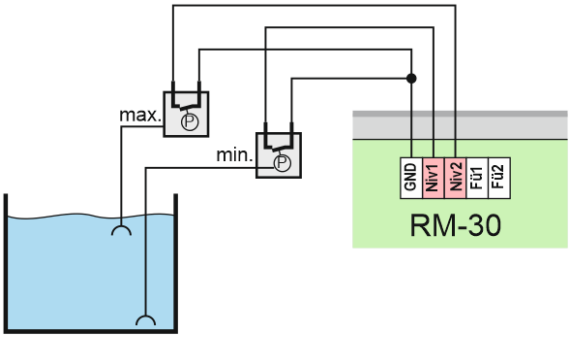
Level inputs

Existing sensors can be connected:

- Level electrodes
- Level pressure switches (pressostate)
- External float switches



Level electrodes



Pressure switches

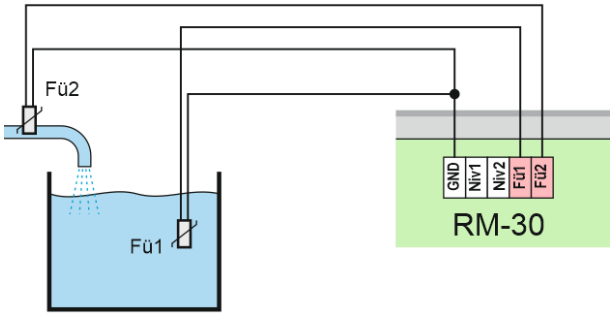
to section 4.3: Wiring / circuit diagram

Sensor inputs

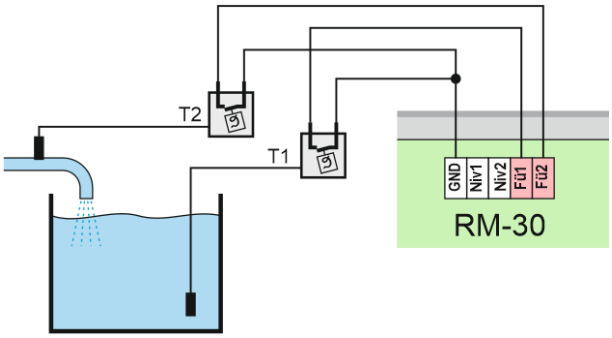
The following can be connected:

- New PT-1000 temperature sensors* (available at Welba)
- Existing thermostat switches*

** must be defined in parameter [A50]!!*



Temperature sensor



Thermostat switch

RS485 interface

Used to connect to a PC with the "Welba-Konsoft" Software via an optionally available USB-RS485 adapter. See chapter 6.

ATTENTION

Pumps and heaters must not be switched directly with the relay of the control. These must be switched by an additional contactor. In each individual case, it must be checked whether additional motor protection switches or other safety devices are required.

Downstream contactors must be equipped with an RC -protective circuit. See section 10.9.

5. Description of the cleaning process

5.1 Cleaning process diagram (maximum configuration)

NOTICE

The following cleaning process diagram shows the maximum configuration of all possible steps. Not all of these steps are required for your cleaning machine.

Predefined configurations* help for a quick adaption to your cleaning machine. Minor adjustments can be made later – on-site – directly by the buttons of the control.

** are available for download as *.wdd. files on the Welba website, or contact us.*

Cleaning Cycle

A *cleaning cycle* consists of *three different rinse cycles*:

- X pre-rinse cycle
- 1 main rinse cycle
- X rinse cycle

The frequency of the pre-rinse and rinse cycles per cleaning cycle is adjustable. [E19 + E39]

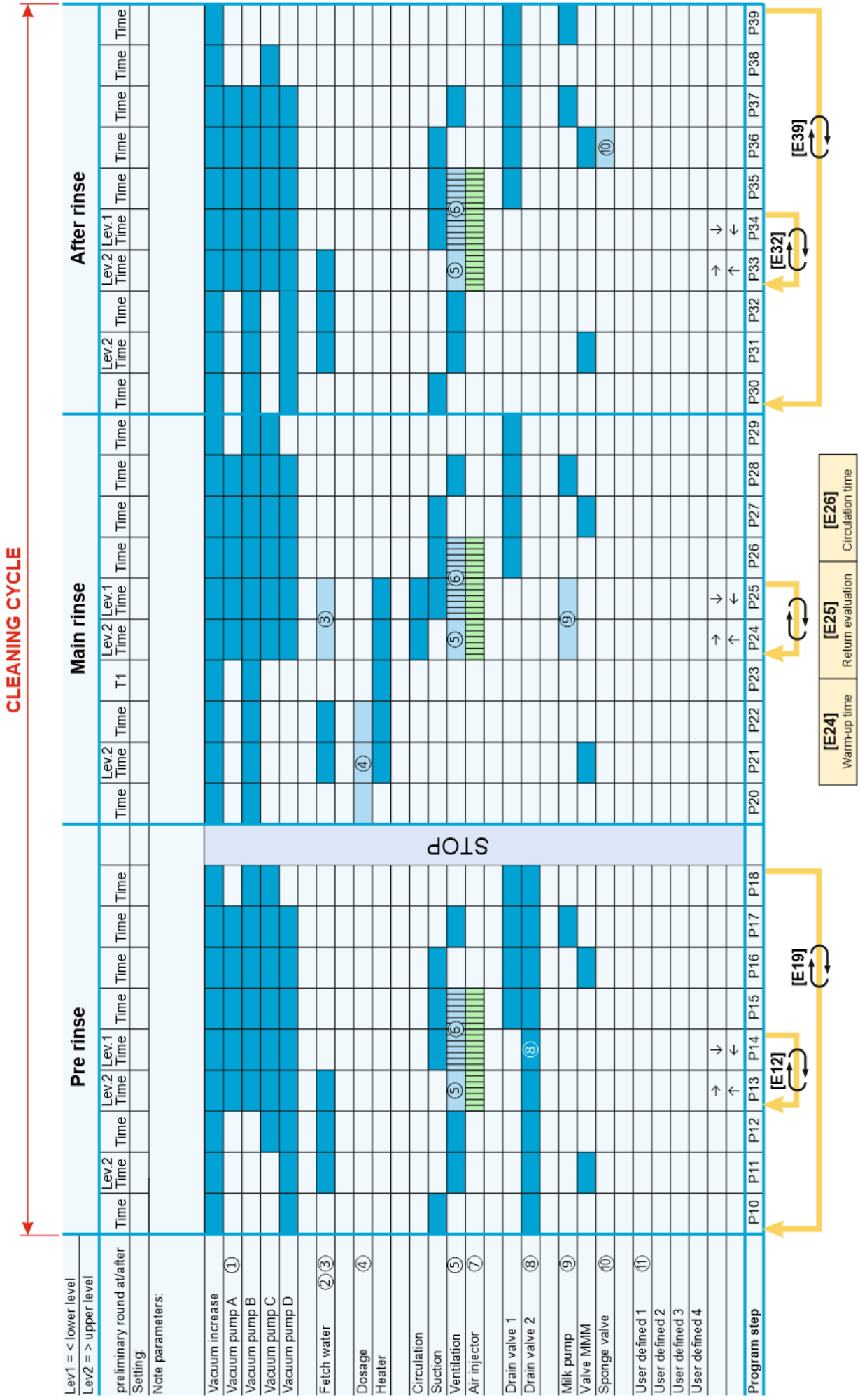
Rinse Cycle

Each *rinse cycle* consists of up to 10 *program steps*. These run sequentially.

Program Step

For each *program step*, there is a parameter of the same name in which the time or, in some steps, the level control is activated or set.

Individual, unnecessary *program steps* can be deactivated by setting the parameter to "0." These *program steps* are then skipped during the program run.


CLEANING CYCLE
Lev1 = < lower level
Lev2 = > upper level
Pre rinse
Main rinse
After rinse
STOP
[E12]
[E19]
[E24] Warm-up time
[E25] Return evaluation
[E26] Circulation time
[E32]
[E39]

5.2 Legend for the cleaning process diagram

1. The operation of the vacuum pump can be set in [E52].
   See section 5.6.3

2. The water valve (cold water, hot water, or mixed water) can be selected separately for each rinse cycle.

3. Refilling water:
   Depending on the setting in [E21], water can be added during the circulation phase.

4. Dosing detergent:
   Depending on the system, the dosing method can be set in parameter [E40].

5. Time-limited ventilation on return after *program steps P13, P24, or P33* can be set in parameter [E47].

6. When draining water into the system, the behaviour of the ventilation valve can be set in [E44].

7. A second, time-delayed output can be assigned to the air injector.

8. The first pre-rinse water can be drained via drain 2.
   The behaviour can be set in [E13].

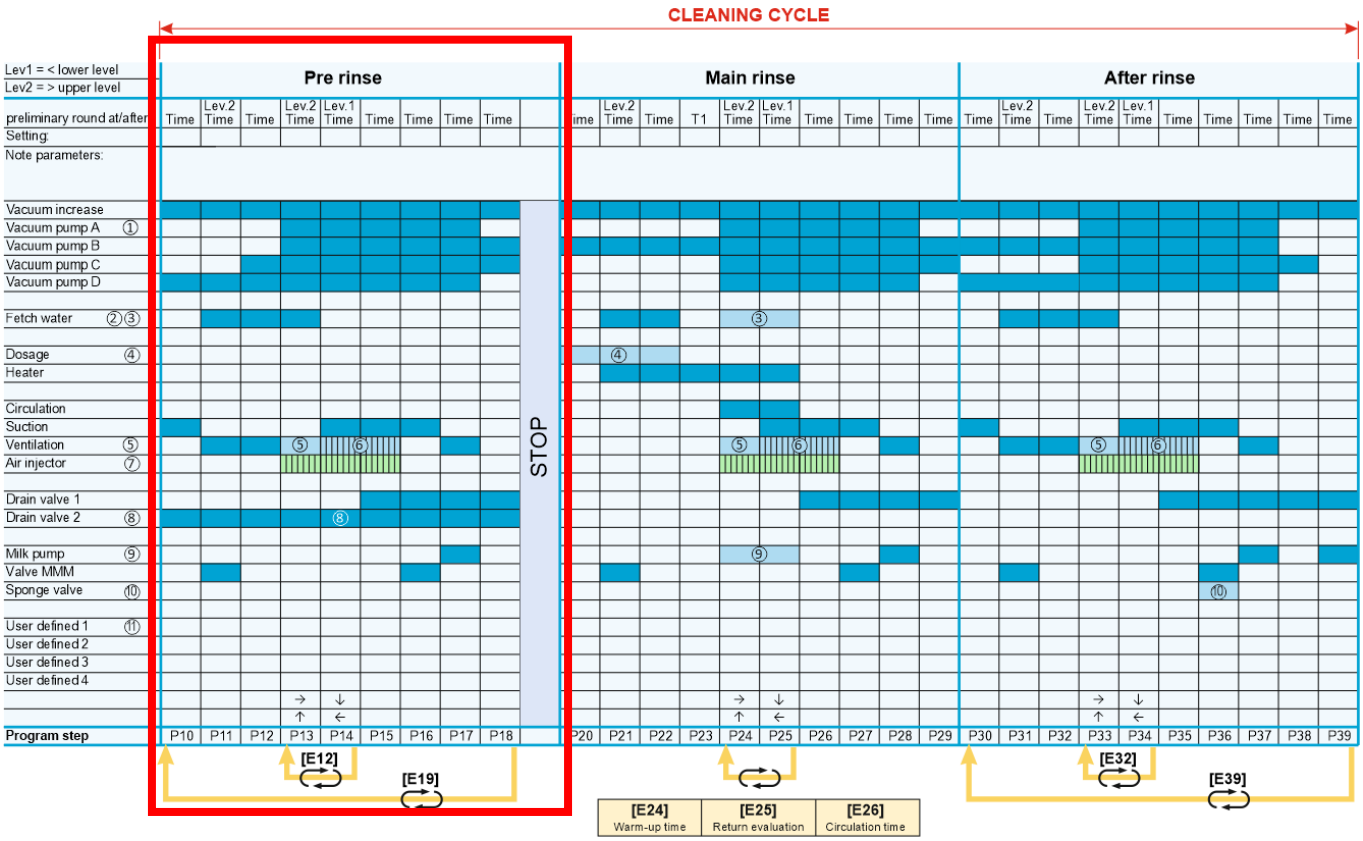
9. The operating mode of the milk pump for the circulation can be set in parameter [E28].

10. Optionally, a sponge valve can be activated at the end of *program step* P36. [E36]. If a required function is not included in the predefined rinsing sequence, it can be defined.

11. Logic modules and two integrated time relays help to implement own output functions.

12. To improve the emptying of milk meters, the "suction valve" can be closed for x seconds at the beginning of program step P36 to create maximum negative pressure. See parameter [E35]

5.3 Description of the “Pre-Rinse” wash cycle



5.3.1 Program steps for the "Pre-Rinse" wash cycle

The following applies to all program steps:

Parameter setting '0' = deactivated!

- [P10] Residual Water Extraction (0..999 sec.)
  This *program step* is only required for milking systems that require the residual water to be extracted for a period of time 'X' before adding water.

- [P11] Fetch water up to level 2 or after a certain time (0..999 sec.)
  In this *program step*, water is fetched for the first time.
  Depending on the setting, for a specific time or up to level 2.

- [P12] Refill water after a certain time (0..999 sec.)
  Additional water can be fetched for a certain time 'X'.
  Depending on the milking system, water can be added above level 2 – or water can be fetched when the vacuum pump is already running.

- [P13] Fetching water up to level 2 or after a time (repeatable) (0..999 sec.)
  This *program step* is intended for milking systems:
  - by a suction valve/drain valve that allows repeated water fetching within a single wash cycle. (Ventilation option in E47))
  - which let the water directly into the flush line

to section 5.3.1 Description of the “Pre-Rinse” wash cycle

- [P14] Water extraction to level 1 or after a time (repeatable) (0..999 sec.)
  Here, the water is extracted until level 1 is achieved or after a time 'X'.
  Plugs can be created:
  - by the function "air injector" [E60 - E63]
  - by the function "aeration pulsation" [E44 - E47] or
  - by small amounts of water in the container by repetition [P13 - P14].

  After this *program step* has been completed, you can optionally return to the next step to fetch water again. See [E12].

- [P15] **Extraction** (0..999 sec.)
  In this *program step*, the remaining water is extracted from the tank for a period of time 'X'.
  The functions "air injector" [E60 - E63] and "aeriation pulsation" [E44 - E47] are still active.
  For milking systems with a drain valve: The drain valve opens at the beginning of this *program step* until to the end of the wash cycle.

- [P16] **Drain** (0..999 sec.)
  In this *program step*, the milking system is drained for a period of time 'X'.

- [P17] **Pumping out** (0..999 sec.)
  In this *program step*, the residual water is pumped out of the end unit for a period of time 'X'.

- [P18] **Drain** (0..999 sec.)
  In this *program step*, residual water can optionally be drained from the milking system for a period of time 'X'.

5.3.2 Options for the wash cycle “Pre-Rinse”

- [E10] Water valve selection for the first flushing cycle / flow

  Here you specify the desired water valve to be used in the first flow. Usually, the "cold water" valve is set here to flush milk residuals from the line.

- [E11] Water valve selection from the second flushing cycle / flow

  Repeat program steps P13+P14 or P10 to P18

  Here you specify the desired water valve, which will be used from the second flow onwards. Usually, the 'warm water' valve is set to preheat the milking system.

- [E12] Number of water extractions

  Number of flows
  - Program step "fetching water" P13 and
  - Program step "water extraction" P14.

  Can be used with automatic dishwashers equipped with a suction valve. Otherwise, see parameter [E19].

- [E13] Separate water outlet for first pre-rinse (drain valve 2)

  Setting if the first rinse water should be drained => e.g., for calf feeding.

- [E17] Stop / break after pre-rinse

  A **STOP** can be programmed here between the pre-rinse and main-rinse cycles. The stop is executed after the first pre-rinse cycle. If multiple cycles are set in [E19], all subsequent cycles are executed after this "stop" is completed.

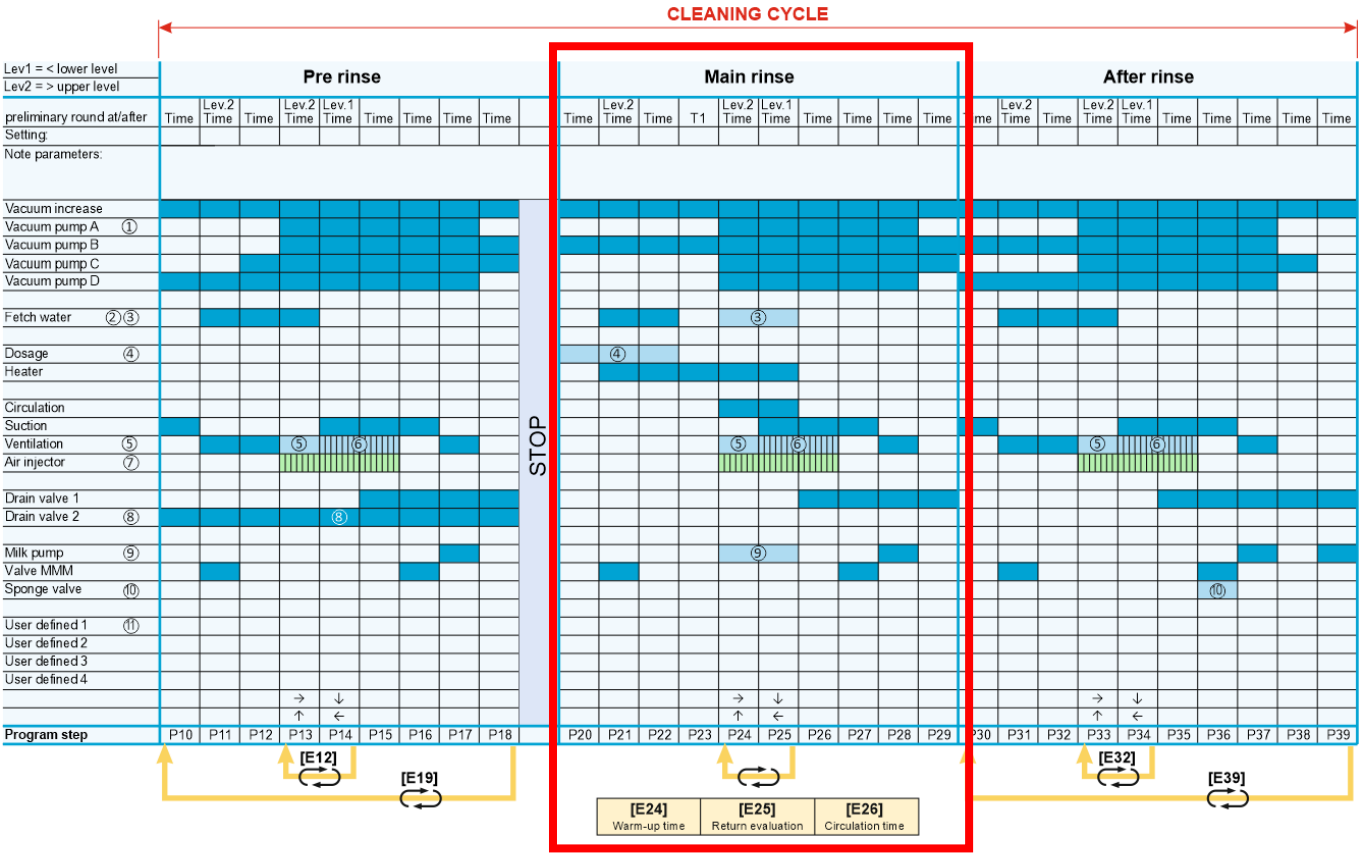
  The continuation of the cleaning from this STOP...

  1. …can be performed at a predefined time by an external timer. The timer sends a signal to the corresponding digital input at the programmed time. (Digital input, function 6: "start from stop")
  2. … is performed as in setting 1 – however by pressing the START / CLEANING button.
  3. …is performed as in settings 1 and 2 – but also after the set time (3 to 999 minutes).

- [E19] Number of pre-rinse cycles

  Enter the number (1 to 5) of total cycles.

5.4 Description of the "Main Rinse" wash cycle



5.4.1 Program steps for the "Main Rinse" wash cycle

The following applies to all program steps:

Parameter setting '0' = deactivated!

- [P20] **Dosing** (optional) 0..999 sec.
  This *program step* is only required in the Circomat automatic cleaning machine.
  The dosing valve is controlled here.

- [P21] **Water fetching up to level 2 or according a time** 0..999 sec
  In this *program step*, water is fetched for the first time. Depending on the setting, for a specific time or up to level 2.
  In this program step, the detergent is dosed via the dosing pump. See [E40]

- [P22] Refill water after a time of 0..999 seconds 0..999 sec.
  Additional water can be fetched for a period of time 'X'.
  Depending on the milking system, water can be added above level 2.

- [P23] One-time heating prior to circulation (option) 0..60 min.
  In this *program step*, the rinse water is heated to the set temperature [P75].
  If the temperature is not achieved within the set timeout [P23], the rinse process continues and a fault is reported at the end of the cleaning process.
  If this step is not required, it can be deactivated.

- Circulation phase
  See section 5.4.2

to section 5.4.1: Program steps for the "Main Rinse" cycle“

- [P26] **Suctioning out** 0..999 sec.
  In this *program step*, the remaining water is drained from the tank for time 'X'.
  The "Air Injector" [E60 - E63] and "Pulsing Ventilation" [E44 - E47] functions are still active.
  For milking systems with a drain valve: The drain valve opens at the beginning of this program step until the end of the rinsing cycle.

- [P27] **Drain** 0..999 sec.
  In this *program step*, the milking system is drained for time 'X'.

- [P28] **Pumping out** 0..999 sec.
  In this *program step*, the residual water is pumped out of the end unit for time 'X'.

- [P29] **Drain** 0..999 sec.
  In this *program step*, residual water can optionally drain from the milking system for the time ‘X’.

5.4.2 Options for the wash cycle „Main Rinse“

- [E20] Water valve selection
  Here you can specify the desired water valve to be used for the main rinse cycle.

- [E21] Water refill options in circulation (P24/P25)
- [E22] Water refill delay / refill time
- [E23] Water refill limit
  See also section **Fehler! Verweisquelle konnte nicht gefunden werden.**
  Here you can add water in various ways during the circulation phase to ensure the milking system is filled with the required amount of water.

Circulation phase

The *two program steps P24 and P25* build the circulation phase. (**Fehler! Verweisquelle konnte nicht gefunden werden.**)

The required times are set in parameters [E24, E25, E26]. The *main wash cycle* will not continue until these three times have been processed. See also section **Fehler! Verweisquelle konnte nicht gefunden werden.** on the next page.

- [E24] **Warm-up time (time 1)** – 0..90 min.
  The milking system is warmed up by the circulating warm water for the time set.

- [E25] **Maximum heating time (time 2)** Thermostop limitation – 0..90 min.
  This time is optional and only active if a 'return flow evaluation' is set. See parameter [A50]. Once the set heating temperature [P76] is achieved, the actual circulation time [E26] starts.
  If the heating temperature [P75] is not achieved after the set maximum heating time [E25] has elapsed, the control switches to the actual circulation time [E26] and reports a fault at the end of the cleaning process.

- [E26] **Circulation time (time 3)** – 0..90 min.
  Time during which the water circulates in the system at the required temperature [P76].
  During this time, 'flush cycles' are continuously generated.

- [E28] **Activate milk pump during circulation time**
  Depending on the milking system type, you can set whether the milk pump is
  - … permanently switched on, or
  - … permanently switched on with a switch-on delay, or
  - … cycled (see also [E65+E66])

- [E56] **Suction valve remains closed during the circulation phase**.
  For systems (e.g., Envistar) that extract the water at a higher level during the circulation phase via a second suction valve.

5.4.3 Variations of the circulation phase sequence

Depending on the type of milking system, the following processes make sense:

- *Programme steps P24 and P25* are constantly repeated depending on the level and thus generate the flush pulses– or
- The control remains *in program step P25* and generates the flush pulses via the air injector or ventilation valve.

- Continuous repetition of *program steps P24+25* - LEVEL-controlled
  - If the upper level is achieved in *program step P24*, the wash cycle switches to P25, where the water is extracted.
  - If the lower level is achieved in *program step P25*, the wash cycle switches back to P24. Water can optionally be refilled. See parameter [E21]
  - The program sequence stops here until the upper level is achieved again.
    This can be achieved either by fetching water again or by the returning water.
    It creates water plugs that are pulled through the pipework system.

- Continuous repetition of *program steps P24+25* – TIME-controlled
  - Same behaviour as before, except that fixed times are specified for the change between the two program steps.

- Staying in *program step P25 - program step 24* is deactivated.
  - For systems without suction valve:
    The *main rinse cycle* remains in *program step* P25 during the entire circulation phase.
  - The plug formation can be realised either by the ‘aeration pulsation’ [E44 - E47] or the ‘air injector’ [E60 - E63].

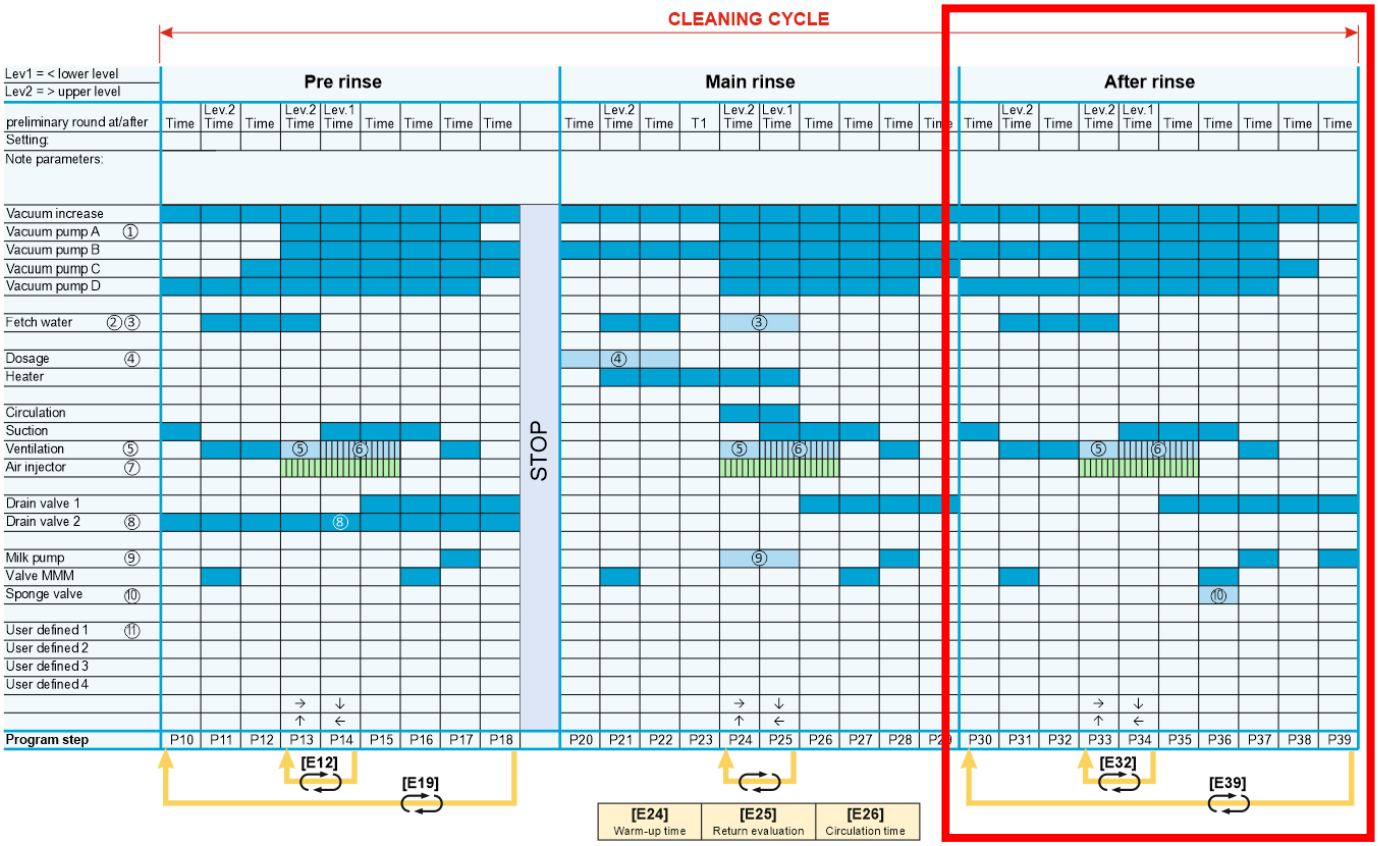
5.4.4 Water refill options in the circulation phase (P24/P25)

See also parameters [E21+E22] in section 5.4.2

There are various options available for filling the milking system with the required amount of water.

- Option 1
  For milking systems with a smaller water tank and level-controlled.
  When returning from *program step P25 to P24*, water is refilled after the delay time [E22] until the upper level is achieved - maximum for the set time [E23].
- Option 2
  For milking systems with a larger water tank and level-controlled.
  In the two *program steps P24 and/or P25*, water is refilled after falling below the lower level after the delay time [E22] has elapsed until the lower level is achieved again - but for a maximum of the set time [E23].
- Option 3
  For milking systems in which the water supply is NOT level-controlled
  In the two *program steps P24 and/or P25*, water is refilled for the time set in [E22].
- Option 4
  For milking systems without a lower level electrode that use the milk pump signal as return flow information. Water is refilled with a delay until return info is recognised. But for a maximum of the set time [E23].

5.5 Description of wash cycle “Rinse”



5.5.1 Program steps wash cycle „Rinse”

The following applies to all program steps:

Parameter setting '0' = deactivated!

- [P30] **Residual water extraction** (0..999 sec.)
  This *program step* is only required for milking systems that require the residual water to be extracted for a time 'X' before water is added.

- [P31] **Fetching water up to level 2 or after a certain time** (0..999 sec.)
  In this *program step*, water is fetched for the first time.
  Depending on the setting, for a specific time or up to level 2.

- [P32] **Refill water after a certain time** (0..999 sec.)
  Additional water can be fetched for a certain time period X.
  Depending on the milking system, water can be added above level 2 – or water can be fetched when the vacuum pump is already running.

- [P33] **Fetching water up to level 2 or after a time (repeatable)** (0..999 sec.)
  This *program step* is intended for milking systems:
  - with a suction valve/drain valve which allows repeated fetching of water within a *wash cycle*. (Aeration option in E47)
  - which let water directly into the rinsing line.

to section 5.5: Rinse Cycle Program Steps

- **[P34] Water extraction up to level 1 or after a time (repeatable)** (0..999 sec.)
  Water is extracted until level 1 is achieved or after a time 'X'.
  Plugs can be created:
  - by the function "air injector" [E60 - E63]
  - by the function "aeration pulsation" [E44 - E47] or
  - in case of small amounts of water in the tank by repetition [P33 - P34].
  - After this *program step* has been completed, you can optionally return to the program to fetch water again. See [E32].

- [P35] **Suctioning out** (0..999 sec.)
  In this *program step*, the residual water is extracted from the tank for time 'X'.
  The functions "air injector" [E60 - E63] and "aeration pulsation" [E44 - E47] are still active.
  For milking systems with a drain valve: The drain valve opens at the start of this *program step* until to the end of the rinsing cycle.

- [P36] **Drain** (0..999 sec.)
  In this *program step,* the milking system is drained for a period of time 'X'.
  Option emptying milk meter
  see section 5.5.2 – Parameter [E35]
  Option sponge valve
  see section 5.5.2 – Parameter [E36]

- [P37] **Pumping out** (0..999 sec.)
  In this *program step*, the residual water is pumped out from the end unit for a time of 'X'.

- [P38] **Drain** (0..999 sec.)
  In this *program step*, residual water can optionally be drained from the milking system for a time of 'X'.

- [P39] **Final pumping out** (0..999 sec.)
  At the end of the *rinsing process*, residual water can optionally be pumped out for the time 'X'.

5.5.2 Options for the wash cycle “Rinse”

- [E30] Water valve selection for the first rinse cycle /flow.
  Selection of the required water valve that will be used for the entire rinse cycle.

- [E32] Number of water extractions
  Number of flows
  - Program step "Fetching water" P33 and
  - Program step "Water extraction" P34.

  Can be used for dish washers which are equipped with a suction valve. Otherwise, see parameter [E39].

- [E35] Emptying milk meter
  To improve the emptying of milk meter, the suction valve can be closed for x seconds at the start of program step P36 to build up maximum negative pressure.

- [E36] Options sponge valve
  Depending on the setting in parameter [E36], the sponge valve can be opened at the end of *program step P36* for the set time 'X' at the end of the last 'rinse cycle'. In this case, the suction valve closes 20 seconds before the sponge valve opens to create maximum negative pressure.

- [E39] Number of rinse cycles
  Enter the number (1..5) of total cycles.

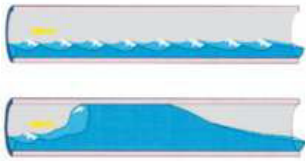
5.6 Additional functions / Cleaning Instructions

5.6.1 Water valve selection for each wash cycle

The desired water valve can be selected for each wash cycle (cold, warm, or hot water).

If both the cold and warm water valves are “occupied”, a third "hot water" valve can be used.

5.6.2 Plug formation (generation of turbulences)



The control offers various options to create plugs.

- Option 1
  For milking systems with a small water tank
  Plugs are created by repeating program steps P13/P14, P24/P25, and P33/P34. See parameters [E12, E32].

- Option 2
  For milking systems with a ventilation valve
  Plugs are created by pulsing of the ventilation valve. See parameters [E44..E46]

- Option 3
  For milking systems with air injector or flush injectors
  Plugs are created by pulsing the air injector or the flush injector.
  See [E60..E63] and section 5.6.11

5.6.3 Vacuum pump settings [E52]

Depending on the system, the vacuum pump is switched on and off at different times.

The control has predefined switching behaviours that can be selected in parameter [E52]. See the cleaning sequence diagram.

If the desired switching behaviour is not defined, it is possible to determine your own definition. See section 5.7

5.6.4 Drain valve settings [E77..E79]

The control has a predefined switching behaviour. See cleaning sequence diagram.

If the predefined switching behaviour does not meet your requirements, you can determine your own definition. See section 5.7

5.6.5 Dosing options for detergents [E40 + E41]

Selection dosing function [E40]

The control offers various options for dosing detergents for the various milking systems. The selection is shown in the parameter list.

		Initial function	*Rinse step*
0:	via cup dosing	9	P21 + P22
1:	Dosing pumps (8-second inlet delay, dosing time adjustable in P71)	9, 15	P21
2:	Circomat	9	P20 .. P22
3:*	via separate water valves (Venturi principle)	9, 15	P21 .. P25
4:	via separate water valves (Venturi principle)	9,15	P21 .. P25
5:*	Cup dosing	9	P21 + P22

** Water valves remain off during dosing.*

Dosing alkaline - alternating acidic [E41]

Selections 1, 3, and 4 in [E40] support alternating detergent use.

Manual switching of the detergent intake => see section 7.3.1 (only possible when operated via the FB-RM operating part).

5.6.6 Options for heating activation [E58]

Depending on how the heating is installed in the milking system, a customized behaviour can be set with parameter [E58] to prevent the heating from being activated without water.

[E58] = 1: For systems with a level electrode where water must always achieve at least this level to switch on the heating.

The heating is temperature-controlled switched on in program steps P21 to P25.

[E58] = 2: For systems that operate without level detection. To protect the heating, it is necessary to ensure that a required minimum amount of water is supplied in program step P21.

The heating is temperature-controlled switched on in program steps P22 to P25.

[E58] = 3: For systems with a level electrode where it is generally necessary for the water level to be at least at this level to switch on the heating, but system-related this is not required in the circulation phase.

The heating is switched on temperature-controlled in program steps P21 to P23 relevant to the level, and in program steps P24/P25 irrelevant to the level.

[E58] = 4: For systems with a level electrode where it is generally not necessary to monitor the water level to switch on the heating, but system-related required in the circulation phase.

The heating is switched on temperature-controlled in program steps P22/P23 irrelevant to the level, and in program steps P24/P25 relevant to the level.

5.6.7 Manual short rinse with clean water [E50]

In the versions

- operation via existing selector switch and BY start button, and
- operation via the FB-RM operating part

the control offers the option of activating a 'short rinse program'. See sections 7.2 + 0.

When the short rinse cycle is initiated, the pre- and main rinse cycles are skipped, and only the 'final rinse' cycle is performed.

5.6.8 Cancellation of a cleaning process

Depending on the operation mode a cleaning process can be manually cancelled.

NOTICE

The following applies to both versions:

After a manual cancellation, the system may need to be drained or the cleaning process must be restarted!

Operation via selector switch

- Set the selector switch to the OFF position:

  Cleaning stops immediately and all elements are switched off.
  "OFF" appears on the display and the "cleaning active" LED is off.

Operation via FB-RM operating part

- Hold the OFF button for 2 seconds:

  Cleaning enters the optional drain phase and opens the drain valve.
  "Drain" (Abl) flashes on the display.

  After the drain time P40 has elapsed, all elements are switched off.
  "OFF" appears on the display and the "cleaning active" LED is off.

5.6.9 Disinfection "Multilactor" [E1]

The RM-30 supports the disinfection of an existing Multilactor. The disinfection sequence consists of three program steps (P1 to P3), for which separate times can be set.

Step 1: The water suction valve is opened for the time set in P1.

Step 2: Additionally, the Multilactor is activated and the vacuum pump is switched on for the time set in P2.

Step 3: Everything is shut down again and stays in a break for the time set in P3.

Start of the cleaning process.

This process can be activated in parameter [E1]. It can be selected whether disinfection should be performed only before cleaning process or also prior to a short rinse.

5.6.10 Service function for testing the cleaning process

Continue the cleaning cycle in single steps. (Step function)

Only possible with the versions

- operation via the existing selector switch and BY start button, and
- operation via the FB-RM operating part

For a faster test of a cleaning process, it is possible to manually switch the cycle from one program step to the next by single-step function, without having to wait until the step is completely processed.

WARNING

CAUTION: Using this single-step function is at your own risk! A continuous switching of important processes poses a risk to both the milking system and the milk!

- Set parameter [E95] to '1'.
  The single-step function is now permanently set.
- Start the cleaning mode.
- While the cleaning mode is running, press and hold the CLEANING button resp. the START button for 4 seconds:
  - The step function is activated,
  - "StP" appears on the display.
- By repeatedly pressing the CLEANING button resp. the START BUTTON, the cycle can now continuously be switched step by step.

5.6.11 Use of air injector/flush injector

A simple air injector or flushing injector with an air and water valve can be configured in parameters [E60] to [E63] to improve turbulence generation.

Simple air injector (setting 0 or 1)

In the predefined or user-defined flushing steps, the air injector 1 (initial function 11) is opened and closed according to the times set in [E61] and [E62].

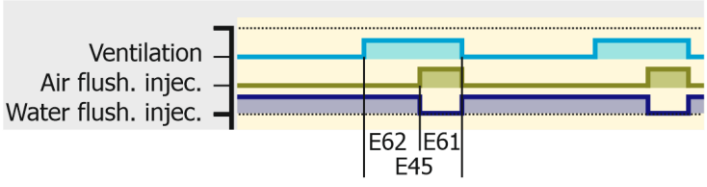
For larger systems, a second air injector 2 (initial function 16) can also be controlled, time delayed [E63].

Flushing injector with air and water valve (setting 2)

The flushing injector is time-coupled with the ventilation. When the ventilation valve opens, after a time delay of [E62], the air valve is activated for the time [E61]. The times [E61 / E62] must be adjusted to the ventilation time [E45]. The water valve is controlled inversely to the air valve (opens the air valve => closes the water valve, closes the air valve => opens the water valve).

- The air valve must be connected to air Injector 1 (initial function 11).
- The water valve must be connected to the air injector 2 (initial function 16).

Example process:



5.7 User-defined wash cycle functions

The cleaning process has a large number of predefined rinse cycle functions, such as the control of water valves, vacuum pumps, milk pumps, etc. The cleaning process diagram (page 25) shows in which program step a particular function is active, or in which the associated element is switched on or off.

If wash cycle functions are required for the milking system that are not predefined, up to four rinse cycle functions (BdF1 to BdF4) can be defined in the "b-parameter level." For each rinse step (P1 to P40) a corresponding b-parameter (b1 to B40) is available in which the definitions can be parameterized.

The input values for the parameters are binary coded (see table). If a "1" is defined in a rinse cycle function, the function is active and the corresponding relay is switched on.

Code	Customised rinse cycle functions			
	BdF 1	BdF 2	BdF 3	BdF 4
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1
10	0	1	0	1
11	1	1	0	1
12	0	0	1	1
13	1	0	1	1
14	0	1	1	1
15	1	1	1	1

Example:

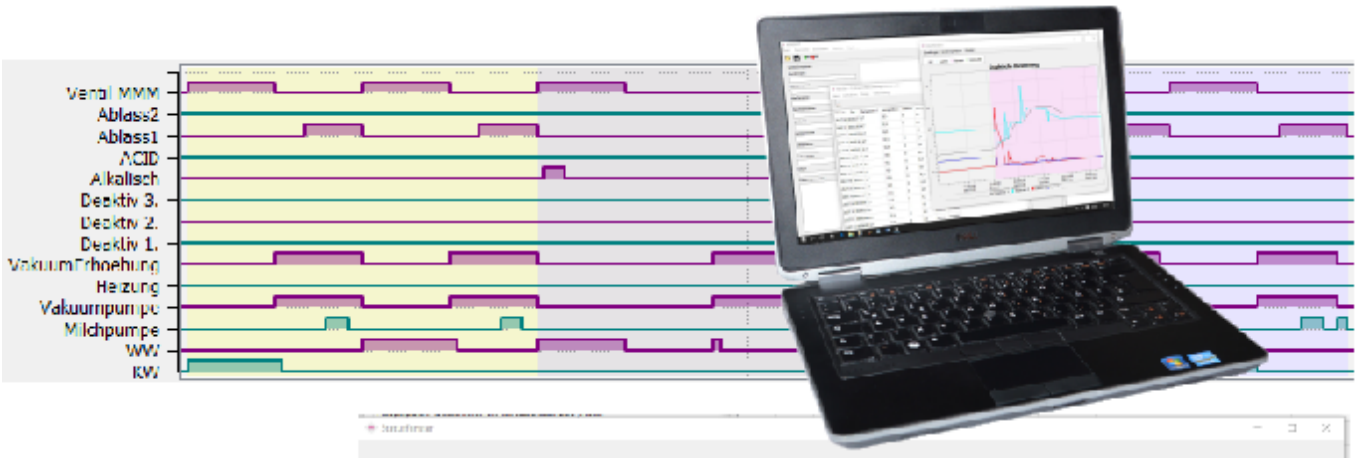
- In the first pre-rinse step (P10), a "valve A" should be controlled.
- In the first after-rinse step (P30), a "valve B" should be controlled.
- At the end of the after-rinse step (P38), both valves should be controlled.

Two independent "user-defined functions" (BdF1 and BdF2) are required, and two output relays are assigned to each function.

Required parameterization

- Parameter [b10] = 1 (BdF 1 active in rinse step P10)
- Parameter [b30] = 2 (BdF 2 active in rinse step P30)
- Parameter [b38] = 3 (BdF 1 and 2 active in rinse step P38)
- Parameter [A1] = 26 (Relay K1 is coupled to BdF 1)
- Parameter [A2] = 27 (Relay K2 is coupled to BdF 2)

6. The configuration Software KONSOFT



For complete description of the Software, see separate instructions.

To connect the RM-30 to a PC, an adapter cable USB-RS-485-001 is required.

With the configuration Software „KONSOFT" the RM-30 can easily be

- configured and parameterized
- commissioned
- **updated** (Firmware)

Configuration

All setting parameters can be entered and stored (level-related) on your PC with a clearly designed operating mask. A description is available for each parameter.

Once all parameters have been entered, the complete configuration can be transferred to the control.

Visualization (for commissioning/troubleshooting)

Measured values and status information can be displayed (and saved) live on the screen either graphically or in tabular form. This allows a quick and easy commissioning and troubleshooting.

Update function

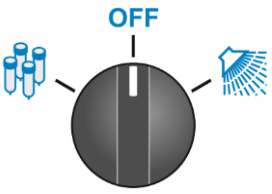
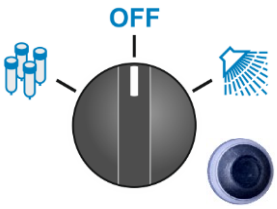
This allows the controller to be updated to the latest operating software by pressing the button.

NOTICE

NOTE: The KONSOFT PC-Software has been thoroughly tested and has proven itself hundreds of times at or customers. Despite all care, we point out that the use of the free PC-Software is at your own risk. WELBA does not accept any liability for damages or loss of data resulting from the installation or use of the Software.

7. Operation of the milking system

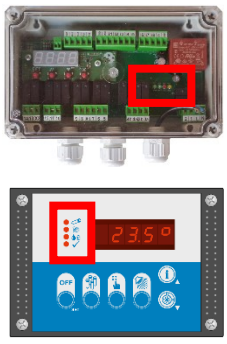
The RM-30 can be operated …

		
…by using the existing selector switch on the cleaning machine. *See section 7.1*	… by using the existing selector switch on the cleaning machine and a start button for the cleaning. *See section 7.2*	… by using the FB-RM operating part *See section 0*

Precondition

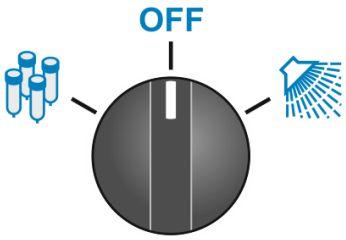
Parameter [A51] = 0	*Parameter [A51] = 1*	*Parameter [A51] = 2*
The two normally open contacts of the selector switch must be connected to 2 digital inputs that are parameterized with the corresponding functions. *[A21..A25] = 2 (MILKING)* *[A21..A25] = 3 (CLEANING)*	*The two normally open contacts of the selector switch and the start button must be connected to 3 digital inputs that are parameterized with the corresponding functions.* *[A21..A25] = 1 (START)* *[A21..A25] = 2 (MILKING)* *[A21..A25] = 3 (CLEANING)*	*The RS485-IO interface of the operating part must be connected to the RS485 interface of the control.*

Meaning of the LED indicators



	1te LED green 2te LED green 3te LED red 4te LED yellow	= Ready = Cleaning active = Fault (see fault code) = Milking active
	‚Milking' LED ‚Cleaning' LED ‚Fault' LED ‚ok' LED	= Milking active = Cleaning active = See fault code = Cleaning completed successfully

7.1 Operation via existing selector switch



Start the milking process

- Set selector switch to the 'MILKING' position:
  - The vacuum pump is started.
  - The yellow "Milking" mode LED flashes,
  - Milking is symbolized on the display.
- Finish milking process => Set selector switch to OFF

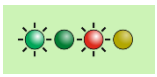
Start cleaning

- Set the selector switch to the 'CLEAN' position.
  Cleaning will start according to the parameter settings.
  - The green "cleaning" mode LED flashes,
  - The temperature or cleaning step is shown on the display (depending on the setting [E97]).
  - After the cleaning cycle has been successfully completed, 'READY' appears on the display and the 'cleaning active 14' is deactivated (the 'cleaning' lamp switches off).
- **Only now:** Set the selector switch to OFF

OFF

Finishing the milking or cleaning process

- Set the selector switch to the 'OFF' position:
  - MILKING is stopped, resp.
  - CLEANING is stopped.
  - CAUTION: If a cleaning process is NOT completed, it will be stopped, i.e. it is uncomplete
  - If the cleaning process is restarted, it will start from the beginning.

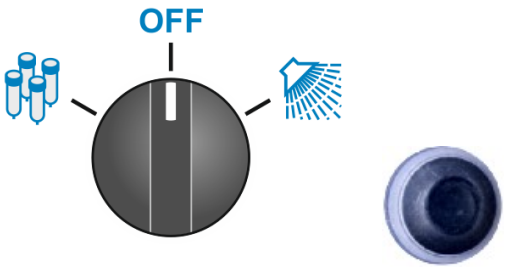


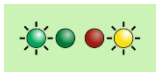
Occurring faults

Occurring faults are displayed as a code on the display.
See Chapter 9.

At the same time, the red fault LED flashes and the ‘fault lamp 13’ is activated and switched off (‘Fault’ lamp flashes).

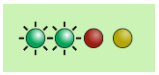
7.2 Operation via existing selector switch + start button for cleaning





Start the milking process

- Set the selector switch to the 'MILKING' position:
  - The vacuum pump is started.
  - The yellow "Milking" mode-LED flashes.
  - Milking is symbolized on the display.
- Finish milking process => Set the selector switch to OFF.



Start cleaning

- Set the selector switch to the 'CLEAN' position.
- Briefly press the START button:
  - Cleaning will start according to the parameter settings.
  - The green "cleaning" mode LED flashes.
  - The temperature or cleaning step is shown on the display (depending on setting [E97]).
  - After the cleaning cycle has been successfully completed, 'READY' will appear on the display and the exit 'cleaning active 14' is switched off (the 'cleaning' lamp switches off).
- **Only now:** Set the selector switch to OFF

Initiate a short rinse cycle (see section 0)

- Set the selector switch to the 'CLEAN' position.
- Hold down the START button until cleaning starts:
  A short rinse cycle is performed (without adding detergent)

OFF

Finishing the milking or cleaning process

- Set the selector switch to the 'OFF' position:
  - MILKING is stopped, or
  - CLEANING is stopped.
  - CAUTION: If a cleaning process is NOT completed, it will be stopped, i.e. it is not completed.
  - If the cleaning process is restarted, it will start again from the beginning.

Occurring faults

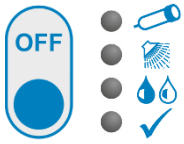
Occurring faults are displayed as a code on the display.
See chapter 9.

At the same time, the red fault LED flashes and the ‘fault lamp 13’ is switched off (‘Fault’ lamp flashes).

7.3 Operation via the FB-RM control

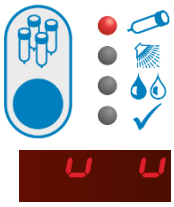
NOTICE

The MILKING and CLEANING operating modes can only be selected from the OFF mode. A direct switching between the modes is not possible.



Finishing the milking or cleaning process

- Press the OFF button: (switch to OFF mode)
  - MILKING is stopped, or
  - CLEANING is stopped.
  - CAUTION: If a cleaning process is NOT completed, it is stopped, i.e.it is not completed.
  - If the cleaning process is restarted, it will start again from the beginning.

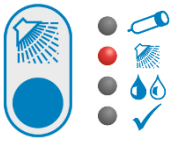


Start the milking process

- Press the 'MILKING' button:
  - The vacuum pump is started.
  - The "Milking" mode LED flashes,
  - Milking is symbolized on the display.
- Finishing of the milking process => press OFF button.

Start cleaning

- Briefly press the 'CLEAN' button:
  - Cleaning is started according to the parameter settings.
  - The "clean" mode LED flashes,
  - The temperature or cleaning step is shown on the display (depending on the setting [E97]).
  - After the cleaning cycle has been successfully completed, the control unit switches to OFF mode.
  - The "READY" mode LED flashes.



Initiate a short rinse cycle (see section 0)

- Press and hold the 'CLEAN' button until cleaning starts:
  - A short rinse cycle is performed (without adding detergent)

Emptying the end unit by the "Pump" button

This button function must be activated in parameter E67. The mode is set in which the button is active (Milking or Off).

- Press and hold the 'PUMP' button:
  - The milk pump will remain switched on until the button is no longer pressed.
  - “P.on” appears on the display.

Displaying information

Depending on the operating status, different displays appear. Depending on the configuration, various information can be called up by pressing the 'INFO' button (repeatedly).

- Press the 'INFO' button
  - Program step
  - Actual temperature sensor 1
  - Actual temperature sensor 2
  - Fault codes (in the case of multiple faults).

Occuring faults

Faults that occur are shown as codes on the display.
See chapter 9.

7.3.1 'HAND' button – optional settings

The 'HAND' button can be configured for various functions depending on the parameter settings in [A52]:

Sponge Valve [A52 = 1]

At the end of the milking process, it is possible to clean the milking system by a sponge.

- Press the 'HAND' button:
  - The sponge valve opens - the negative pressure pulls the sponge through the milking system.

Manual detergent switching [A52 = 2]

Only if the milking system has two dosing pumps (acidic/alkaline) and the parameters [E40 = 1] + [E41 >=1] are set.

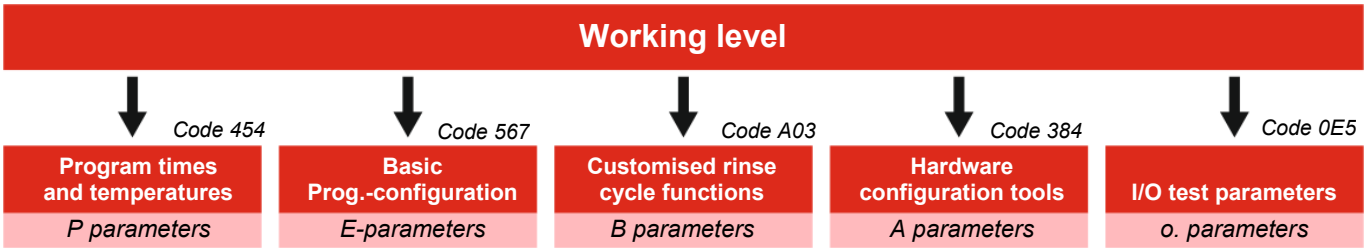
After the cleaning cycle has started, the detergent used in this cleaning cycle is displayed

- LED OFF: ALKALINE detergent.
- LED ON: ACIDIC detergent.

- Press the 'HAND' button:
  - The currently used cleaning agent is switched to the other one.

8. Parameterization

8.1 The parameterization in levels



The working level

The working level is used for operation and control in everyday operation. The RM-30 is parameterized in 5 different parameter levels.

NOTICE

Access to the subordinate parameter levels after having entered a code in order to avoid accidential adjustment of the parameters.

- -

Level "Program Sequence Settings and Temperatures"
(P-parameter) see section 8.4

This is where the actual program sequence is defined.

Parameterization whether the program steps are executed level- or time-controlled, or whether they are deactivated completely.

- -

Level "Basic Program Configuration"
(E parameter) see section 8.5

Setting of the basic cleaning sequence for pre-rinsing, main rinsing and rinsing. Settings for dosing, ventilation, milk pump, valves, etc.

- -

Level "Customised Program Configuration"
(b parameter) see section 8.6

Customised rinsing functions can be defined.

- -

Level "Hardware Configuration Tools"
(A parameter) see section 8.7

Determination/parameterization of the hardware-configuration such as relay inputs, digital input and RS485-settings, etc.

- -

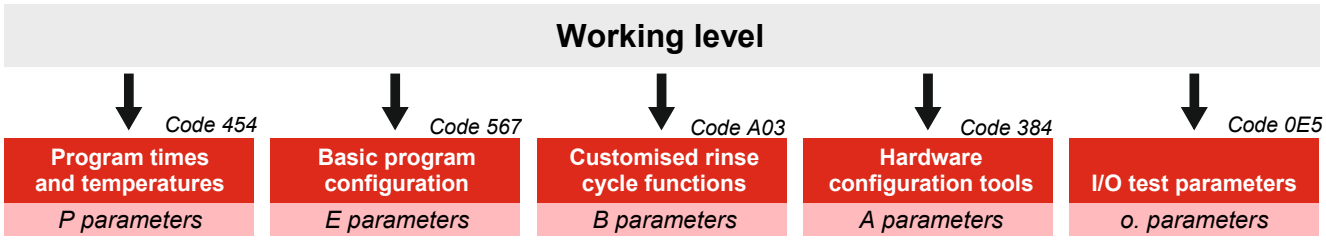
Level "I/O Test Parameter"
(o. parameter) see section 8.8

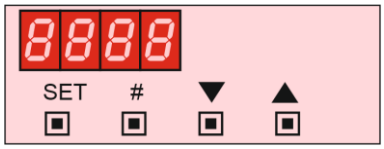
Used to commission the control and function test of the connected components.

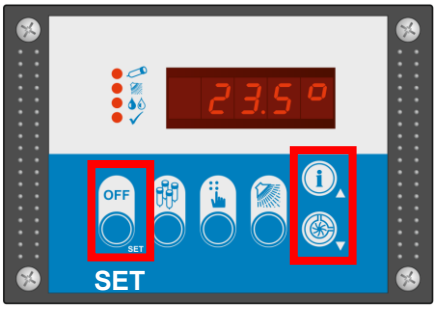
8.3 Changing and saving of parameter values

The RM-30 is parameterization is made in different parameter levels.

To change parameters in one of the lower levels, enter the corresponding 'level code'.







The level code or the parameters are entered via the buttons on the RM-30 (if available) or via the control unit.

8.3.1 Entering of level code

Proceed as follows (control must be in OFF mode):

- Press the "SET" button for 5 seconds:
  '000' appears on the display - the first '0' flashes.
- Use the arrow keys to set the first digit of the desired code.
- Confirm the correct digit with "SET."
  The set digit is accepted - the second '0' flashes.
- Use the arrow keys to set the second digit and press SET to confirm.
- Set the third digit in the same way and confirm with SET:
  The first parameter of the selected level appears.

If an incorrect code is entered, the control will return to OFF mode.

to section 8.3: Change and save parameters

8.3.2 Displaying and changing of parameter values

- Use the arrow keys to select the desired parameter.
- Press button "SET": The parameter value is displayed.

Change of parameter value:

- Use the arrow keys to select the desired parameter,
- Hold the "SET" button and set simultaneously with the arrow keys the desired value.
  TIP: If the arrow keys are held down, the value starts to scroll.

8.3.3 Saving of parameters and returning to the working level

(Can be switched back from any parameter.)

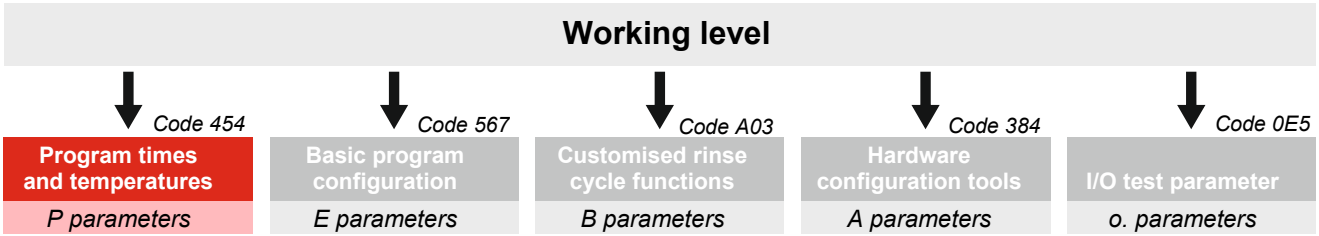
Standard with saving the values:

- Press both arrow keys simultaneously.
  The control switches to OFF-mode.

Back without saving the values:

- If no button is pressed for 60 seconds, the control will automatically return to OFF-mode. All changes are lost.

8.4 Level “Program times and temperatures” (P parameter)



Switching to the “P-level” see section 8.3

Disinfection multilactor see also section 5.6.9		Range	Default
P01	Preparation time	0 .. 999 sec.	5
P02	Disinfection time	0 .. 999 sec.	180
P03	Completion time	0 .. 999 sec.	30

Rinse cycle 1 (pre-rinse) see also section 5.3.1		Range	Default
P10	Residual water extraction	0 .. 999 sec.	0
P11	Fetching water up to level 2 or after a time (initial) 0: deactivated 1: up to level 2 (cleaning stops after timeout E87) 2… time-dependent	0 .. 999 sec.	1
P12	Additional fetching of water after time (overfilling)	0 .. 999 sec.	0
P13	Fetching water level 2 / time (repeatable) 0: deactivated 1: up to level 2 (cleaning stops after timeout E87) 2… time-dependent	0 .. 999 sec.	1
P14	Water extraction up to level 1 / time (repeatable) 0: deactivated 1: up to level 1 (cleaning stops after timeout E88) 2… time-dependent After completion of this step, a return to P13 takes place depending on parameter E 12 (repeated water fetching)	0 .. 999 sec.	1
P15	Extraction time	0 .. 999 sec.	30
P16	Drainage time	0 .. 999 sec.	180
P17	Pumping off time	0 .. 999 sec.	30
P18	Drainage time	0 .. 999 sec.	0

to section 8.4: Level “Program execution times and temperatures” (P parameter)

Rinse cycle 2 (main rinse) see also section 5.4.1		Range	Default
P20	Dosing (Circomat option)	0 .. 999 sec.	0
P21	Water fetching up to level 2 or time (initial) 0: deactivated 1: up to level 2 (cleaning stops after timeout E87) 2… time-dependent	0 .. 999 sec.	1
P22	Additional fetching of water after time (overfilling)	0 .. 999 sec.	0
P23	One-time heating prior to circulation (option) 0: This step is deactivated. 1…60 activated; the set value is the timeout if the temperature is not achieved	0 .. 60 min.	10
P24*	Water refill Continue at Level 2 - Time (repeatable) 0: deactivated 1: to level 2 (cleaning stops after timeout E87) 2… time-dependent	0 .. 999 sec.	1
P25*	Water extraction up to level 1 - time (repeatable) 0: deactivated 1: up to level 1 (cleaning stops after timeout E88) 2… time-dependent	0 .. 999 sec.	1
P26	Extraction time	0 .. 999 sec.	30
P27	Drainage time	0 .. 999 sec.	180
P28	Pumping off time	0 .. 999 sec.	30
P29	Drainage time	0 .. 999 sec.	0

* Steps P24 and P25 form the main cycle and are repeated continuously.
Time is set in E24, E25, and E26.

Rinse cycle 3 (After rinse) see also section **Fehler! Verweisquelle konnte nicht gefunden werden.**		Range	Default
P30	Residual water extraction	0 .. 999 sec.	0
P31	Fetching water up to level 2 or time (initial) 0: deactivated 1: up to level 2 (cleaning aborted after timeout E87) 2… time-dependent	0 .. 999 sec.	1
P32	Additional fetching of water after time (overfilling)	0 .. 999 sec.	0
P33	Fetching water up to level 2 / time (repeatable) 0: deactivated 1: up to level 2 (cleaning stops after timeout E87) 2… time-dependent	0 .. 60 min.	1
P34	Water extraction up to level 1 / time (repeatable) 0: deactivated 1: up to level 1 (cleaning stops after timeout E88) 2… time-dependent	0 .. 999 sec.	1
P35	Extraction time	0 .. 999 sec.	30
P36	Drainage time (sponge valve option)	0 .. 999 sec.	180
P37	Pumping off time	0 .. 999 sec.	30
P38	Drainage time	0 .. 999 sec.	120
P39	Final pumping	0 .. 999 sec.	15

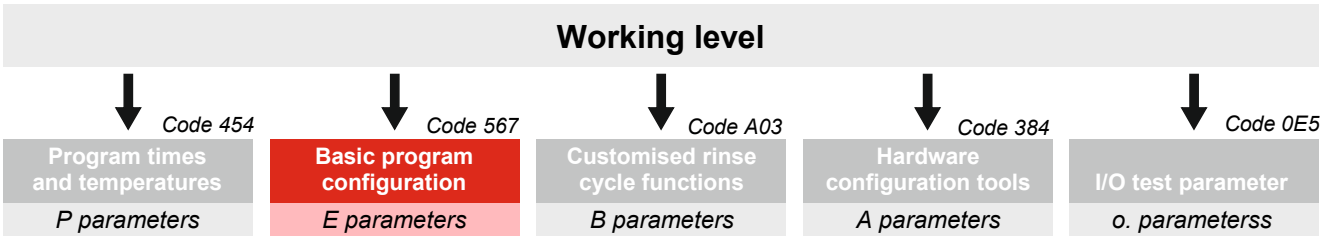
to section 8.4: Level “Program execution times and temperatures” (P parameter)

Stop time see also section **Fehler! Verweisquelle konnte nicht gefunden werden.**		Range	Default
P40	Stop time (optional depending on system type)	0 .. 999 sec.	20

Dosing times/temperatures (optional)		Range	Default
P71	Dosing time alkaline	0 .. 999 sec.	30
P72	Dosing time acidic	0 .. 999 sec.	30
P75	Heating temperature (P21, P22, P23)	20 .. 85,0°	53,0
P76	Post-heating temperature (P24, P25)	20 .. 85,0°	48,0
P77	Return temperature	20 .. 85,0°	48,0

Software version		Range	Default
P98	Display of the installed software version		

8.5 Level “Basic program configuration” (E-parameter)



Switching to the “E-level” see section 8.3

Activation multilactor disinfection see also section 5.6.9		Range	Default
E1	Activation of multilactor disinfection 0: deactivated 1: activated, only prior to cleaning 2: activated, prior to cleaning and short rinse	0 .. 2	0

Pre-rinse settings see also section **Fehler! Verweisquelle konnte nicht gefunden werden.**		Range	Default
E10	Water valve selection for first water extraction (rinse cycle/ flow) 1: Cold water 2: Warm water 3: Mixed water 4: Hot water	1 .. 4	1
E11	Water selection from the second water extraction (rinse cycle/ flow) (Repeat program steps P13, P14) 1: Cold water 2: Warm water 3: Mixed water 4: Hot water	1 .. 4	2
E12	Number of water extractions (Repeat program steps "fetching Water" P13 and "water extraction" P14)	1 .. 20	2
E13	Separate water drainage for the first pre-rinse (drain valve 2) 0: deactivated 1: activated, drain valve 2 is activated instead of drain valve 1 2: activated, drain valve 2 is activated parallel with drain valve 1 3: activated, independent of drain valve 1, drain valve 2 is activated during the entire first pre-rinse	1 .. 3	0
E17	Stop/break after pre-rinse 0: deactivated 1: activated, ongoing via timer (digital input) 2: activated, ongoing via timer or start button 3…999: activated, ongoing via timer or start button or Time (3…990 minutes)	0 .. 999 min.	0
E19	Number of pre-rinse cycles	1 .. 5	1

to section 8.5: Level “Basic program configuration” (E parameter)

Main rinse settings see also section 5.4.2		Range	Default
E20	Water valve selection 1. Water extraction (rinse cycle/flow) 1: Cold water 2: Warm water 3: Mixed water 4: Hot water	1 .. 4	2
E21	Water refill options in circulation (P24/P25) 0: deactivated 1: Delayed in step P24 up to level 2. (after return from P25) 2: Delayed in steps P24 and P25 up to level 1 3: Delayed in steps P24 and P25 for a fixed adjustable time 4: Delayed in steps P24 and P25 up to feedback milk pump (Input function 11)	1 .. 4	1
E22	Water refill delay / refill time Depending on the setting in [E21], the time set here is the refill delay for the level control or the refill time for total time setting	1 .. 999 sec.	35
E23	Water refill limit Depending on the setting in [E21], the refill time can be limited for event-based options (1, 2, 4) if the signal does not react or if a slower refill is wanted. 0: deactivated 1…: time in seconds	0 .. 999 sec.	0

Circulation phase (P24 / P25)

E24	Warm-up time (time 1)	1…90 min.	5,0
E25	Maximum heating time (time 2) thermostop limitation	1…90 min.	15,0
E26	Circulation time (time 3)	1…90 min.	7,0

E28	Activate milk pump during circulation time 0: deactivated 1: activated, permanently switched on 2: activated, pulsed 3: activated, permanently switched on after the switch-on delay [E66]	0 .. 3	0

to section 8.5: Level “Basic program configuration” (E parameter)

Rinse settings see also section 5.5.2		Range	Default
E30	Water valve selection 1: Cold water 2: Warm water 3: Mixed water 4: Hot water	1 .. 4	1
E32	Number of rinse cycles (Repeat program steps P33, P34)	1 .. 20	2
E35	Emptying milk meter To improve the emptying of milk meters, the "suction valve" can be closed for x seconds at the beginning of program step P36 to create maximum negative pressure. 0: deactivated 1...60 seconds	0 .. 1	0
E36	Sponge valve option 0: deactivated 1… at the end of program step P36, the sponge valve is opened for the set time.	0 .. 500 sec.	0
E39	Number of rinse cycles	1 .. 5	1

Dosing settings		Range	Default
E40	Dosing function selection 0: via cup dosing in P21 and P22 parallel with fetching water 1: via dosing pumps in step P21 (inlet delayed by 8 seconds, dosing time adjustable in P71) 2: parallel with warm water. (Circomat) 3: via separate water valves with which detergent is dosed. The regular water valves remain off. 4: via separate water valves with which detergent is dosed. Parallel with the regular water valves. 5: via cup dosing in P21 and P22, the water valves remain closed.	1 .. 5	1
E41	Dosing alkaline - alternating acidic (optional with dosing pumps only) 0: deactivated 1… x times alkaline, once acidic Note: Interrupted rinse cycles are not counted. The currently active detergent is displayed at the top of the drops on the FB-RM control panel: LED off = alkaline / LED on = acidic	0 .. 10	0

Ventilation settings see also section 5.6.2		Range	Default
E44	Ventilation options in P14+P15 / P25+P26 / P34+P35 0: No ventilation. 1: Pulsation. Ventilation valve is opened parallel to the suction. 2: Pulsation. Ventilation valve is opened alternately with the suction valve.	0 .. 2	0
E45	Pulse switch-on time	1 .. 60 sec.	16
E46	Pulse switch-off time	1 .. 60 sec.	7
E47	Ventilation time when returning after P13, P24, P33	1 .. 999 sec.	35

to section 8.5: Level “Basic program configuration” (E parameter)

Rinse cycle settings		Range	Default
E50	Short rinse cycle (see also section 0) 0: deactivated 1: Short rinse is possible by holding the start button	0 .. 1	0
E52	Selection function vacuum pump (see 5.6.3) 0: Function as set in "User-defined 1" (BdF1). See section 5.7 1: Function as predefined in rinse plan version A. 2: Function as predefined in rinse plan version B. 3: Function as predefined in rinse plan version C. 4: Function as predefined in rinse plan version D. Depending on the system, a customised vacuum pump switching behaviour for the cleaning can be selected.	0 .. 4	1
E53	Signal vacuum increase 0: only active when the vacuum pump is on 1: active during the entire cleaning	0 .. 1	0
E56	Suction valve remains closed during the circulation phase For systems (e.g., Envistar) that extract water at a higher level via a second suction valve during the circulation phase. 0: deactivated 1: activated	0 .. 1	0
E58	Activation of heating (see also section 5.6.6) 0: deactivated 1: activated, only if level is 1 (P21 - P25) 2*: activated, regardless of level (P22 - P25) 3: activated, prior to circulation (P21, P22, P23) only if level is 1, during circulation (P24, P25) regardless of level. 4*: activated, prior to circulation (P22, P23) regardless of level, during circulation (P24, P25) only if level is 1 ** In this setting, it must be ensured that sufficient water has been filled in, in P21.*	0 .. 4	1

Settings air injector see also section 5.6.2 and 5.6.11		Range	Default
E60	Selection air injector function 0: Function as set in "user-defined 3" (BdF3). See section5.7 1: Function as predefined in the rinse plan. 2: Rinse injector control. Linked to the pulsation of the [E44] ventilation.	0 .. 2	1
E61	Switch-on time	1 .. 60 sec.	16
E62	Switch-off time / delay time (depending on function selection)	1 .. 60 sec.	7
E63	Delay second air injector exit	1 .. 60 sec.	0

Settings milk pump see also section 5.4.2		Range	Default
E65	Switch-on time (pulsation, optional in circulation)	4 .. 60 sec.	7
E66	Switch-off time (pulsation, optional in circulation)	4 .. 60 sec.	16
E67	Milk pump button function 0: deactivated 1: activated in OFF mode 2: activated during milking 3: activated in OFF mode and milking	0 .. 3	0

to section 8.5: Level “Basic program configuration” (E parameter)

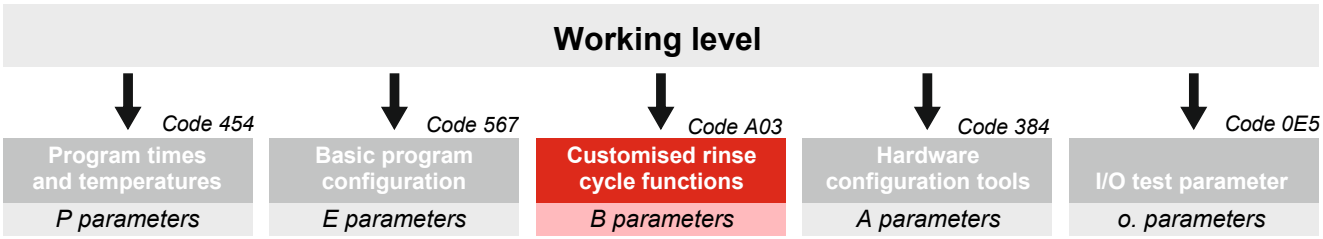
Settings for input functions		Range	Default
E70	Safety switch (see section 10.1) 0: deactivated 1: activated, secures "start milking" (contact open) and "start cleaning" (contact closed). 2: as 1, with cleaning stop if the contact is opened during cleaning. 3: activated, secures the start of modes with the reversed signal: - "start milking" **(contact must be closed)** - "start cleaning" **(contact must be open).** 4: as 3, with cleaning stop if the contact is closed.	0 .. 4	0
E71	Milking level switch (see section 10.2) 0: deactivated 1: activated. To start the vacuum pump, the "milking level switch" input must also be closed.	0 .. 1	0
E72	Dry-run protection input (see section 10.4) 0: deactivated 1: "high active" - signal at input triggers a fault 2: "low active" - no signal at input triggers a fault	0 .. 2	0

Settings for drain valve see section 5.6.4		Range	Default
E77	Selection function drain valve 1 0: Function as set in "user-defined 2" (BdF2). 1: Function as pre-defined in rinse plan.	0 .. 1	1
E78	Switching sense drain valve 1 0: De-energised closed 1: De-energised open	0 .. 1	0
E79	Switching sense drain valve 2 0: De-energised closed 1: De-energised open	0 .. 1	0

Level settings see also section 10.3		Range	Default
E85	Level sensitivity (water quality)	-10 .. 10	0
E86	Level inertia (reaction time)	1 .. 5	2
E87	Timeout period for fetching water up to level 2	1 .. 30 min.	10
E88	Timeout period for draining water up to level 1	1 .. 30 min.	10

Service settings		Range	Default
E95	Skip forward one programme step at a time during the rinse cycle (step function) (see section 5.6.10) 0: deactivated 1: activated	0 .. 1	0
E97	Display in cleaning mode 0: Current program step 1: Current temperature (if temperature sensor is installed) 2: Alternating program step temperature	0 .. 2	0

8.6 Level “User-defined rinse functions” (b parameter)



Switch to the “b-level”, see section 8.3

For a description of the user-defined rinse cycle functions see section 5.7.

Multilactor disinfection, see also section **Fehler! Verweisquelle konnte nicht gefunden werden.**		Code	Default
b1	Definition for program step P1	0 .. 15	0
b2	Definition for program step P2	0 .. 15	0
b3	Definition for program step P3	0 .. 15	0

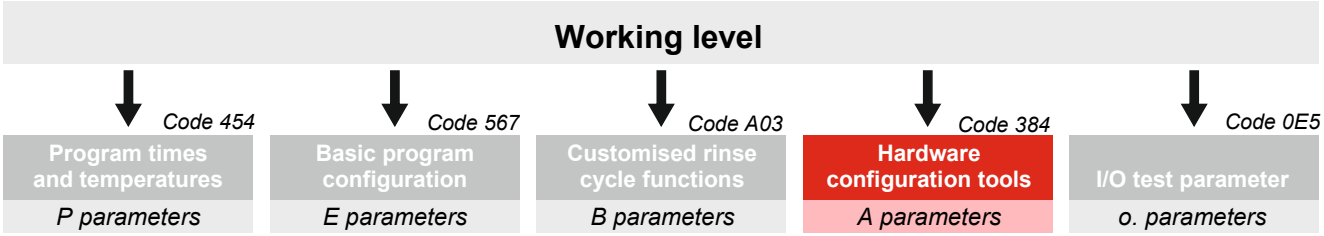
Rinse cycle 1 (pre-rinsing)		Code	Default
b10	Definition for program step P10	0 .. 15	0
b11	Definition for program step P11	0 .. 15	0
b12	Definition for program step P12	0 .. 15	0
b13	Definition for program step P13	0 .. 15	0
b14	Definition for program step P14	0 .. 15	0
b15	Definition for program step P15	0 .. 15	0
b16	Definition for program step P16	0 .. 15	0
b17	Definition for program step P17	0 .. 15	0
b18	Definition for program step P18	0 .. 15	0

Rinse cycle 2 (main-rinsing)		Code	Default
b20	Definition for program step P20	0 .. 15	0
b21	Definition for program step P21	0 .. 15	0
b22	Definition for program step P22	0 .. 15	0
b23	Definition for program step P23	0 .. 15	0
b24	Definition for program step P24	0 .. 15	0
b25	Definition for program step P25	0 .. 15	0
b26	Definition for program step P26	0 .. 15	0
b27	Definition for program step P27	0 .. 15	0
b28	Definition for program step P28	0 .. 15	0
b29	Definition for program step P29	0 .. 15	0

to section 8.6: Level “User-defined rinse functions” (b parameter)

Rinse cycle 3 (rinsing)		Code	Default
b30	Definition for program step P30	0 .. 15	0
b31	Definition for program step P31	0 .. 15	0
b32	Definition for program step P32	0 .. 15	0
b33	Definition for program step P33	0 .. 15	0
b34	Definition for program step P34	0 .. 15	0
b35	Definition for program step P35	0 .. 15	0
b36	Definition for program step P36	0 .. 15	0
b37	Definition for program step P37	0 .. 15	0
b38	Definition for program step P38	0 .. 15	0
b39	Definition for program step P39	0 .. 15	0
b40	Definition for program step P40	0 .. 15	0

8.7 Level “Hardware-configuration tools” (A-Parameter)



Switch to the “A-level”, see section 8.3

Function classification initial function on relays		Range	Default
	0: Deactivated 1: Cold water 2: Hot water 3: Milk pump 4: Vacuum pump 5: Heater 6: Circulation valve 7: Drain valve 8: Ventilation valve 9: Dosing (alkaline) 10: Sponge valve 11: Air injector 1 12: Drain valve 1 13: Fault lamp 14: Cleaning active 15: Dosing optional (ACID) 16: Air injector 2 17: Drain valve 2 18: Vacuum increase 19: Stop active 20: Milking active 21: OFF active 22: MMM valve 23: Multilactor water extraction valve 24: Multilactor cleaning signal 25: Hot water 26: User-defined function 1 27: User-defined function 2 28: User-defined function 3 29: User-defined function 4 30: Multifunction relay 1 31: Multifunction relay 2 32: Output input direct 1 33: Output input direct 2 34: Output AND 1 35:Output AND 2 36: Output OR 1 37: Output OR 2 38: Output NOT 1 39: Output NOT 2		
A1	Function classification relay 1	0 ..	1
A2	Function classification relay 2	0 ..	2
A3	Function classification relay 3	0 ..	3
A4	Function classification relay 4	0 ..	4
…	…	…	…
A12	Function classification relay 12	0 ..	12
A13	Function classification relay 13	0 ..	13
A14	Function classification relay 14	0 ..	14

to section 8.7: Level “Hardware Configuration Tools” (A Parameter)

Function classification of digital inputs		Range	Default
	0: Deactivated 1: Start button 2: Milking selector switch 3: Cleaning selector switch 4: Safety switch 5: Start sponge 6: Start from stop 7: Milking level switch 8: Dry protection heater 9: Input multifunction relay 1 10: Input multifunction relay 2 11: Feedback milk pump		
A21	Function classification digital input 1	0 ..	1
A22	Function classification digital input 2	0 ..	2
A23	Function classification digital input 3	0 ..	3
A24	Function classification digital input 4	0 ..	4
A25	Function classification digital input 5	0 ..	5
A26	Function classification digital input 6	0 ..	6
A27	Function classification digital input 7	0 ..	7
A28	Function classification digital input 8	0 ..	8

Setting temperature sensor		Range	Default
A50	Operating mode (see section 10.8) <u>Digital evaluation - via thermostat switch:</u> 0: Digital, one input (Fü1) for heating and holding temperature. No evaluation of return temperature. 1: Digital, one input (Fü1) for heating, holding, and return temperature. 2: Digital, two inputs (Fü1) for heating and holding temperature, (Fü2) for return temperature. <u>Analogue evaluation - via PT-1000 temperature sensor</u> 3: Sensor, one input (Fü1) for heating and holding temperature (P75/P76). No evaluation of the return temperature. 4: Sensor, one input (Fü1) for heating, holding, and return temperature (P75/P76/P77). 5: Sensor, two inputs (Fü1) for heating and holding temperature (P75/P76), (Fü2) for return temperature (P77).	0 .. 5	0

Operation settings		Range	Default
A51	Operating options (see chapter 7.) 0: Operation via selector switch (WITHOUT start button) 1: Operation via selector switch (WITH start button) 2: Operation via the FB-RM control panel	0 .. 2	1
A52	Function universal button (FB-RM) (see chapter 7.3.1) 0: Deactivated 1: Sponge valve during milking 2: Detergent switching during cleaning	0 .. 2	0

to section 8.7: Level “Hardware Configuration Tools” (A Parameter)

Direct input		Range	Default
	This function allows an input to be placed/issued directly to an initial function or linked via logic modules. 0: deactivated 1..8: Digital input 9: Level 1 10: Level 2 11: Temperature 1 12: Temperature 2		
A60	Output direct 1	0 .. 12	0
A61	Output direct 2	0 .. 12	0

Logic module AND function		Range	Default
	Any output functions AND can be linked with this function 0: deactivated 1..: freely selectable output function. See A1…		
A62	AND1 classification input A	0 ..	0
A63	AND1 classification input B	0 ..	0
A64	AND1 classification input C	0 ..	0
A65	AND2 classification input A	0 ..	0
A66	AND2 classification input B	0 ..	0
A67	AND2 classification input C	0 ..	0

Logic module OR function		Range	Default
	Any output functions OR can be linked with this function 0: deactivated 1..: freely selectable output function. See A1…		
A68	OR1 classification input A	0 ..	0
A69	OR1 classification input B	0 ..	0
A70	OR1 classification input C	0 ..	0
A71	OR2 classification input A	0 ..	0
A72	OR2 classification input B	0 ..	0
A73	OR2 classification input C	0 ..	0

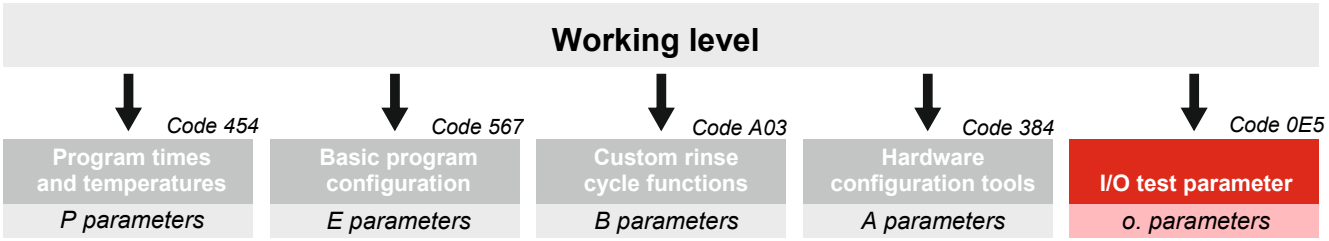
Logic module NOT function		Range	Default
	Any output functions NOT can be linked with this function 0: deactivated 1..: freely selectable output function. see A1…		
A74	NOT1 classification input	0 ..	0
A75	NOT2 classification input	0 ..	0

to section 8.7: Level “Hardware Configuration Tools” (A Parameter)

Multifunction relay 1		Range	Default
A81	Multifunction relay 1 function selection 0: Deactivated 1: Switch-on-delayed T1 2: Switch-off-delayed T2 3: Switch on and off-delayed T1 and T2 4: Switch-on impulse T2 5: Switch-off impulse T2 6: Clock generator T1 on, T2 off 7: Switch-on impulse T2 delayed by T1 8: Switch-off impulse T2 delayed by T1	0 .. 8	0
A82	Multifunction relay 1 input classification 0: Digital input (multifunction relay 1) 1..: Freely selectable initial function. See A1…	0 ..	0
A83	T1	1 .. 5000 sec.	30
A84	T2	1 .. 5000 sec.	30

Multifunction relay 2		Range	Default
A86	Multifunction relay 2 function selection 0: Deactivated 1: Switch-on-delayed T1 2: Switch-off-delayed T2 3: Switch on and off-delayed T1 and T2 4: Switch-on impulse T2 5: Switch-off impulse T2 6: Clock generator T1 on, T2 off 7: Switch-on impulse T2 delayed by T1 8: Switch-off impulse T2 delayed by T1	0 .. 8	0
A87	Multifunction relay 2 input classification 0: Digital input (multifunction relay 2) 1..: Freely selectable initial function. See A1…	0 ..	0
A88	T1	1 .. 5000 sec.	30
A89	T2	1 .. 5000 sec.	30

8.8 Level “I/O test parameters” (o. parameter)



Switching to the “o.-level” see section 8.3

Meaning of the parameters

All inputs and outputs of the individual components can be tested in this parameter level. To do this, the corresponding relays are set to 'I' or '0'.

Test output relay		Range	Default
	• Select param. using the UP / DOWN buttons. • Hold down SET: UP: Relay energized DOWN: Relay deactivated		
o.1	Set relay output 1	0 .. 1	0
o.2	Set relay output 2	0 .. 1	0
o.3	Set relay output 3	0 .. 1	0
…	…	…	…
o.13	Set relay output 13	0 .. 1	0
o.14	Set relay output 14	0 .. 1	0

Test digital inputs		Range	Default
	0: Input unconnected 1: Input connected (bridged)		
o.21	Test digital input 1	0 .. 1	- - -
o.22	Test digital input 2	0 .. 1	- - -
o.23	Test digital input 3	0 .. 1	- - -
…	…	…	
o.27	Test digital input 7	0 .. 1	- - -
o.28	Test digital input 8	0 .. 1	- - -

to section 8.8: Level “I/O test parameters” (o. parameter)

Test level inputs		Range	Default
	0: Level not achieved 1: Level achieved		
o.41	Level 1	0 .. 1	- - -
o.42	Level 2	0 .. 1	- - -

Test sensor inputs		Range	Default
	Depending on the parameterization, the status or temperature is displayed here		
o.51	Sensor input 1	0 .. 1 .. 99	- - -
o.52	Sensor input 2	0 .. 1 .. 99	- - -

9. Faults / fault messages

A fault is shown on the display as flashing fault code

9.1.1 Fault safety elements

Fault code	See section 10.1
F11	**Safety switch „Milking“**
F12	**Safety switch „Cleaning“**
F13	**Safety switch „Cancellation in cleaning“**

9.1.2 Level fault

Fault code	See section 10.3
F21	**Timeout level 1 in wash cycle 1**
F22	**Timeout level 1 in wash cycle 2**
F23	**Timeout level 1 in wash cycle 3**
F25	**Timeout level 2 in wash cycle 1**
F26	**Timeout level 2 in wash cycle 2**
F27	**Timeout level 2 in wash cycle 3**

9.1.3 Temperature fault

Fault code	
F31 F32	**Sensor fault 1** **Sensor fault 2** The corresponding sensor or sensor cable is defective and must be replaced or repaired.
F33	**Heating timeout** Heating temperature not achieved in program step P23.
F34	**Dry running protection** (see section 10.4)
F35	**Return temperature in circulation not achieved** (see 5.4.2)

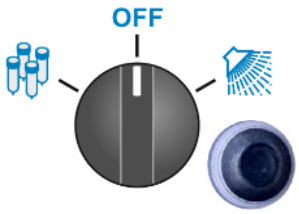
9.1.4 System fault

Fault code	
F41	**Blackout during cleaning** (see section 9.1.6)

9.1.5 Communication fault

Fault code	
F99	**Communication fault with display module FB-RM**

9.1.6 Behaviour in case of a power failure



RM-30 Version with selector switch

Milking The milking process is continued once the power is restored.

Cleaning If a power failure occurs during an ongoing cleaning cycle, cleaning will not be continued after the power is restored – fault message F41 appears.

To restart the entire cleaning process, the selector switch must be briefly switched to the OFF position and then back to the CLEAN position.

If there is an additional start button, it must be pressed, too.

RM-30 Version with FB-RM remote control unit

Milking After the power is restored, the control is in OFF mode. Restart the milking process by pressing the MILKING button.

Cleaning If a power failure occurs during an ongoing cleaning cycle, cleaning will not be continued after the power is restored – fault message F41 appears.

To restart the complete cleaning process, press the OFF button and then the CLEAN button.

-

10. Other information

10.1 Set up of safety switches [E70]

A safety switch can be activated in parameter [E70]. Function '4' (safety switch) must be assigned to a digital input [A21..A28].

If the 'Safety Switch' function is activated and the milk hose is not in the specified position,

- do not start “Milking” (fault F11 is displayed)
- do not start “Cleaning” (fault F12 is displayed)
- cancellation of cleaning (fault F13 is displayed))
  (if the contact is switched during cleaning)

10.2 Milking level switch [E71]

If you want to set up a way to temporarily interrupt the milking process by switching off the vacuum pump, an additional switch can be installed.

Proceed as follows:

- Install the switch
- Assign function ”7” (milking level switch) to a digital input [A21..A28].

By pressing the switch, the milking process can be interrupted and reactivated.

10.3 Level control [E85..E88]

The following parameters for level control can be set here:

E85 Level sensitivity (water quality)

Here, you can adjust the sensitivity of the level detection to the local water quality.

- Setting > 0 = more sensitive
- Setting < 0 = less sensitive

E86 Level interia (reaction time)

A reaction inertia can be set up here to ensure a fault-free detection even in case of water splashes

E87 Timeout for water fetching up to level 2 (upper level)

If level 2 is NOT achieved within the time set here, cleaning is interrupted and a fault message is displayed.

E88 Timeout for water suction up to level 1 (lower level)

If the water level does NOT fall below 1 within the time set here, cleaning is interrupted and a fault message is displayed.

10.4 Dry running protection F34 - [E72]

A "dry-running protection" fault message can be configured in the RM-30. If the dry-running protection is activated, the dry-running protection is continuously evaluated in cleaning mode.

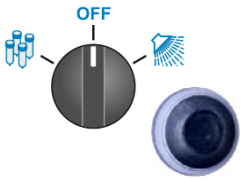
If the dry-running protection is triggered, this fault must be corrected as quickly as possible!

WARNING

If fault F34 is ignored, the cleaning cycle will be performed without a heating phase!

Dry-running protection triggered during cleaning

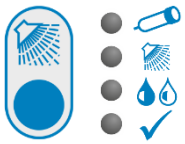
If the dry-running protection is triggered, the heating is switched off - but cleaning continues until the end. (All heating phases are skipped). At the end of cleaning, fault message F34 appears.



Dry-running protection is already triggered when cleaning starts

RM-30 version with start button:

- If the switch is set to the "Cleaning" position, fault F34 is displayed and signals: Dry-running protection triggered.
- If the start button is pressed now, the cleaning cycle will be performed without a heating phase



RM-30 version with FB-RM remote control:

- If the “Cleaning” button is pressed, fault F34 is displayed and signals: Dry-running protection triggered.
- If the “Cleaning” button is pressed again, the cleaning cycle will be performed without a heating phase

To set up the "Dry-running protection" function, proceed as follows:

- Set in selection 1 or 2 parameter [E72]
- Assign function “8” (dry-running protection) to a digital input [A21..A28].
- Connect the dry-running protection of the heater to the assigned digital input.

10.5 Integrated multifunction time relays

The RM-30 has two integrated time relays that can be used to switch external components. This eliminates the need of additional external time relays.

Settings as follows:

- Select time relay 1 or 2 with parameters [A81] or [A86] (selection 1..8).
- The respective time relay must be assigned with output function '30 / 31'
  - to a free relay [A1..A14], or
  - to a logic module [A62..A75].
- Determine the trigger signal:
  - [A82] or.[A87] =
  - 0: function “9” or “10” are to be assigned to a free digital input [A21..A28]
  - 1..x: the trigger signal is sent via the corresponding output function '1..39' of the control - see [A1..A14]
- Set desired switching times in parameters T1 [A83] or [A88] and T2 [A84] or [A89].

Selection 1: Delayed switch-on T1

When the trigger signal is received, a delay time T1 starts.

After T1 has elapsed, the relay output is switched on (but only as long as the trigger signal is present). If the trigger signal is shorter than T1, the relay is not switched on.

Selection 2: Delayed switch-off T2

When the trigger signal is received, the relay output is switched on simultaneously. If the trigger signal is released, a time T2 starts. Only after T2 has elapsed the relay is switched off.

Selection 3: On and off delayed T1 and T2

When the trigger signal appears, a delay time T1 starts. After T1 has elapsed, the relay output is switched on (but only as long as the trigger signal is present). If the trigger signal is shorter than T1, the relay is not switched on.

If the trigger signal is released, a delay time T2 starts. The relay is switched off after T2 has elapsed.

to section 10.5: Integrated multifunction time relay

Selection 4: Switch-on pulse T2

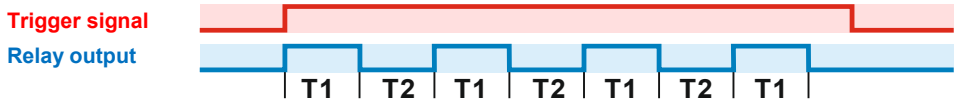
When the trigger signal is received, a pulse of length T2 is given at the relay output (but only as long as the trigger signal is present). If the trigger signal is not received within the time T2, the relay switches off

Selection 5: Switch-off pulse T2

When the trigger signal is not received, a pulse of length T2 is given at the output of the relay (but only as long as the trigger signal remains off). If the trigger signal returns within T2, the relay switches off again.

Selection 6: Clock generator T1 on, T2 off

As long as the trigger signal is present, the relay output is alternately switched ON for the time T1 and OFF for the time T2. If the trigger signal does not appear, the relay switches off again.

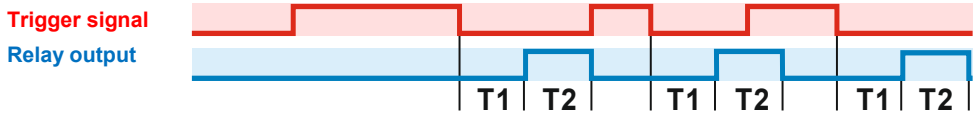


Selection 7: Delayed pulse, ON-triggered (Event-driven -> cannot be cancelled!)

If the trigger signal is received, the relay output is switched on for a time T2 after a delay time T1. The relay output remains switched on even if the trigger signal switches off again before time T2 has elapsed.

Selection 8: Delayed pulse, OFF-triggered (Event-driven -> cannot be cancelled!)

After "elimination" of the trigger signal ", a delay time T1 starts. After that, the relay output is switched on for the time T2.



10.6 Logic functions

The RM-30 has a toolbox with logic functions which allow to link input and output signals to generate new signals required in the milking system. Each module has one to three inputs to which an output signal can be connected.

10.6.1 "Input Direct" module

With this module it is possible to give an input signal (which can also be a level) directly to an output, or to link it with other signals via additional logic modules.

Example:

A valve connected to relay 1 is to be switched via a button (at input 5).

Parameterization:

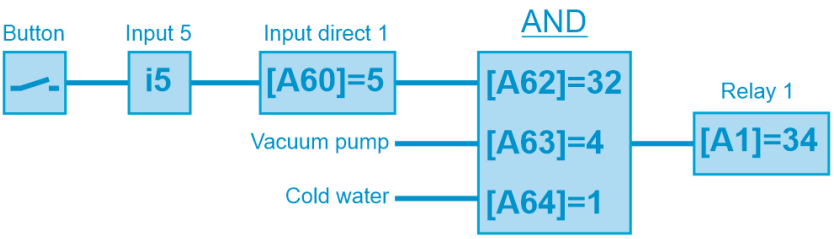
- Parameter [A60] = 5 - assign input 5 to the "input direct 1" function
- Parameter [A1] = 32 - put function “input direct 1” to relay 1.

10.6.2 „AND“ module

This module has three inputs, each of which can be linked to an "output function." If all inputs are active, the output of this module is active, too. If only two inputs are required, the third can remain deactivated and will then be ignored.

Example:

We expand the previous example. The valve at the input should only switch on when the button is pressed, the vacuum pump s operating, and the cold water valve is open.



Parameterization::

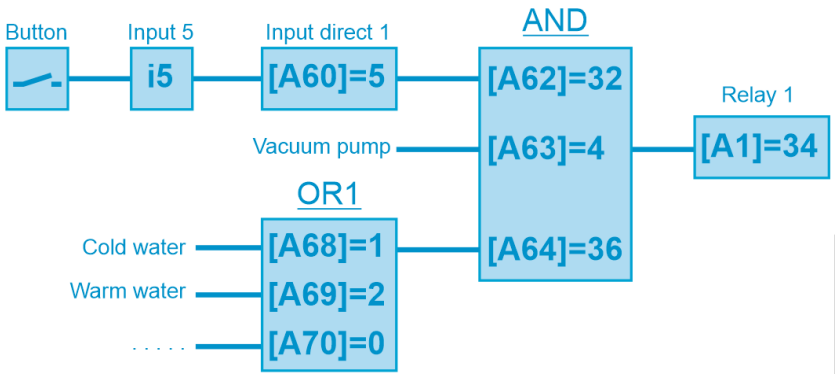
- Parameter [A60] = 5 - assign input 5 to the " input direct 1" function
- Parameter [A62] = 32 - Input direct 1 (button) at the first input, AND1
- Parameter [A63] = 4 - vacuum pump at the 2nd input AND1
- Parameter [A64] = 1 - cold water valve on the 3rd input AND2
- Parameter [A1] = 34 - output of AND1 to relay 1.

10.6.3 „OR“ module

This module has three inputs, each of which can be coupled to an "output function." If at least one input is active, the output of the module is also active. If only two inputs are required, the third can remain deactivated and will then be ignored.

Example:

We expand the previous example. The valve at the input should only switch on when the button is pressed, the vacuum pump is running, and the cold water valve or the hot water valve is open.



Parameterization:

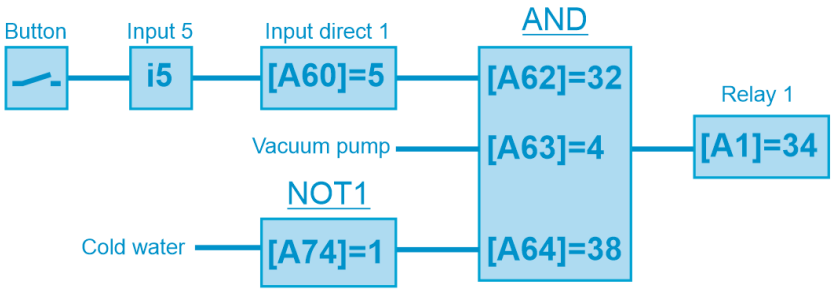
- Parameter [A60] = 5 - assign input 5 to the "input direct 1" function
- Parameter [A62] = 32 - input direct 1 (button) at the 1st input AND1
- Parameter [A63] = 4 - vacuum pump at the 2nd input AND1
- Parameter [A64] = 36 - to the output of OR1
- Parameter [A68] = 1 - cold water valve at the 1st input OR1
- Parameter [A69] = 2 - hot water valve at the 2nd input OR1
- Parameter [A1] = 34 - output of AND1 to relay 1.

10.6.4 „NOT“ module

This module has one input and inverts it at the output. It is needed to reverse the direction of a signal.

Example:

We change the example from the start. The valve at the input should only switch on when the button is pressed, the vacuum pump is running, and the cold water valve is not open.



Parameterization:

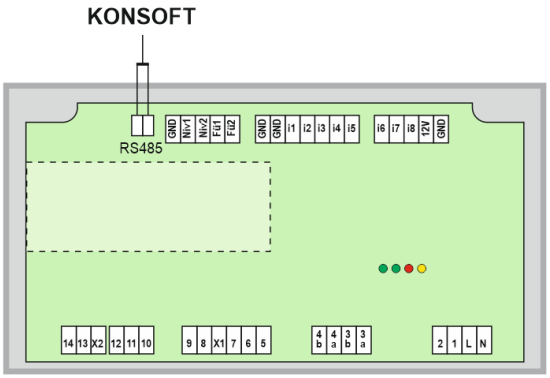
- Parameter [A60] = 5 - Assign input 5 to the " input direct 1" function
- Parameter [A62] = 32 - input direct 1 (button) at the 1st input, AND1
- Parameter [A63] = 4 - Vacuum pump at the 2nd input, AND1
- Parameter [A64] = 38 - NOT1 at the 3rd input, AND2
- Parameter [A74] = 1 - Cold water on NOT1
- Parameter [A1] = 34 - Output of the AND1 to relay 1

10.7 Interface RS485

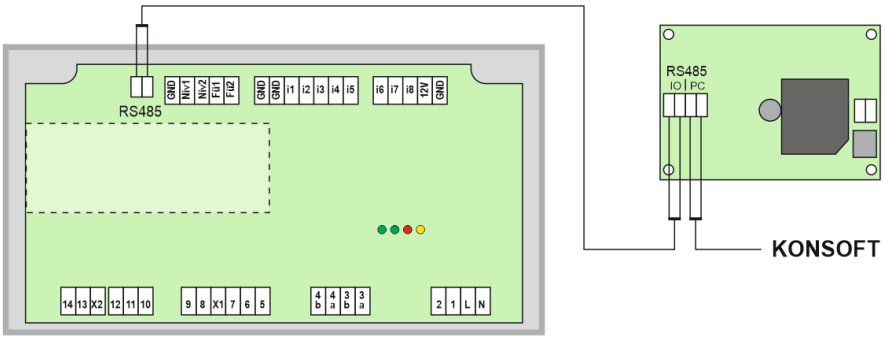
The RM-30 has a RS485 interface as a connection option for a PC with the Welba-Konsoft (see chapter 6.) for parameterization, updating and reading of the data.

To connect the RM-30 to a PC, an adapter cable USB-RS-485-001 is required.

RM-30 WITHOUT remote control



RM-30 WITH remote control



10.8 Setting the temperature sensor [A50]

To enable a “co-operation” with different milking systems, the RM-30 control supports various types of temperature measurement.

Supported are:

- **Thermostat switch ***
- **PT1000 temperature sensors ***

  * Each one with or without return flow evaluation

  The return flow evaluation can be performed by using the same sensor as for the heating but also by a separate sensor.

Temperature recording via thermostat switch

Generally, the normally open contact of the thermostat must be used here. When the contact at the thermostat closes, the temperature is achieved and the heating switches off. When the contact opens, the heating is switched on again.

Setting 0:

For systems in which a *thermostat switch* is installed and *no return flow evaluation* is required.

- Heating or reheating takes place in program steps P21 to P25.
- No return flow evaluation takes place during the circulation phase. The expiration time of the circulation phase consists of the times E24 and E26.

Setting 1:

For systems in which a *thermostat switch* is installed and *a return flow evaluation* is required.

- Heating or reheating takes place in steps P21 to P25.
- During the circulation phase, a return flow evaluation takes place.
- This means that the drain remains in circulation until the temperature* is achieved.

Setting 2:

For systems in which *two thermostat switches* are installed, whereby the second thermostat switch is used for return flow evaluation

- Heating or reheating occurs in steps P21 to P25 (controlled by thermostat 1).
- During the circulation phase, a return flow evaluation takes place via thermostat 2. This means that the drain remains in circulation until the temperature* is achieved.

** maximum for the time E25*

to section 10.8: Setting the temperature sensor [A50]

Temperature measurement via PT1000 temperature sensor

The advantage of these sensors is that the temperatures for heating P75, reheating P76, and return flow evaluation P77 can be set separately, and the current temperature can be displayed.

Setting 3:

For systems with a *PT1000 temperature sensor* installed and *no return flow evaluation* is required

- In steps P21, P22, and P23, the water is heated to the temperature set in P75. This temperature can be set separately to initially draw the water into the system at a higher temperature. This makes a faster warm-up of the system possible.
- During the circulation phases P24/P25, the water is reheated to the temperature set in P76. A return flow evaluation does not take place. The run-off time of the circulation phase is made up of the times E24 and E26.

Setting 4:

For systems in which a *PT1000 temperature sensor* is installed and *a return flow evaluation* is required.

- In steps P21, P22, and P23, the water is heated to the temperature set in P75. This temperature can be set separately to initially draw the water into the system at a higher temperature. This allows a faster warming up of the system.
- In the circulation phase P24/P25, the water is reheated to the temperature set in P76. A return flow evaluation takes place during the circulation phase. This means that the drain remains in the circulation phase until the temperature* set in parameter P77 is achieved.

Setting 5:

For systems in which *two PT1000 temperature sensors* are installed, whereby the second temperature sensor is used for the return flow evaluation.

- In steps P21, P22, and P23, the water is heated to the temperature set in P75. This temperature can be set separately to initially draw the water into the system at a higher temperature. This allows a faster warming up of the system.
- During the circulation phase P24/P25, the system heats up to the temperature set in P76. During the circulation phase, a return flow evaluation takes place via temperature sensor 2. This means that the drain remains in circulation until the temperature set in parameter P77* is achieved.

** maximum for the time E25*

10.9 General measures when using electronic control systems

So that even complicated regulatory tasks can be presented to the user in a manner which is clear and simple and ensures high measurement accuracy, today's electronic control systems make increasing use of microprocessors. However, the benefits of these systems are countered by the disadvantage that increased measurement accuracy is accompanied by sensitivity to interference. In order to minimise the effect which interference may have on the regulator the user also must take account of a number of points when installing a new regulator.

Assistance here is provided by standard DIN VDE 0843 on the electromagnetic compatibility (EMC) of measurement, control and regulatory devices in industrial process technology. The following table shows, for example, the maximum interference levels to which (according to the standard), an appliance may be exposed.

Degree of severity	Environment class	Test voltage Power supply	Test voltage Signal/control line
1	well-protected environment	0.5 kV	0.25 kV
2	protected environment	1.0 kV	0.5 kV
3	typical industrial environment	2.0 kV	1.0 kV
4	industrial environment with very high interference level	4.0 kV	2.0 kV

As the values given in the table are maximum values, operational values should remain well below them. However, in practice this is possible only with difficulty, as even a normal contactor without interference suppression produces interference pulses of up to 3.0 kV. For this reason we recommend that the following principles be taken into account during installation:

a. Try to eliminate all sources of interference by carrying out interference suppression and minimising the interference level. Radio interference suppression is required under VDE 0875 and confirmed by VDE 0874. In principle the interference must be eliminated at source. The nearer the interference suppresser is to the source of interference the greater its effect.

   Interference spreads through wires or by electromagnetic radiation. It is usually the former which interferes most seriously with regulation systems.

Possible interference sources (to name a few) include:

- bouncing contacts when switching loads
- switching off inductive loads (contactors, motors, solenoid valves, etc.)
- unsatisfactory routing of wires, too small cross-sections
- loose contacts
- rhythmically changing power stages (power converters)
- power breakers
- high-frequency generators

to section 10.9: General measures when using electronic control systems

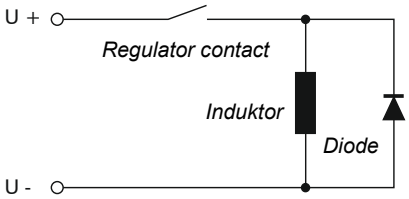
b. If specific interference sources cannot be avoided they should at least be kept at a distance from the regulator system.

c. Capacitive and inductive couplings can cause crosstalk between high-voltage lines and parallel low-voltage and sensor lines. This distorts measured values and signals and can disrupt the entire regulatory process. It is therefore recommended that all sensors and signal lines be placed separately from the control and mains voltage lines.

d. If possible a separate main line should be provided to feed the regulator system. This helps reduce any interference penetrating the regulator via the mains supply line. Voltage surges resulting from switching substantial loads will also then be less of a problem.

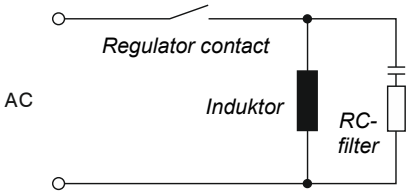
e. In the case of contactors, solenoid valves and other inductive consumers the induction voltage occurring during switching has to be reduced by appropriate protection methods. The choice of methods depends on whether the consumer runs on DC or AC voltage.

Right !



DC voltage

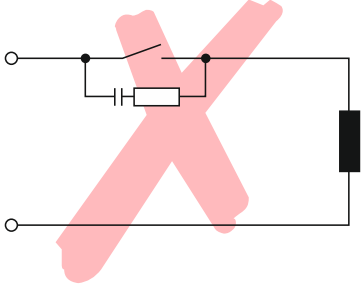
In the case of d/c voltage systems the induction voltage occurring can, for example, be limited by using self-induction diodes, varistors or suppresser diodes. The diagram on the left shows one possibility using a self-induction diode.



AC voltage

In the case of a/c voltage interference suppression as described above is not possible. Instead an RC combination must be used. An RC filter must be connected as directly as possible to the inductance in order to ensure a short line. In addition the component ratings of the RC combination must be geared to the inductance. Too low ratings lead to excessive voltage and too high ratings cause significant losses in the interference suppresser component. Another point to note here is that only capacitors which meet VDE 0656 may be used. They must be suited to the mains voltage and designed for very high switching voltages. The diagram on the left shows inductance interference suppression using an RC filter.

Wrong !



An RC filter should not be fitted directly to the regulator's switching contact (as shown on the left), as an idle current will flow through the RC combination even when the switching contact is open. This current may be enough to mean that a downstream contactor is not de-energised and a closed protective contact does not reopen.

to section 10.9: General measures when using electronic control systems

f. Semiconductor switches such as thyristors or triacs also produce interference voltages. They occur as a result of non-linear characteristics and finite ignition voltages. These components must be protected against excessive voltages, for which mainly varistors, RC combinations or choke coils are used. The use of zero-voltage switches is also recommended.

The suggestions made represent only a few of the possible ways of protecting a microprocessor-controlled regulator system from interference. The suggested measures have the advantage that they will increase the lifetime of the devices as lower induction voltages (reduced spark formation) will also reduce contact burn.