Universal tank control

WTS-300

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

Firmware V4.3

WTS-300 G1

WELBA

Measuring - Controlling - Regulating
All from the same source

welba.de

1. Introduction

1. Introduction

1. Introduction

1.1 Information about this operating instructions

These operating instructions are intended for the use by plant engineers, installers or service technicians of the WTS-300 universal tank control. This manual contains all necessary suggestions, Information, recommendations and advice for the safe and proper installation and commissioning of the tank control. It is only with the knowledge of this operating instruction that errors in the tank 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 WTS-300 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.

Operation instruction for the operator

The plant engineers, the installer or the service technician must prepare operating instructions for the operator of the tank control (farmer). 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 tank control needs.

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

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

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

NOTICE	**NOTICE for storing the operating instructions**
	This instruction manual is part of the product and must always be readily available for the service technician.

1.2 Limitation of liability

WARNING

The proper function of the WTS-300 depends on many external factors on which the manufacturer has no influence. The manufacturer accepts no liability for any damages on the milk cooling tank, the connected components or the milk. The integrated tank monitor supports only the control of the milk quality and does neither absolve the farmer (as operator of the milk tank) nor the driver of the milk collecting truck from the duty of care. Both parties have to ensure that the milk is transportable before it is removed from the tank.

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 assume any liability for damages due to:
- Non-observance of the installation instruction
- Improper use
- Installation by unqualified staff
- Non-professional installation by third parties
- Unauthorized modifications
- Technical modifications
- Use of unapproved spare parts (e.g. batteries)

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.

1.3 Warning notices in these operating instructions

Important safety information in these assembly instructions are identified by symbols. These instructions on occupational safety must be adhered to and followed. In these cases, behave particularly carefully in order to avoid accidents, personal injury and property damage.

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

DANGER!

Nature and source of danger
This warning signs 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.

WARNING

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

ATTENTION

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

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

NOTICE	***These operating instructions contain important technical and safety information. Please read carefully before installation and before any work on or with the regulator.***

These instructions have been compiled with maximum care and attention. However, their content does not constitute an assurance of product features.

The manufacturer cannot be held liable for errors and may at any time make changes serving technical progress. All rights reserved.

1.4 Device description

Die The WTS-300 is an universal tank control unit that combines various basic functions in one unit

- a milk cooling thermostat
- an extensive cleaning control
- an extended robot interface
- an extended tank monitoring system

All functions can be parameterised separately and universally.

The control unit has various operating modes:

- OFF mode (tank is empty)
- Cooling mode
- Continuous stirring mode
- Cleaning mode

WELBA „KONSOFT"

The free of charge configuration Software KONSOFT provides a simple parameterization and updating of the WTS-300 as well as a comfortable evaluation of the determined data.

See section 5.2

The KONSOFT PC-Software has been thoroughly tested and has proven itself hundreds of times in customer use. 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.

NOTICE

1.5 Type designation

The type designation of your controller is attached to the holder frame.

1.6 Item supplied

- Controller WTS-300
- Holder
- Rubber seal
- Sensor TF1A-2
- Fixing screws
- Any optional accessories ordered.

1.7 Dimensions
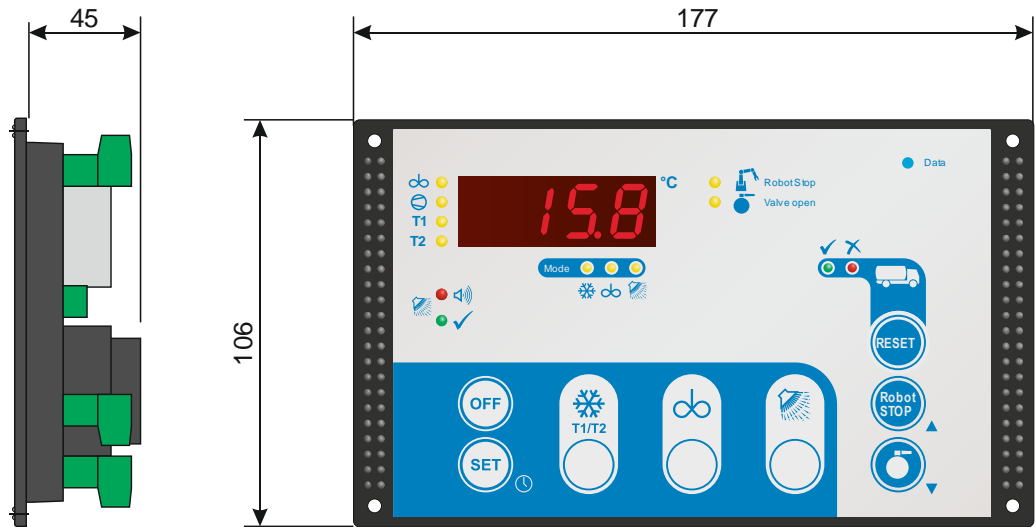
1.8 Sensor dimensions and technical data
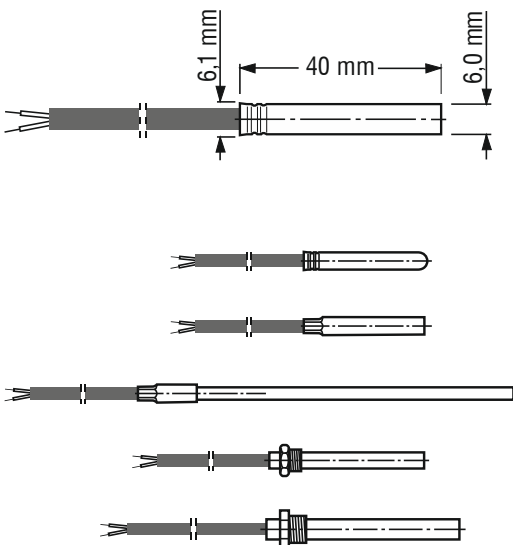
Sensor element	KTY 81-210
Bush material	1.4301 (V2A)
Bush length	40 mm
Bush diameter	6,0 mm +/- 0,1
Cable material	PVC
Measurement range	-10 .. 70° C
Cable length	standard 2 metres

A Sensors other than our standard type are available on request (different bush form or cable length).

Some of the options are shown here.

1.9 Technical data of control unit

Operating voltage	230V AC +/-10%, 50/60 Hz
Relay contact	12 performance relays expandable by 6 relays*
max. switching current	6 x each 6A AC1 - 250V AC 4 x each 10A AC1 - 250V AC 2 x each 12A AC1 - 250V AC
max. current per terminal	12A - 250V AC
max. switching voltage	250V AC - 50..60 Hz
Display	13 mm LED-Display, 4 digits
Display range	-999 .. 9999
LED switching status displays	3 mm LED
Number of sensor inputs	1 or 2
Measurement range	-5° .. +95°C
Temperature resolution	0,1°C
Sensor input	for KTY 81-210 (optionally PT-100)
Control mode	two-step controller
Hysteresis*	0,1 K .. 99,9 K ((standard adjusting 0.7 K)
Water detection	via 2 independent level monitors
Target temperature T1* Target temperature T2*	standard adjusting 8°C standard adjusting 4°C
Digital inputs	8 (via optocoupler) expandable by 5 digital inputs*
Interface	2x RS-485
Supply ext. pressure sensor	12V +/-3V max. 40 mA
Connection	Plug-in screw connections for cables up to 2.5 mm²
Housing - Front dimension - Front panel cut out - Insertion depth	 177 x 106 mm 157 x 97 mm 45 mm
Protection - Housing front - Rear	The control is open on the rear, as it is de-signed for installation in a closed housing IP 64 IP 00 IP 20
Electrical safety	Protection class II, Overvoltage category III, pollution degree I
Environment specifications: - Operation temperature - Storage temperature - max. humidity 75% (no dew)	 0° .. +50°C -20° .. +70°C 75% (no dew)

Technical data subject to change.
* via I/O expansion module ESIO-001

2. Safety

2.1 General Information

⚠ WARNING	*The plant engineering company, the installer or the service engineer must prepare operating instructions for the operator, taking account of the controller's parameters as supplied.*

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

In preparing the operating instructions for the end user, especially the chapter on "Safety", account must be taken of local regulations.

The parameter settings of the WTS-300 as supplied do not correspond to the intended use. This can lead to undefined behaviour by individual components when the system is commissioned.

For this reason, no actuators should be connected when starting operation. Load circuits should be separated.

The general principle is that the plant constructor is responsible for putting the controller into operation.

NOTICE	*IMPORTANT NOTICE ON LIABILITY*

The faultless function of the WTS-300 depends on many external factors, which the manufacturer has no influence on. The manufacturer assumes no liability for damage to the milk cooling tank, the connected components or the milk. The integrated tank monitor thus only supports the milk quality and does not release the farmer (as operator of the milk cooling tank) or the driver of the milk collecting truck from the duty of care. These must ensure, before withdrawing from the tank, that the milk is transportable.

⚠ WARNING

IMPORTANT NOTICE ABOUT THE ACCUMULATORS

See section 9.7

(required when using the tank monitor)

The life of the accumulators is limited. The built-in accumulators must be replaced by new ones every two years at the latest.

Only (!) charged accumulators of the following specification may be used: 1.2 V NiMh - size AA (min. 2.000 mAh)

⚠ DANGER!

DO NOT USE BATTERIES !!!   EXPLOSIVE !!!!!

⚠ WARNING

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

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

The universal tank controller may only be installed by an authorised specialist, observing all local safety requirements.

Access to the environment when connected must be restricted to specialised personnel.

Universal tank controllers contain live components. They must be built into the plant in such a way that contact with such live components is impossible.

The controller is not suitable for use in explosive atmospheres. Danger of explosion. Use only outside areas subject to explosive atmospheres.

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

No fluids must penetrate the housing.

The universal tank control may not be exported to the USA without the manufacturer's express permission!

2. Safety

2.2 Intended use

NOTICE	*These operating instructions contain important technical and safety information. Please read carefully before installation and before any work on or with the regulator!*

Universal tank controllers WTS-300 are designed to control heating systems, condensing units, alarms, fans, etc. in milk cooling tanks as well as to monitor milk quality. Furthermore, connected milking robots can be controlled. Any other use of the device is permitted only with prior written permission from the manufacturer.

The controller is intended only for incorporating into machinery, display panels or switchboxes etc. and when fitted corresponding to protection class 2 (double or reinforced insulation). It is only allowed to be put into operation in installed state. The use of the control is permitted in devices of protection class 1 and 2. The controller must not be modified or converted in any way.

The universal tank controller is ready for use only when the parameters have been set appropriately. Its use before this has been done would have no benefits and could also damage the equipment or adversely affect the milk to be temperature-controlled.

Responsibility for the faultless functioning of the connected devices lies with the plant engineer or the installer or the service engineer who has installed and commissioned the WTS-300.

The device is fitted with a resistance temperature sensor.

The controller is not suitable for use in explosive atmospheres. Danger of explosion. Use only outside areas subject to explosive atmospheres.

The WTS-300 fulfils the EC requirements for electromagnetic compatibility (EMC) and the Low Voltage Directive (LVD).

The safety components meet the VDE regulations.

2.3 Wiring, screening, earthing

When selecting wiring materials and installing and connecting the temperature controller to the electricity supply, account must be taken of DIN VDE 0100 "Erection of power installations with rated voltages below 1000" or the relevant national regulations (e.g. based on IEC 60364).

- Wherever possible, keep input, output and supply leads and sensor cable physically separate 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 switchbox.
- Ensure correctly wired potential equalisation.

2.4 Electrical safety

- The controller 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.
- As well as incorrect installation, wrong parameter settings can also adversely affect the correct functioning of the controller. For this reason, safety devices that are independent of the controller should always be used, e.g. high and low pressure valves or temperature limiters. Account should be taken of the local safety regulations in this connection.
- The load circuit (relay outputs K1 to K12) must be fused in accordance with the connected components.
- The connection of external voltages to the digital inputs can lead to the destruction of the control.
- Caution: All cables to the digital inputs must be shielded and kept as short as possible. EMC.

NOTICE

Important note concerning the external fuse

- The transformer, which is installed in the WTS-300, has a two-chamber safety winding, which is only short-circuit-proof due to the built-in thermal protection. If the temperature exceeds 145 ° C, there is a risk of damage!
Protect control unit with an external fuse of 160mA!

3.   Installation

3.1 Location and climatic conditions

It is essential not to install the device under the following conditions:
- severe jolting, vibration or magnetic fields
- permanent contact with water
- relative humidity of more than 90%
- sharply fluctuating temperatures (condensation)
- 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 high levels of spurious radiation.

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

3.2 Unpacking and storage

If the packaging is damaged or something is missing, do not fit the temperature controller. In this case please contact Welba.

If you keep the temperature controller 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

For fixing the housing please follow the instructions:
- Place the seal carefully in the groove. Ensure it is not twisted.
- Insert the housing from the front through the switchboard cut-out.
- Attach the holding frame in the rear position as shown by the picture.
- Fasten the housing by using the screws provided.

all drillings ø 4 mm
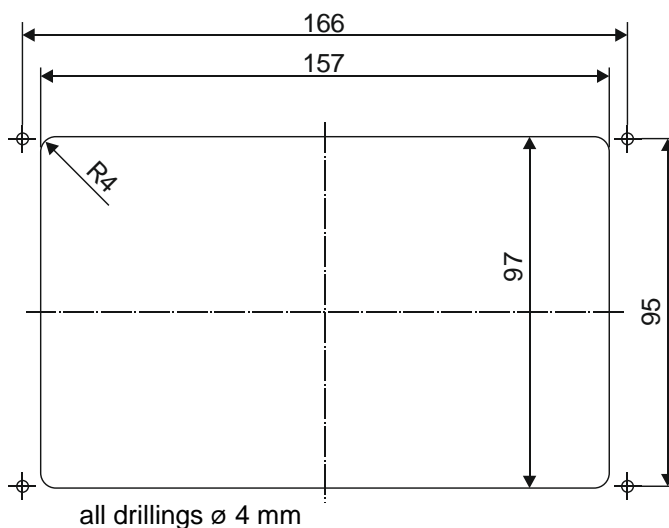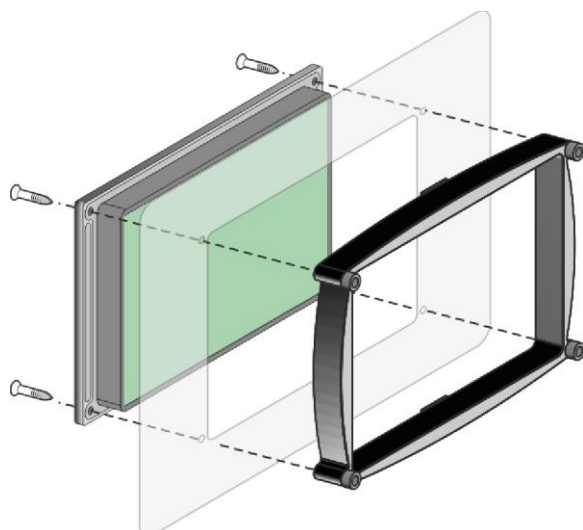
3.4 Fitting the sensor

⚠ WARNING	*The sensor cable must not be chafed or kinked.*
	There must be no substantial mechanical pressure on the sensor tube.
	Do not place the sensor and the high-voltage cable in the same cable conduit (not even within the switchbox).
	Temperature range sensor cable -10°C .. +70°C

The WTS-300 has been designed for connection to various types of sensor (see technical data). It can function properly only if one of those sensor types is installed and the parameters are correctly set.

When setting the temperature controller parameters (and whenever the sensor is replaced) the "actual value correction" [Parameter C91] must be adjusted so that the temperature measured corresponds to that shown on the display. A reference thermometer should be used for this purpose.

See section 9.3
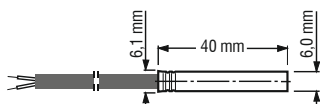
Pay attention to the permitted temperature range for sensor cable exposure.

Changing the sensor cable length

If it is necessary to shorten or lengthen the sensor cable on installation (or if a sensor other than the one supplied is to be fitted), the "actual value correction" parameter must be adjusted accordingly. See section 9.3

4. Electrical connection

4.1 Safety during installation

⚠️ **WARNING**

Before connecting ensure that the mains voltage is the same as indicated on the device's type plate.

Incorrect electrical connection can cause damage to the regulator and to the equipment.

The temperature controller should be disconnected from the mains voltage while connecting plant components or the sensor.

No appliances 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 controller's mains terminals.

4.2 Procedure

⚠️ **WARNING**

In order to avoid injury to persons or damage to connected components, connections must in all cases be undertaken in the following order!

- Pull out all the controller's plug-in terminals.
- Put the controller in position in the housing or switchboard.
- Connect all components and sensors in accordance with section 4.4 (Circuit diagram) to the plug-in terminals.
  (Do not yet plug the terminals into the controller!)
- Connect the mains cable to plug-in terminal A1 / A2.
- Plug terminal A1/ A2 into the controller.
- Close the switchbox and turn on the mains voltage.

- Switch on the controller and set the parameters
  (possibly using the optional WELBA-KONSOFT configuration software).
- Plug the pre-cabled plug-in terminals of the components into the controller.
- Close the switchbox.

4.3 Wiring

Correct wiring in accordance with the information in the accompanying description and local regulations is essential. Take particular care to ensure that the AC supply is not connected to the sensor input or other low-voltage inputs or outputs.

The various relay contacts may only be connected with uniform tension.

Use copper wire (except for the sensor connection) and ensure that all supply leads and connection terminals are dimensioned to suit the relevant current rating.

When connecting the controller and selecting the wiring materials to be used, it is essential to comply with the provisions of DIN VDE 0100 "Erection of power installations with rated voltages below 1000" or the relevant national regulations.

Furthermore, all connections must comply with the relevant VDE regulations or corresponding national regulations.

- Within the two relay groups (K3 to K6) and (K9 to K12), the respective relays are connected with each other on one side. They connect the respective voltage which has been connected at the feed point (terminals 8 and 17) to the load.
- Compressor, cleaning pump and heater must not be connected directly to the relays on the control unit. These must be switched by additional contactors. In individual cases, it must be checked whether additional motor protection switches or other safety devices are to be installed.
- Contactors are to be fitted with an RC protective circuit.
- Connection of the digital inputs:
- Only the output signal of the control provided at terminal 38 must be connected to the digital inputs (via potential-free switching contacts)!

4.4 Connection diagram (Delivery configuration)

- Electrical connections must be as shown in the diagram below.
- Use cable bushes.
- Make sure that cables cannot chafe.
- Observe relay current rating.
- In all cases use contactors for pump, compressor and heater.
- Do not feed digital inputs with external voltage! Use potential-free switches.

ATTENTION => Delivery configuration

The <u>final</u> assignment of components to the <u>relay outputs</u> is set in the A parameters (A1 to A20). See section 8.11

The assignment of components to the <u>digital inputs</u> is set in the A parameters (A21 to A33). See section 8.11
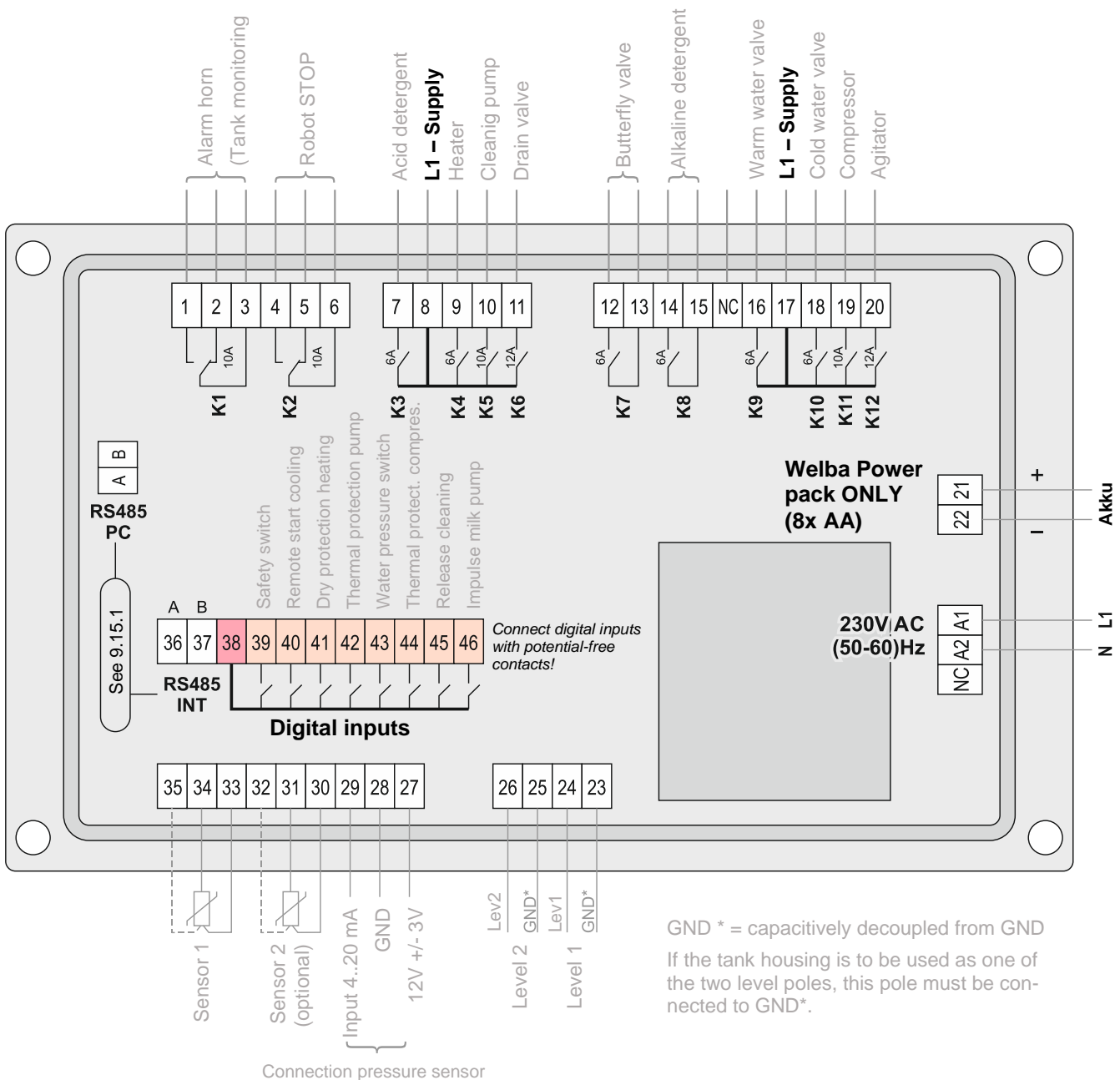
4.5 Wiring the digital inputs

Terminals 39 to 46 are digital optocoupler inputs. These are used to monitor and process external switching contacts. These switching contacts must be potential-free! The signal provided by the controller at terminal 38 must be fed separately to each individual switching contact.

Parameter assignment

| A21 | A22 | A23 | A24 | A25 | A26 | A27 | A28 |

| 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 |

Connect digital inputs with potential-free contacts!

Digital inputs
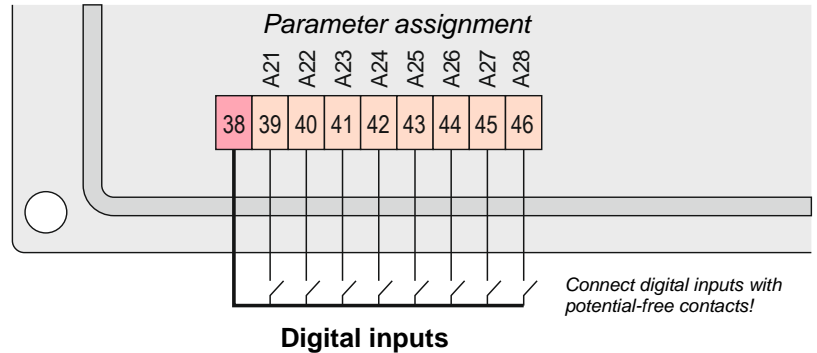
4.6 Connection robot

If the WTS-300 and the robot have a separate power supply, the robot can still be stopped (by corresponding connection) in the event of power failure.

K2
10A
4 → [A41] = 0
5 → [A41] = 2
6 ← from robot
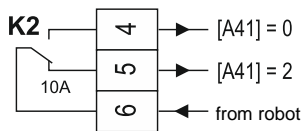
Robot requires an active signal to stop (high-active)

- [A41] = 0: In the event of a power failure, the robot is <u>not</u> stopped
  (Connection to terminal 6 / 4)
- [A41] = 2: In the event of a power failure, the robot is stopped
  (Connection to terminal 6 / 5)

K2
10A
4 → [A41] = 1
5 → [A41] = 3
6 ← from robot
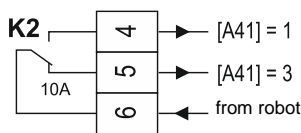
Robot needs to lose the signal to stop (low active)

- [A41] = 1: In the event of a power failure, the robot is stopped
  (Connection to terminal 6 / 4)
- [A41] = 3: In the event of a power failure, the robot is <u>not</u> stopped
  (Connection to terminal 6 / 5)

4.7 Connection of external pressure sensor (optional)

Terminals 27 | 28 | 29 must be used only for the connection of an external pressure sensor. See section 10.5

Internal power supply
via terminal 27
12 V +/- 3 V - max. 40 mA

NOTICE

If the sensor cannot be powered by internal power supply:
Use external power supply.

Connection pressure sensor two-wire

| 29 | 28 | 27 |
signal 4..20 mA   + Pressure sensor **two-wire**

| 29 | 28 | 27 | 230V / 24V
signal 4..20 mA   − + Pressure sensor **two-wire**

Connection pressure sensor three-wire

| 29 | 28 | 27 |
signal 4..20 mA   − + Pressure sensor **three-wire**
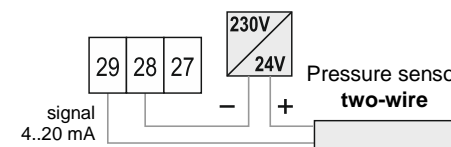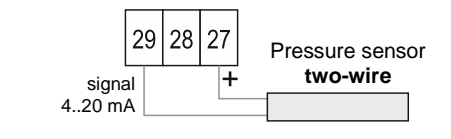
| 29 | 28 | 27 | 230V / 24V
signal 4..20 mA   − + Pressure sensor **three-wire**
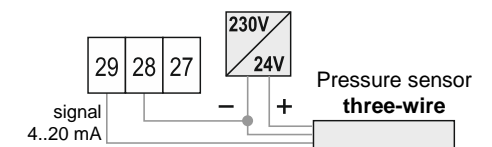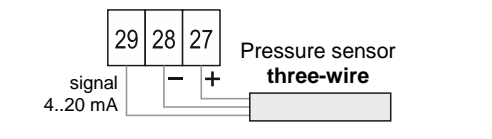
5.   Operation

5.1 Function overview

The WTS-300 is a universal tank control unit which combines all the basic functions in one device:
- milk cooling control
- comprehensive cleaning control
- an extended robot interface
- an extended tank monitor

All basic functions can be selected and operated from the working level. The control unit can also be adapted to a wide range of different system types and sizes. This takes place through the thematically organised parameter levels.

Working level
for normal daily operation

- General cooling parameters
- Extended cooling parameters
- General cleaning parameters
- Extended cleaning parameters 1
- Extended cleaning parameters 2
- Service parameter
- General tank monitor parameter
- Extended tank monitor parameter
- Alarm configuration
- Configuration
- I/O test parameter
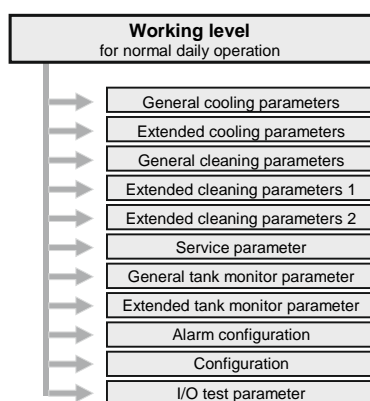
Within the working level the control unit differentiates between various operating modes:

5.1.1   OFF mode (stand-by)

Shows the current time.

All LEDs are out
(Exceptions: robot, outlet valve and tank monitor LEDs may be lit)

All output relays are deactivated
(Exceptions: robot, outlet valve and tank monitor alarms may be active)

CAUTION: The control unit is live even when switched off!

5.1.2 Cooling mode

(can NOT be started from cleaning mode)

Two freely definable target temperatures can be selected by pressing a button.

If the milk temperature exceeds the selected target temperature (T1 or T2) by the hysteresis value, the compressor contactor and agitator are switched on automatically. Once the target temperature is attained, the compressor contactor switches off, while the agitator continues to run for the set "after-stirring" period.

During cooling breaks the agitator switches on periodically, in accordance with the set 'pause time', in order to ensure an even temperature throughout the milk.

Independently of this, during cooling, short or long "intermediate stirring" can be switched on by pressing a button.

Cooling can be triggered in different ways:
- manually using the "START COOLING" button
- via digital input "Remote start to cooling" (by robot or external button)
- automatically following cleaning (only in conjunction with robot)

Cooling now starts in accordance with the pre-set starting mode:

Immediately or after a cooling start delay, with periodic cooling boosts, etc.

5.1.3 Continuous stirring mode

From OFF mode, the agitator can be switched on by pressing a button and then switched off again by pressing the OFF button.

Parameter [C25] can be used to set the time after which the agitator is to switch off automatically.

The countdown can be interrupted at any time using the OFF button.

If [C25] is set to '0', the agitator will run continuously, but can be switched off at any time using the OFF button.

From the continuous stirring mode, it is possible to switch directly to the cooling or cleaning mode by pressing a button.

5.1.4 Cleaning mode

(can NOT be started from cooling mode)

The cleaning timer controls the water intake by time or level, as desired. All running times (heater, pump, detergent injection) can be set separately. The automatic switchover from acidic to alkaline detergent is also adjustable.

The WTS-300 controls the different processes and times fully automatically.

Following a power failure the control unit will restart in the mode it was in before. See also section 9.6

Robot interface

Depending on the parameter settings, the control unit includes a built-in robot interface with the following functions:
- „Robot start / stop" and
- "Butterfly valve open / closed"

These functions are controlled via the keypad.
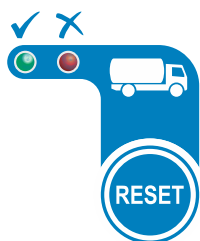
Tank monitor function

During the entire cooling and cleaning process, the built-in tank monitor keeps check on the correct operation of all components, in order to guarantee the perfect state of the milk.

In particular, the following are monitored:
- minimum and maximum milk temperatures during cooling
- power failure (optionally power pack required!)
- agitator function (optionally agitator monitoring module required
- minimum and maximum temperatures during cleaning
- etc.

Any faults are indicated by two LEDs, and associated fault codes flash in the display.

In the case of errors which may jeopardise the milk quality, the red LED "Don't add milk" lights up.

5. Operation

5.2 The configuration software KONSOFT

For software description see separate instructions

The user-friendly configuration software "KONSOFT" can be used for
- configuration
- parameter setting
- visualisation
- storage
- updating

Configuration

All setting parameters can be entered and stored, with reference to levels, on your PC using a clearly designed template. A description is available for every parameter.

Once all parameters are entered, the complete configuration can be transferred to the control unit via USB interface

Visualisation

Also by USB transfer, values and status or error reports can be obtained from the control unit, displayed on screen graphically or in tabular form, and stored. This allows rapid analysis in the event of a fault.

Bootloader function

This allows control units to be updated to any new software by pressing a button, without changing parameter settings.

NOTICE	NOTE: The KONSOFT PC-Software has been thoroughly tested and has proven itself hundreds of times in customer use. 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.

5.3 Guideline for the initial installation / parameterization

Before setting parameters you should decide the following:
- Which components (pump, compressor, heater, robot, butterfly valve, alarm, etc.) do you wish to control or regulate with the control unit?
- Which external signal transmitters (sensors, safety switches, pressure switches, robot signals etc.) are decisive for the control of the connected devices?
- Are alarm functions to be defined?
- Which occurrences (temperature, time) shall affect the control processes?
- Which cleaning processes are appropriate to the system??

Step 1   Connect all hardware components acc. to connecting diagram. See section 4.4

When using the tank monitor, connect optionally extra modules such as USB module and / or stirring unit monitoring module.

Step 2   Assign hardware components to the corresponding relay outputs (A1 to A20). See section 8.11

Step 3   Assign external signal transmitters to the digital inputs (A21 to A33). See section 8.11

Step 4   Check the wiring of all connected components. See section 8.12

Step 5   Adjust cooling and cleaning parameter. See sections 8.2 to 8.5

Step 6   Test cleaning sequence on proper function. See section 6.6

IF ROBOTS IS SHALL BE USED:

Step 7   Adjust parameter A40 and A41.

IF TANK MONITORS SHALL BE USED:

Step 8   A-parameter, h-parameter, adapt H-parameter according to conditions.

Step 9   Assign occurrences to the various alarms in the F-parameters (alarm horn, LED-display, SMS-message, etc.)

TIPP

For the parameterization and the commissioning of the WTS-300 use the free Software "Welba KONSOFT".

Advantages:

- Fast and comfortable parameterization of the WTS-300.
- Clear presentation of the parameter-settings of your tank.
- Fast transfer of an existing configuration onto identical or similar tanks.
- Use the „monitoring function" of the Software when commissioning the WTS-300. Here all occurrences can be graphically displayed and recorded.
- Store your configurations so that in case of a spare parts delivery the parameterization can be loaded onto the new device. Only the actual value correction has to be entered newly

In case of the initial installation the display shows after the application of the mains voltage

- 4 circulating bars,

- then briefly the Firmware-version

- then the time

Information:

NOTICE

If only 4 blinking horizontal bars are displayed after the application of the mains voltage, the time has to be reset. See section 5.4

NOTICE

For data evaluation, the Software Konsoft uses the entered date of the WTS-300. If date and time are not entered correctly, the evaluation is also incorrect!

Now the control unit's parameters must be properly set in line with the features of your system.

⚠ WARNING

Incorrectly set parameters can lead to serious malfunctions and damage to the milk-cooling tank.

When setting the control unit parameters, please bear in mind the consequences of malfunctions. For example, a continuously operating compressor can result in damage to the system. Protect yourself and your system by additional safeguards.

NOTICE

The control unit offers more application functions than the number of relays and digital inputs available on the printed circuit board. When starting configuration please give careful consideration to how you want to allocate all the various components to the relays and digital inputs.

5.4 Setting the date and time

In the event of a power cut, the date and time are retained for up to 5 days. After that they must be re-entered.

When the power is connected ...

... there are two possible displays::

1) Time is lost: 4 dashes are shown:

The date and time must be re-entered. Proceed as follows:

- Press one of the arrow keys: the year appears, flashing.
- Set the time as described below. The date and time must be re-entered.

2.) Time is still preserved:

During initialisation, 4 rotating bars are shown, then the current firmware appears briefly, then the time is displayed. If it is not correct, adjust it as follows.

NOTICE

If there is a device error or parameter loss when the voltage is applied, an error message appears on the display. See section 9.6

Setting the time during normal operation

- Press the OFF button: a time is displayed.
- Hold the SET button down until the year appears, flashing.
  (in between, the tank temperature is shown briefly)
- Use the arrow keys to set the correct year
- Press the SET button: the month appears, flashing.
- Use the arrow keys to set the correct month.
- Press the SET button: the day appears, flashing.
- Use the arrow keys to set the correct day.
- Then set the hour and minute displays in the same way.
- When finished press the SET button.
- Setting is completed, and the actual time is displayed.

Year

Date

Time
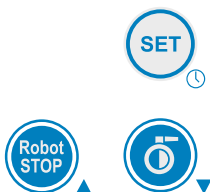
5.5 Operation in levels

The working level is used for operation and control in everyday operation.

The WTS-300 is parameterized in 11 different parameter levels.

The subordinate parameter levels are only entered after entering a code in order to avoid inadvertent adjustment of the parameters.

Working level		

Parameter level

General cooling parameters	C parameter	*code: C212*
Extended cooling parameters	P parameter	*code: D345*
General cleaning parameters	n parameter	*code: B454*
Extended cleaning parameters 1	r parameter	*code: C567*
Extended cleaning parameters 2	L parameter	*code: D432*
Service parameters	E parameter	*code: EA03*
General tank monitor parameters	h parameter	*code: 4711*
Extended tank monitor parameters	H parameter	*code: F94A*
Alarm configuration	F parameter	*code: FFFF*
Configuration	A parameter	*code: A384*
I/O test parameters	o. parameter	*code: 10E5*

General cooling parameters - (c parameter)
Parameters such as setpoints, hysteresis etc. can be set here.

Extended cooling parameters - (P parameter)
Setting of plant-specific functions such as agitator function, cooling start variant, milk removal option, etc.

General cleaning parameters - (n parameter)
Parameters such as the run times of the rinses etc. can be set here.

Extended cleaning parameters 1 - (r parameter)
Setting of plant-specific functions such as configuration of safety elements, level detection, number of passes of individual cleaning stages etc.

Extended cleaning parameters 2 - (L parameter)
Setting of all parameters in terms of 'quantity-controlled water fetching and dosing' with the optional expansion module ESIO-001.

Service parameters - (E parameter)
Displays the tank monitor parameters and counters

General tank monitor parameters - (h-parameter)
Determine whether and when informative alarms are triggered

Extended tank monitor parameters - (H parameter)
Determine whether and when critical alarms are triggered

Alarm configuration - (F parameter)
Here an individual behaviour can be assigned for each fault.

Configuration - (A parameter)
Determination / Parameterisation of the hardware configuration

I/O test parameters - (o parameter)
Is intended for commissioning the control system.

5.6 Operation of working level

Working level for normal daily operation	
General cooling parameters	code: C212
Extended cooling parameters	code: D345
General cleaning parameters	code: B454
Extended cleaning parameters 1	code: C567
Extended cleaning parameters 2	code: D432
Service parameters	code: EA03
General tank monitor parameters	code: 4711
Extended tank monitor parameters	code: F94A
Alarm configuration	code: FFFF
Configuration	code: A384
I/O test parameters	code: 10E5

The working level is used for operation and control in everyday operation:
- OFF mode = switch off the control (Stand-by)
- Start cooling mode
- Start continuous stirring
- Start cleaning mode
- Robot operation
- Milk removal via the butterfly valve
- Observe tank monitor

5.6.1 Button functions

„OFF" button

Active modes are closed down when the OFF button is pressed.

- Switch control unit to STAND-BY
- Close down cleaning mode or continuous stirring mode prematurely
- Acknowledge error
- Change to programming mode (hold down button for 3 seconds)

„SET" button

in OFF mode =	press briefly: Display of critical faults (if available) Hold down for 3 seconds: set date and time
in cleaning mode =	"Cleaning stage" or "Tank temperature" is displayed (see Parameter [r97]) and current error
Parameter setting =	the current value entered is displayed
in cooling mode =	Display of various information such as time, fault, litre display, pressure (see section 10.5 + 10.8)

„COOL" button

in OFF mode =	Start cooling
press 2x =	bypass the cooling start delay (if set)
press long =	new start of the cooling-start-delay (see section 9.15.2)
in cooling mode =	change target temperature T1 / T2

„AGITATOR" button

in OFF mode =	start continuous stirring mode
in cooling mode =	press for 1 second: "Intermediate stirring SHORT" press for 3 seconds: "Intermediate stirring LONG" *See also at the end of section „5.6.3 Cooling mode"*

"WASHING" button

in OFF mode =	start cleaning

NOTE: Installation "Quick cleaning programme" see parameter [r28]

"ARROW KEYS"

To select and adjust parameters.

- -

Operation by the driver of the milk truck

„RESET" button

press briefly =	Confirmation of the message "do not load". See 7.2
hold 5 seconds =	Test of the red alarm-LED

„ROBOT STOP" button   (if parameterized)
Starts or stops both the robot and the cooling mode as well.

„PNEUMATIC OUTLET VALVE" button   (if parameterized)
Opens / closes the pneumatic outlet valve.

5.6.2 Meaning of the LED's

LEDs in cooling mode

LED "AGITATOR"

during cooling mode	Agitator is switched on

LED "COMPRESSOR"

permanently on	Compressor contactor is switched on
off	Compressor contactor is switched off
flashing slowly	- Pause time compressor (pendulum protection) - Compressor delay / pre-stirring active - Anti-freezing protection active - Compressor blocked via digital input
flashes fast in case of a fault	- Fault thermal protection / fault contact - Phase fault (opt. in connection with ESVAW 003)

LED "T1" or „T2"

T1 on	Set target temperature for "T1" is active
T2 on	Set target temperature for "T2" is active
T2 flashing	automatic switching back to T1 active, see [P80]]

LEDs in cleaning mode

LED "ERROR"

flashing	The control is in error mode and must be acknowledged with the "OFF" button.

LED "END OF CLEANING / TANK EMPTY"

permanent	Cleaning successfully finished - tank is ready for further filling.

Display of operation mode

Mode ❄ ∞ 🚿	**LED operating mode "COOLING"** flashing „cooling start delay" is active permanent „cooling mode" is active
Mode ❄ ∞ 🚿	**LED operating mode "AGITATION "** permanent „continuous stirring" is active
Mode ❄ ∞ 🚿	**LED operating mode "CLEANING"** Permanent „cleaning mode" is active flashing no cleaning release from the robot (see section 9.15.1)

Robot / Drain valve

● Roboter Stop ○ Valve open	**LED "ROBOTER STOP"** permanent Roboter is stopped flashing - "CLEANING" button was pressed before the robot was stopped or - Robot release delay active. See [A42]
○ Roboter Stop ● Valve open	**LED "PNEUMATIC OUTLET VALVE" opened** permanent pneumatic outlet valve is open flashing flashing cleaning button has been pressed before the pneumatic outlet valve has been opened.

Tank monitoring

✔ ✗ ● ○ 🚚	**LED (green) "MILK COLLECTION OK"** permanent everything ok - milk can be loaded. flashing flashing informative alarm is on
✔ ✗ ○ ● 🚚	**LED (red) "DON'T ADD MILK !"** flashing critical alarm is on. permanent critical alarm is on - has already been acknowledged off everything ok - milk can be loaded..
● Data	**LED (blue) "Data"** Flashing Tank monitor data are stored on the USB stick. 5 sec. permanent, then off Saving finished, stick can be removed.

5.6.3 Operation modes

OFF mode

OFF	The current time is displayed. (see also section 5.4) The control unit is on stand-by - All mode LEDs are out. - All output relays are deactivated (Exceptions: robot, butterfly valve and tank monitor alarms may be active) **CAUTION: The control unit is live even when switched off!**

Cooling mode

Cooling mode is started from the OFF or from the continuous stirring mode.

MANUALLY	by pressing the COOL button
DIGITALLY	via digital input "Remote start to cooling" (by robot or external button)
AUTOMATICALLY	following cleaning (if programmed)

Subject: Cooling start delay.

If "Cooling start delay" [P60] is programmed, the compressor starts after a delay, in order to prevent a small amount of milk in the tank from freezing. During the cooling-start-delay LED "operation mode "COOLING" is blinking.

This delay applies only for the first milking after cleaning.

Note: If you push the button "COOLING" twice (double click), cooling will start immediately without a delay - the LED will be lit continuously.

There are various cooling start delay options. See section 9.15.2

After the start of the cooling mode
- The COOLING mode LED is lit
- The robot is enabled (LED off).
- The butterfly valve is closed (LED off).

- The "agitator" LED lights up
- LED „compressor" displays the current condition of the compressor.
- Further description of the LED display see section 5.6.2.
- The "T1" or "T2" LED (for target temperature 1 or 2) lights up.
- The pre-set target temperature T1 or T2 flashes three times in the display, then the current temperature of the milk is shown.

  If you wish to change to the other target temperature: press the COOL button again. (Switching over from T1 to T2 may be blocked via parameter [P80]).

The milk is now cooled down to the set target temperature, and the agitator runs continuously during cooling. If the milk temperature is already below the target, just the agitator runs for the time being.

- When the target temperature is reached, the compressor switches off.
- At the end of the set "after-stirring" period [c20], the agitator also switches off.
- During cooling breaks the agitator switches on periodically, in line with the set "pause time" [c21] for the "after-stirring" period [c20], in order to ensure an even temperature throughout the milk.
- If the milk temperature rises again, and exceeds the selected target temperature by the hysteresis value [c10 or c11], the compressor and agitator are switched on again automatically.

Agitating in cooling mode = **INTERMEDIATE STIRRING**

(only if released in parameter [P22])

- In cooling mode, briefly press the AGITATOR button:
  A "short intermediate stirring" is triggered [duration = c23].
  The indication "Sho" is displayed.
- In cooling mode, press the AGITATOR button for 5 seconds:
  A "long intermediate agitating" is triggered [duration = c24].
  The indication "Lon" is displayed.

Continuous stirring mode

if parameter [c25] = '0'

- Press the "AGITATOR" button: (from OFF mode)
  Switches on continuous stirring mode (revolving bar in the display).
- Press "OFF" button:
  Switches off continuous stirring mode.

if parameter [c25] > '0'

- Press the "AGITATOR" button: (from OFF mode)
  If parameter [c25] is set higher than '0', when the button is pressed the agitator runs for the set number of minutes.
- Press "OFF" button:
  Switches off continuous stirring mode prematurely.

5. Operation

Cleaning mode

- Press the "WASH" button: (NOT possible from cooling mode)
  Cleaning proceeds automatically in line with your settings.
  Depending on the setting in [r97], the display indicates the current cleaning stage or the temperature.
  Exception: During the heating stages the current water temperature is displayed.

Run a short rinsing cycle (if in [r28] parameterized)

- Hold SET-button and then press button CLEANING immediately.

To stop cleaning manually

- Press OFF button for 3 seconds: The cleaning programme switches to the stop phase. "ABL" and "F43" flash alternately in the display, indicating "outlet valve open".
- All currently active relays are de-energised
  (apart from "Cleaning active" and "Robot stop")
- The outlet valve opens for a pre-set time and then closes again.
- The red "WASHING" LED blinks - code F43 flashes in the display.
- The control unit switches to OFF mode only when the OFF button is pressed again.

Cleaning does not start

There are various possible causes – depending on parameter settings:

- The robot has not been stopped -> Stop.
- The butterfly valve is still closed -> Open.
- The safety switch is in the wrong position.
- No cleaning release from the robot (see section 9.15.1)

Displays during main wash

- during intake of alkaline detergent: "ALC"
- during intake of acidic detergent: "ACI"
- during disinfecting: "dESI"
- during heating the temperature alternates with "HEAt""

Robot operation *only if the robot is configured*
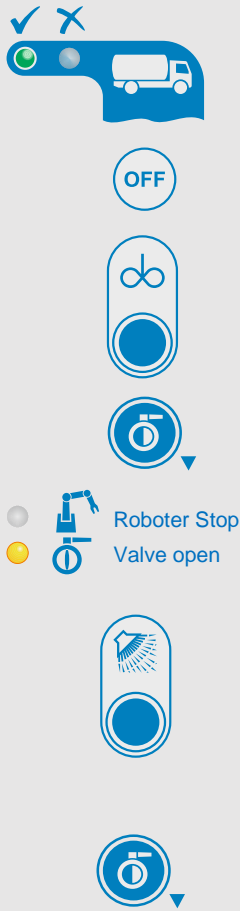
Using the ROBOT STOP button, the operation of a connected robot is either stopped or enabled.

With the start / stop of the robot, the cooling mode of the milk tank is simultaneously started / stopped.

Robot Stop
Valve open

- Hold down the ROBOT STOP button for approx. 3 seconds: robot operation is either enabled or stopped (Toggle function)
  The current switching status is indicated by LED.

Section 5.6.3 Operation modes

Milk collection

Complete emptying of tank into collection tanker

- Ensure that the green LED of the tank monitor indicator is lit

- Press the OFF button

- To stir the milk for a short period: briefly press the AGITATOR button. After the desired stirring time, stop the agitator by pressing the OFF button.
- Connect the milk pipe from the tanker.
- Open the tank outlet. (depending on the system, either manually or by means of the BUTTERFLY VALVE button)

If the tank has a pneumatic butterfly valve:

- Press the "BUTTERFLY VALVE" button for approx. 3 seconds:
  The butterfly valve opens – the milk is transferred to the tanker.
  The "Valve open" LED is lit.

Roboter Stop

Valve open

When the tank is empty

- Disconnect the tanker's milk pipe.
- Connected the cleaning hose to the tank outlet.
- Press the WASH button.

To draw off a small quantity of *milk* *(tanks with pneumatic butterfly valve)*

If milk is to be taken from the tank while cooling mode is running, proceed as follows

- Parameter [P32] Setting 1 -> Button function
  The butterfly valve opens immediately and remains open for as long as the button is held down.
  When the button is released, the valve closes immediately.
- Parameter [P32] Setting 2 -> Toggle function
  Press the BUTTERFLY VALVE button for 3 seconds - Outlet opens.
  Briefly press the button again - Outlet immediately closes.

For both settings a time limit can be programmed via parameter [P33].

> Function is also operable via external button.
>
> (see parameters A21..A33 - setting 26)

Observe the tank monitor

The "Tank monitor" function indicates whether the milk quality is guaranteed or whether a fault has occurred during cleaning.

- LED shows green: milk can be taken out.
- LED shows red: DO NOT LOAD MILK!
  The fault is indicated in the display.

A detailed description of the tank monitor function may be found in section 7.1 of these operating instructions.

6. Cleaning

6.1 Cleaning methods (cooling tank-configurations)

6.1.1 Circulation cleaning with a beaker
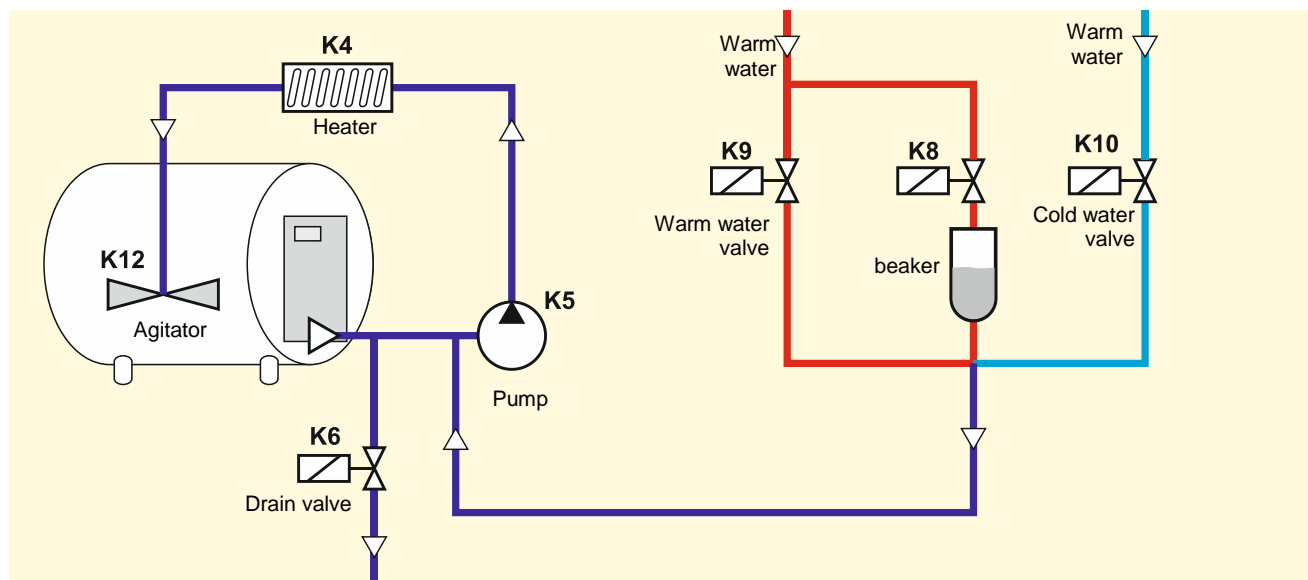
Cleaning method for milk cooling tanks, where alkaline and acidic detergents are supplied either by a drawer or a fixed beaker. See also section 11.1

6.1.2 Circulation cleaning with two dosing pumps
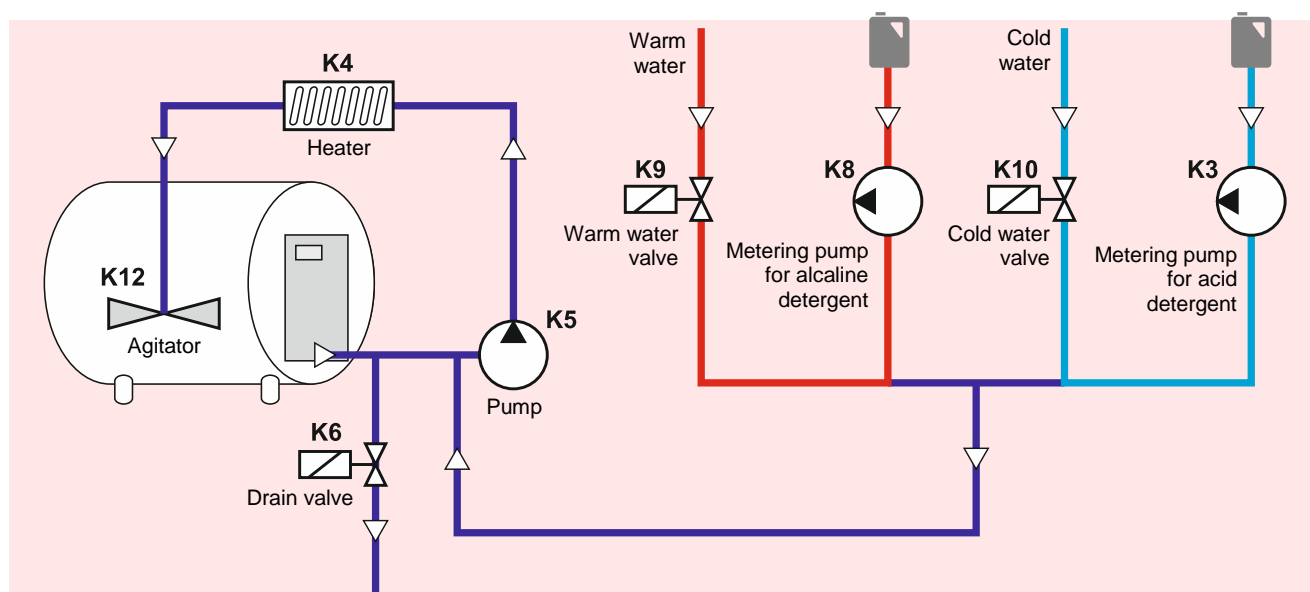
Cleaning method for milk cooling tanks, where alkaline and acidic detergents are supplied by separate dosing pumps.

6.1.3 Displacement cleaning with feed container, dosing pumps in circulation pipe
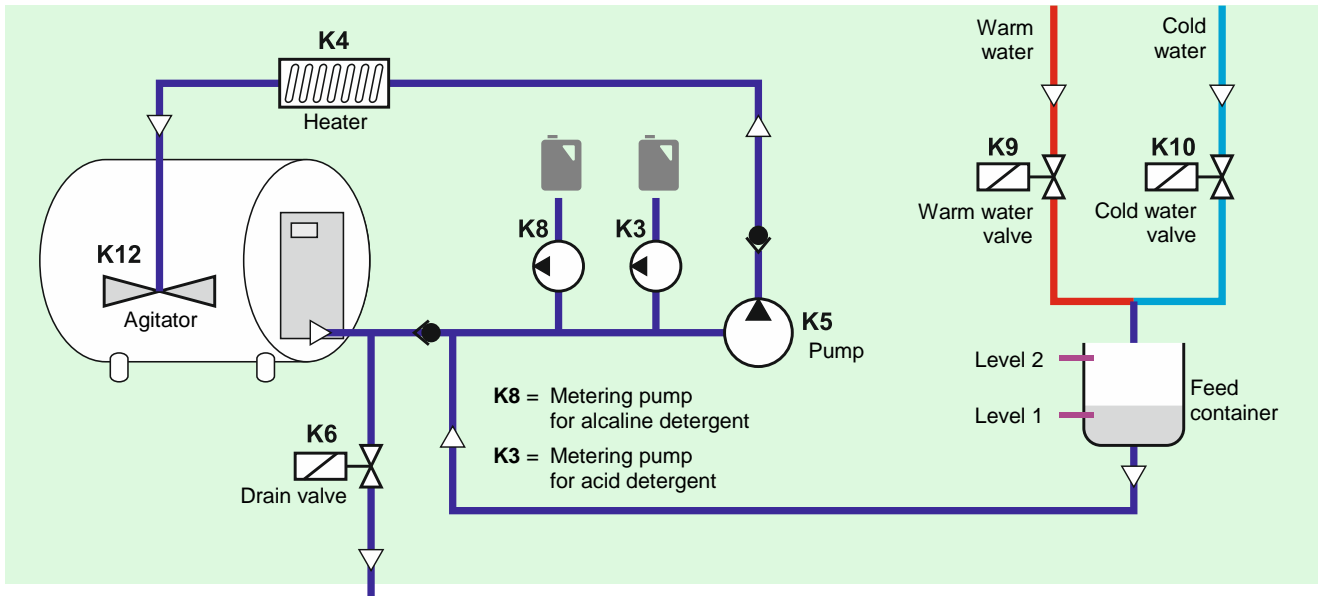
Cleaning method for milk cooling tanks, where hot and cold water are dosed level-controlled in a feed container, before pumped out for tank cleaning. The detergent is filled into circulation line.

6.1.4 Displacement cleaning with feed container and dosing pumps
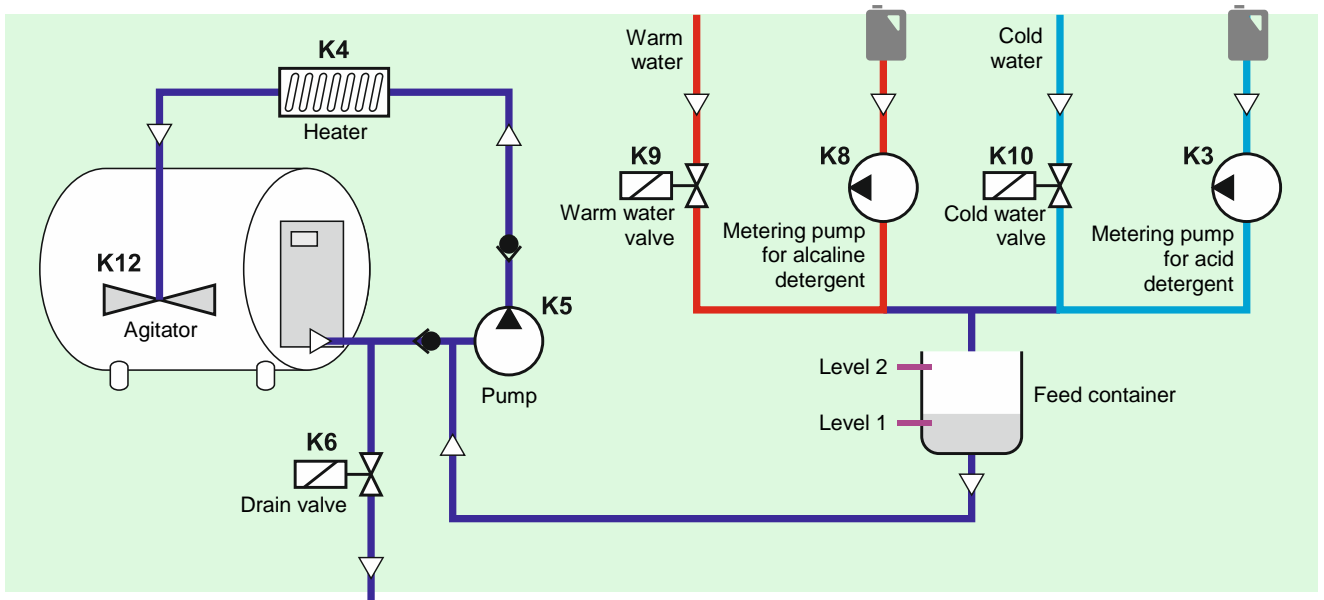
Cleaning method for milk cooling tanks, where water and detergent are dosed level-controlled in a feed container, before pumped out for tank cleaning.

6.2 Cleaning programme diagram (Maximum configuration)
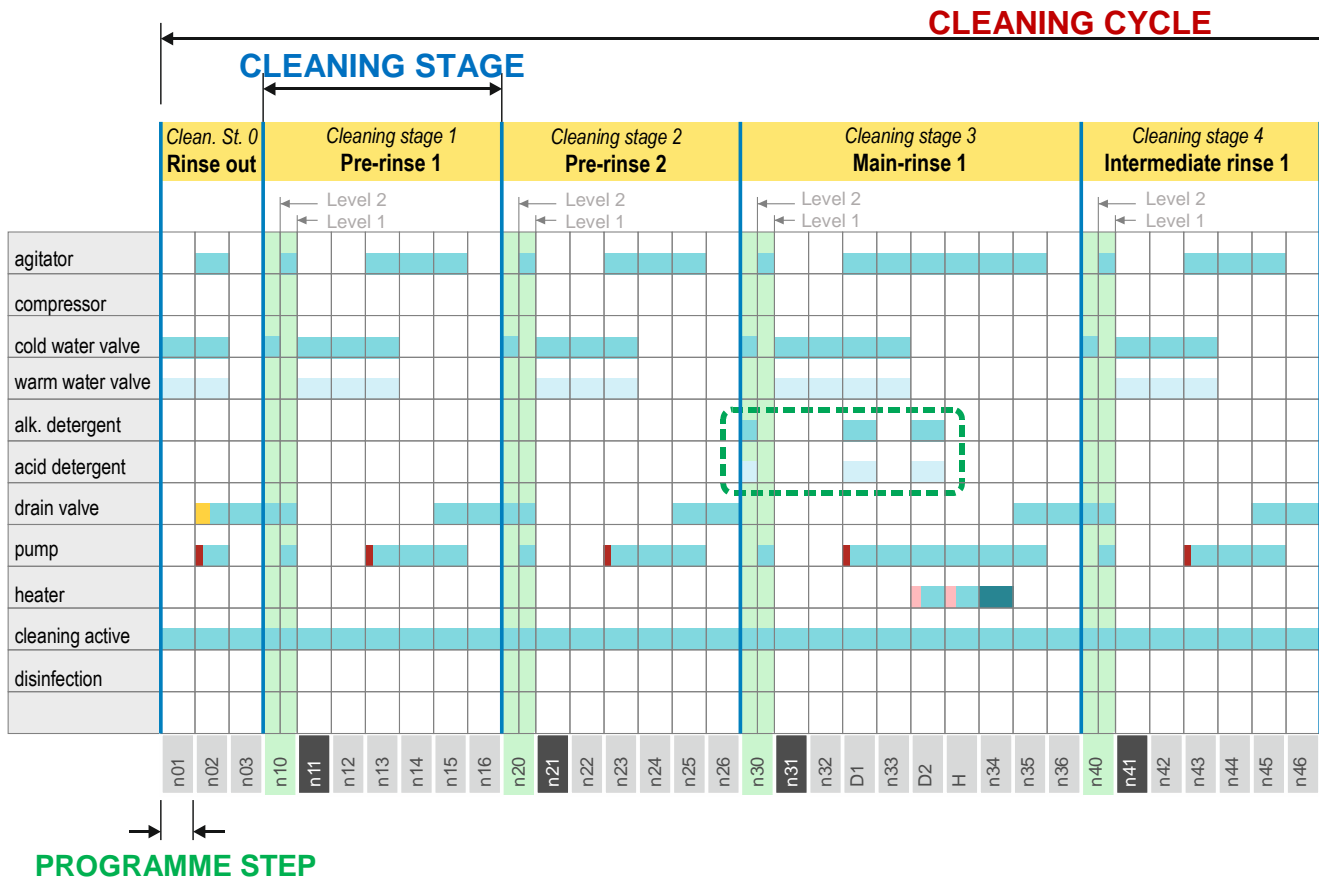
CLEANING CYCLE

A CLEANING CYCLE consists of different CLEANING STAGES. Whether and how often each individual cleaning cycle is carried out is parameterized in parameters [r40 to r49].

CLEANING STAGE

Each CLEANING STAGE consists of several 'PROGRAMME STEPS'.
The sequence of a rinsing cycle is determined by the parameterisation of the programme steps

PROGRAMME STEP

Each individual PROGRAMME STEP can be set via n-parameters (section 8.4). Entering '0' deactivates a programme step.

- Only available when activated in parameters
- Switch-on delay for heater
- Post-heating temperature during main circulation
- Cleaning pump venting (if set in parameter [r80])
- Switch-on delay drain valve [r26]
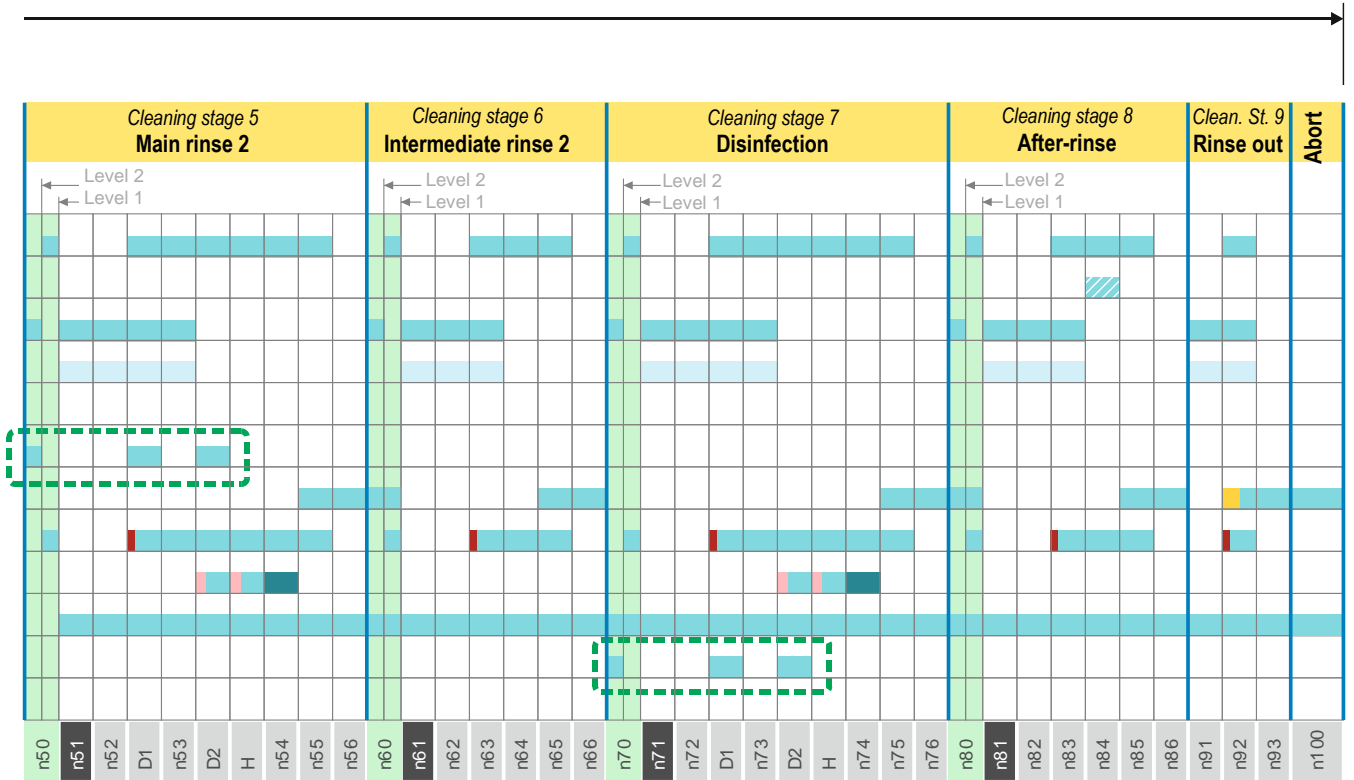
During the cleaning process the current pro-gramme step is displayed (factory setting)

The flashing point indicates activity.

PROGRAMME STEPS

n	Designation of the **n-parameters**, with which the corresponding times are set
n	n-parameter, only required in case **of cleaning method with feed container** ‚green' (see section 6.1.3 and 6.1.4)
n	n-parameter, only required for **water intake by level**
D	Adjustment of dosing times for detergents (see section 6.3.6)
H	Heat-up time (variable - until the set temperature is reached)

6.3 Explanation and programming of the cleaning process

6.3.1 Factory setting

In the factory setting, the WTS-300 is set as follows:
- Only 1 main rinse cycle per cleaning cycle
- 3 cleaning cycles are carried out with alkaline detergent, before 1x acidic cleaning takes place
- Water intake via time (the first two programme steps of each rinse cycle are deactivated)
- Dosing of detergent via time and dosing pumps

By setting the cleaning parameters, the sequence of the cleaning cycles can be adapted to all system types.

6.3.2 Determination of the number of individual rinsing cycles

Parameters [r40 to r49] are used to set whether and how often each individual rinsing cycle is carried out. The parameters of the deactivated rinsing cycles are hidden.

During the cleaning cycle, the display shows the programme step currently being carried out.

6.3.3 Different methods of water intake

		- all pre-rinses - all intermediate rinses - all after-rinses								- main rinse 1 - main rinse 2 - disinfection											
cold water valve																					
warm water valve																					
	n16	n20	n21	n22	n23	n24	n25	n26	n30	n31	n32	D1	n33	D2	H	n34	n35	n36	n40	n41	
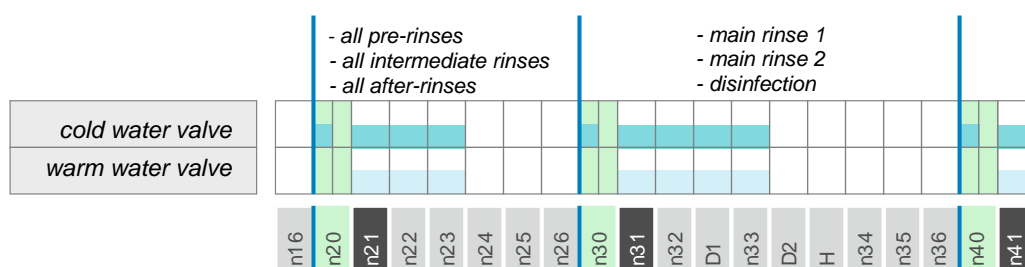
The WTS-300 offers various methods of water intake to suit the different types of system. The setting for this is made in the first parameters of each rinsing cycle. See section 6.4

⧖	**TIME** (factory setting)	
	Here the water intake is opened TEMPIRAL ONLY.	
⊥⧗	**LEVEL**	
	Here the water valve is opened until the LEVEL ELECTRODE is achieved.	
⊥⧗ ⧖	**LEVEL** and **TIME**	
	As LEVEL, but an additional 'water intake time' can be determined.	
⊔⊥	**PRE-HOPPER**	
	Here you can set in the programme steps [n10, n20, n30... n80] how often the pre-hopper is filled with water up to level 2 and then pumped out up to level 1.	
⌘	**QUANTITY-CONTROLLED** (special application)	
	Here, the water intake is quantity-controlled via a FLOW SENSOR.	

NOTICE	**Special application** **"Dosing detergent and / or water intake QUANTITY CONTROLLED"** As a rule, the functions - dosing of cleaning agent or disinfectant' is time-controlled and / or - water intake optionally are time- or level-controlled. In certain applications, however, it may be advantageous to control these functions 'quantity-controlled'. For setting instructions on this topic, see section 6.6 Quantity-based dosing into the feed container is not supported!
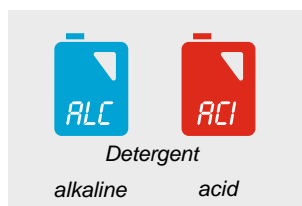
6.3.4 Cleaning with alkaline or acidic detergents

In parameter [r45] it is parameterized whether the cleaning cycle is generally carried out with one or two main rinses.

Cleaning cycle with one main rinse cycle   *(factory setting)*

> If a cleaning cycle with acidic detergent shall take place only after x cleaning cycles with alkaline detergent, main rinse 2 must be deactivated [r45 = 0]. In parameter [r21] is set after how many alkaline cleaning cycles a cycle with acidic detergent shall take place.

Cleaning cycle with main rinse 1 + 2

- If main rinse 1 + 2 is activated [r45 = 1], both alkaline and acidic detergent is used in each cleaning cycle.

See also section 6.2

6.3.5 Disinfection

In rinsing cycle 7, a 'disinfection' can optionally be parameterised.

Settings:

- Activate rinsing cycle 7 in parameter [r47],
- Enter the desired dosing time in parameter [n103],
- Assign output function '17' to a free relay [A1..A12].

The display shows "dESI" during the dosing process.
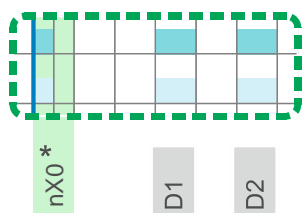
6.3.6 Time of detergent dosing

In parameter [r20] you can select whether the detergent is to be dosed in programme step D1 or D2 or in the feed container.

0: Programme step nX0 => dosing in feed container (displacement cleaning)
1: Programme step D1   => add detergent AND water at the same time
2: Programme step D2   => add detergent ONLY

The detergent is always added time-controlled [n101.. n103] in the factory setting. During dosing, the following appears in the display

> - ALC - alkaline detergent is dosed
> - ACI - acid detergent is dosed

NOTICE

Dosing into the pre-hopper

When dosing into the pre-hopper, the detergent is added with the second water intake only. See also section 6.2 - Cleaning flow chart.

NOTICE

Detergent is added by beaker

When adding detergent by a beaker, see section 11.1 – Possibility 2.

* only required for cleaning methods with pre-hopper 'green'.

6.4 Parameterization of the cleaning stages

6.4.1 Cleaning methods

Section 6.1 explains 4 cleaning methods for different cooling tank configurations. The parameterization of all 4 methods is described below, whereby the specific differences are marked in colour.

Circulation cleaning with beaker	Circulation cleaning with dosing pumps	Displacement cleaning with dosing pumps and feed container
6.1.1	6.1.2	6.1.3 + 6.1.4

The following chart shows the cleaning stages and the associated parameters:

	Clean. St. 0 Rinse out	Cleaning stage 1 Pre-rinse 1	Cleaning stage 2 Pre-rinse 2	Cleaning stage 3 Main-rinse 1	Cleaning stage 4 Intermediate rinse 1
agitator					
compressor					
cold water valve					
warm water valve					
alk. detergent					
acid detergent					
drain valve					
pump					
heater					
cleaning active					
disinfection					

Parameter columns: n01, n02, n03 | n10, n11, n12, n13, n14, n15, n16 | n20, n21, n22, n23, n24, n25, n26 | n30, n31, n32, D1, n33, D2, H, n34, n35, n36 | n40, n41, n42, n43, n44, n45, n46

Only reasonable for yellow and pink

Cleaning stage 0: RINSE OUT

Parameter [r40] = 0   'Cleaning stage 0' disabled
Parameter [r40] = 1..5   'Cleaning stage 0' execute x-times

- Water is taken in.

  The parameter [r50] is used to stipulate whether cold, hot or mixed water is to be taken in.

  Furthermore, for "Cleaning stage 0", the water intake time was set [n01].

- Agitator and pump start to run, the outlet valve will open.

  The water circulates for the pre-set time [n02].

- Agitator and pump switch off.

- Drain valve opens for the pre-set time [n03]. The drain valve is assigned to the respective cleaning stage via the parameters [r60 to r68].

  Parameter [r24 / r25] determines whether the drain valve is normally open or normally closed. Applies to all cleaning stages.

Section 6.4: Parameterization of the cleaning stages

	Clean. St. 0 **Rinse out**	Cleaning stage 1 **Pre-rinse 1**	Cleaning stage 2 **Pre-rinse 2**	Cleaning stage 3 **Main-rinse 1**	Cleaning stage 4 **Intermediate rinse 1**
agitator					
compressor					
cold water valve					
warm water valve					
alk. detergent					
acid detergent					
drain valve					
pump					
heater					
cleaning active					
disinfection					

Column parameters: n01, n02, n03 | n10, n11, n12, n13, n14, n15, n16 | n20, n21, n22, n23, n24, n25, n26 | n30, n31, n32, D1, n33, D2, H, n34, n35, n36 | n40, n41, n42, n43, n44, n45, n46

(Each cleaning stage shows "Level 2" and "Level 1" indicators.)

Cleaning stage 1: PRE-RINSE 1

Parameter [r41] = 0   'Cleaning stage 1' disabled
Parameter [r41] = 1..5   'Cleaning stage 1' execute x-times

- In case of cleaning method 'green' – it is set in programme step [n10] how often the feed container is filled with water up to level 2 and water is pumped back up to level 1. As long as the rinsing pump is running, the drain valve is open.

- Water is taken in.

In case of green n11 and n12 have to be parameterized on „0"

    The parameter [n11] is used to stipulate whether water will be taken by level or time.

    If time-controlled, the water intake time is defined in parameter [n12].

    If, in the event of intake by level, the level is not reached after a pre-set time [r32], the cleaning cycle is interrupted. See section 7.5.3 - F44

    The cleaning parameter [r51] is used to stipulate whether cold, hot or mixed water is to be taken in.

In case of green n13 have to be parameterized on „0"

- Agitator and pump start to run.

    Another option is to select an 'additional water intake time' using [n13].

In case of green n14 have to be parameterized on „0"

- The water circulates for the pre-set time [n14].

    An additional time can be defined in parameter [n15], in which the drain valve opens (agitator and cleaning pump continue to run)

- Agitator and pump switch off.

- Outlet valve opens for the pre-set time [n16]. See also [n15].

Section 6.4:   Parameterization of the cleaning stages

	Clean. St. 0 Rinse out	Cleaning stage 1 Pre-rinse 1	Cleaning stage 2 Pre-rinse 2	Cleaning stage 3 Main-rinse 1	Cleaning stage 4 Intermediate rinse 1

Cleaning stage 2: PRE-RINSE 2

   Parameter [r42] = 0   'Cleaning stage 2' disabled
   Parameter [r42] = 1..5   'Cleaning stage 2' execute x-times

- In case of cleaning method 'green' – it is set in programme step [n20] how often the feed container is filled with water up to level 2 and water is pumped back up to level 1. As long as the rinsing pump is running, the drain valve is open.

- Water is taken in.

   In case of green n21 and n22 have to be parameterized on „0"

   Parameter [n21] is used to stipulate whether water will be taken by level or time.

   If time-controlled, the water intake time is defined in parameter [n22].

   The cleaning parameter [r52] is used to stipulate whether cold, hot or mixed water is to be taken in.

   If, in the event of intake by level, the level is not reached after a pre-set time [r32], the cleaning cycle is interrupted. See section 7.5.3 - F44

   In case of green n23 and n24 have to be parameterized on „0"

- Agitator and pump start to run.

   Another option is to select an 'additional water intake time' using [n23].

   The water circulates for the pre-set time [n24].

   An additional time can be defined in parameter [n25], in which the drain valve opens (agitator and cleaning pump continue to run)

- Agitator and pump switch off.

- Drain valve opens for the pre-set time [n26]. See also [n25].

Section 6.4:   Parameterization of the cleaning stages

	Clean. St. 0 Rinse out	Cleaning stage 1 Pre-rinse 1	Cleaning stage 2 Pre-rinse 2	Cleaning stage 3 Main-rinse 1	Cleaning stage 4 Intermediate rinse 1

Cleaning stage 3:   MAIN WASH 1

Parameter [r43] = 1   not changeable

- In case of cleaning method 'green' – it is set in programme step [n30] how often the feed container is filled with water up to level 2 and water is pumped backup to level 1. The drain valve remains closed up to cleaning step [n35/n36].

  Settings for version 6.1.4 (dosing in pre-hopper)

  Parameter [r20 = 0] and parameter [n30 = min. 2] since the detergent is added when water is taken from the pre-hopper for the second time.

In case of green n31 and n32 have to be parameterized on „0"

- Water is taken in.

  Parameter [n31] is used to stipulate whether water will be taken by level or time.

  If time-controlled, the water intake time is defined in parameter [n32].

  If, in the event of intake by level, the level is not reached after a pre-set time [r32], the cleaning cycle is interrupted. See section 7.5.3 - F44

  The cleaning parameter [r53] is used to stipulate whether cold, hot or mixed water is to be taken in.

In case of green n33 have to be parameterized on „0"

- Agitator and pump start to run. Water circulates in the tank.

  Another option is to select an 'additional water intake time' using [n33].

* (D1 or D2 in cleaning programme diagram)

Section 6.4: Parameterization of the cleaning stages

In case of green n32 and n33 have to be parameterized on „0"

Cleaning agent dosing: *(see also section 6.3.6)*

● Depending on the setting of the parameter [r20], detergent is injected at the end of the water intake time [n32] or the subsequent water intake time [n33] as follows:

  ▪ *If ‚cleaning stage 5' is activated [r45=1] only alkaline detergent is injected here for duration [n101*].*

  ▪ *If 'cleaning stage 5' is deactivated [r45=0] alkaline detergent is injected x times for duration [n101*] before acidic detergent is injected once for duration [n102*].*

  ▪ *The number of alkaline cleaning cycles is set in [r21].*

● If a heater is present [r35], this is switched on. When the heating temperature [n106] is reached, the heater is switched off again.

  If the temperature is not reached within the pre-set time [r37], the control unit continues with the program, but a fault report is displayed at the end. See section 7.5.3 - F44

  If a switch-on delay [r36] has been parameterized for heating, heating starts only after this time has elapsed. (This is to ensure that water is in the heater.)

● Main circulation time: The water circulates for the pre-set time [n34]. During the main circulating time, a post-heating temperature [n109] can be defined.

● An additional time can be defined in parameter [n35], in which the drain valve opens (agitator and cleaning pump continue to run)

● Agitator and pump switch off.

● Drain valve opens for the pre-set time [n36]. See also [n35].

Section 6.4: Parameterization of the cleaning stages

	Clean. St. 0 Rinse out	Cleaning stage 1 Pre-rinse 1	Cleaning stage 2 Pre-rinse 2	Cleaning stage 3 Main-rinse 1	Cleaning stage 4 Intermediate rinse 1
		Level 2 / Level 1	Level 2 / Level 1	Level 2 / Level 1	Level 2 / Level 1
agitator					
compressor					
cold water valve					
warm water valve					
alk. detergent					
acid detergent					
drain valve					
pump					
heater					
cleaning active					
disinfection					
	n01 n02 n03	n10 n11 n12 n13 n14 n15 n16	n20 n21 n22 n23 n24 n25 n26	n30 n31 n32 D1 n33 D2 H n34 n35 n36	n40 n41 n42 n43 n44 n45 n46

Cleaning stage 4: ZWISCHENSPÜLEN 1

    Parameter [r44] = 0   'Cleaning stage 4' disabled
    Parameter [r44] = 1..5   'Cleaning stage 4' execute x-times

- In case of cleaning method 'green' – it is set in programme step [n50] how often the feed container is filled with water up to level 2 and water is pumped back up to level 1. As long as the rinsing pump is running, the drain valve is open.

- Water is taken in.

In case of green n41 and n42 have to be parameterized on „0"

  Parameter [n41] is used to stipulate whether water will be taken by level or time.

  If time-controlled, the water intake time is defined in parameter [n42].

  The cleaning parameter [r54] is used to stipulate whether cold, hot or mixed water is to be taken in.

  If, in the event of intake by level, the level is not reached after a pre-set time [r32], the cleaning cycle is interrupted. See section 7.5.3 - F44

In case of green n43 and n44 have to be parameterized on „0"

- Agitator and pump start to run.

  Another option is to select an 'additional water intake time' using [n43].

  The water circulates for the pre-set time [n44].

  An additional time can be defined in parameter [n45], in which the drain valve opens (agitator and cleaning pump continue to run)

- Agitator and pump switch off.

- Drain valve opens for the pre-set time [n46]. See also [n45].

Section 6.4:   Parameterization of the cleaning stages

	Cleaning stage 5 **Main rinse 2**	Cleaning stage 6 Intermediate rinse 2	Cleaning stage 7 Disinfection	Cleaning stage 8 After-rinse	Clean. St. 9 Rinse out	Abort

Cleaning stage 5: MAIN WASH 2

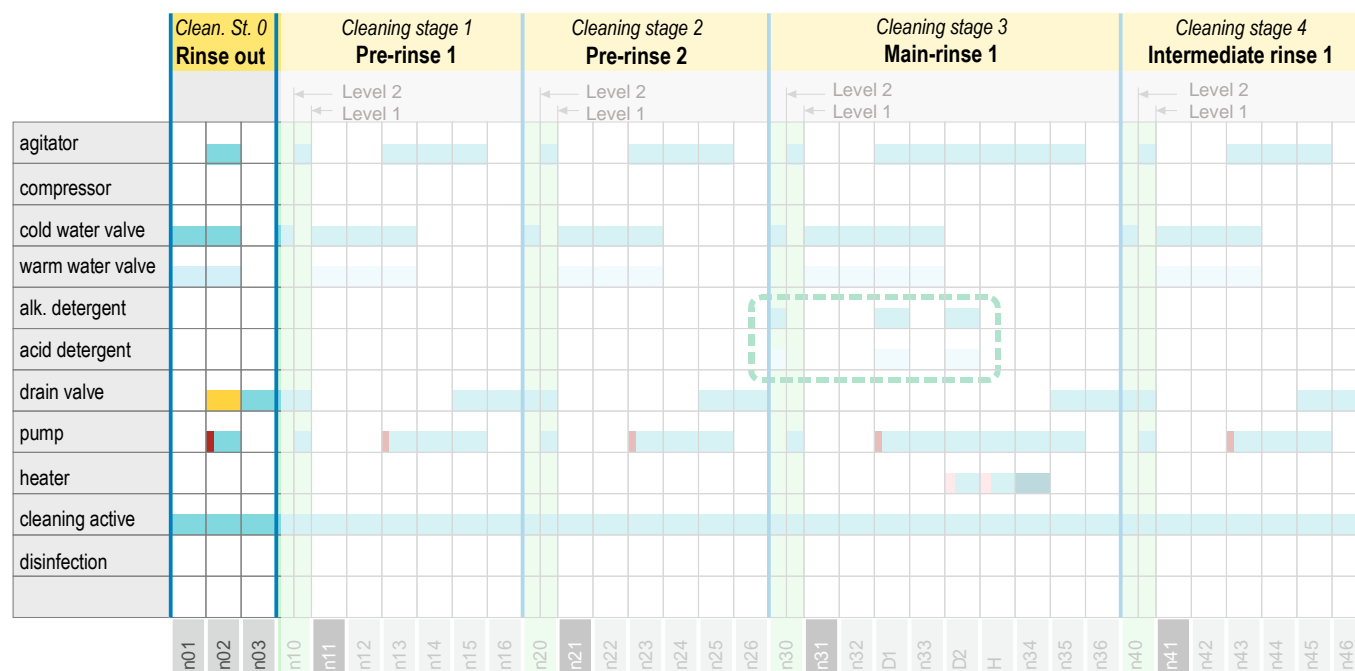Parameter [r45] = 0   'Cleaning stage 5' disabled
Parameter [r45] = 1..5   'Cleaning stage 5' execute one time

- In case of cleaning method 'green' – it is set in programme step [n30] how often the feed container is filled with water up to level 2 and water is pumped backup to level 1. The drain valve remains closed up to cleaning step [n55/n56].

  Settings for version 6.1.4 (dosing in pre-hopper)

  Parameter [r20 = 0] and parameter [n50 = min. 2] since the detergent is added when water is taken from the pre-hopper for the second time.

In case of green n51 and n52 have to be parameterized on „0"

- Water is taken in.

  Parameter [n51] is used to stipulate whether water will be taken by level or time.

  If time-controlled, the water intake time is defined in parameter [n52].

  If, in the event of intake by level, the level is not reached after a pre-set time [r32], the cleaning cycle is interrupted. See section 7.5.3 - F44

  The cleaning parameter [r54] is used to stipulate whether cold, hot or mixed water is to be taken in.

In case of green n53 have to be parameterized on „0"

- Agitator and pump start to run. Water circulates in the tank.

- Another option is to select an 'additional water intake time' using [n53].

- Depending on the setting of the parameter [r20], acidic detergent is injected at the end of the water intake time [n52] or the subsequent water intake time [n53]. The duration of the detergent dosing is set in parameter [n102].

- If a heater is present [r35], this is switched on. When the heating temperature [n107] is reached, the heater is switched off again.

  If the temperature is not reached within the pre-set time [r37], the control unit continues with the program, but a fault report is displayed at the end. See section 7.5.3 - F44

  If a switch-on delay [r36] has been parameterized for heating, heating starts only after this time has elapsed. (This is to ensure that water is in the heater.)

6. Cleaning

Section 6.4: Parameterization of the cleaning stages

- Main circulation time: The water circulates for the pre-set time [n54]. During the main circulating time, a post-heating temperature [n110] can be defined.
- An additional time can be defined in parameter [n55], in which the drain valve opens (agitator and cleaning pump continue to run)
- Agitator and pump switch off.
- Drain valve opens for the pre-set time [n56]. See also [n55].

Section 6.4: Parameterization of the cleaning stages
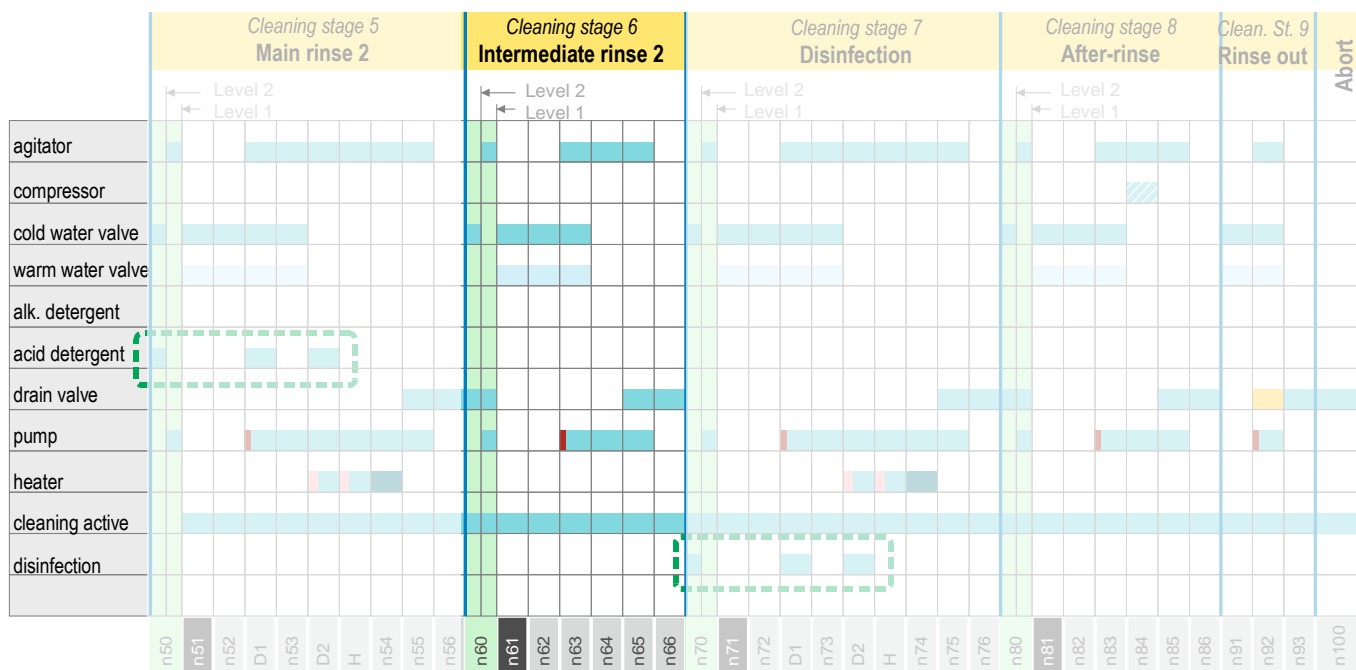
Cleaning stage 6: INTERMEDIATE RINSE 2

Parameter [r46] = 0   'Cleaning stage 6' disabled
Parameter [r46] = 1..5   'Cleaning stage 6' execute x-times

- In case of cleaning method 'green' – it is set in programme step [n60] how often the feed container is filled with water up to level 2 and water is pumped back up to level 1. As long as the rinsing pump is running, the drain valve is open.

- Water is taken in.

In case of green n61 and n22 have to be parameterized on „0"

Parameter [n61] is used to stipulate whether water will be taken by level or time.

If time-controlled, the water intake time is defined in parameter [n62].

The cleaning parameter [r55] is used to stipulate whether cold, hot or mixed water is to be taken in.

If, in the event of intake by level, the level is not reached after a pre-set time [r32], the cleaning cycle is interrupted. See section 7.5.3 - F44

In case of green n63 and n64 have to be parameterized on „0"

- Agitator and pump start to run.

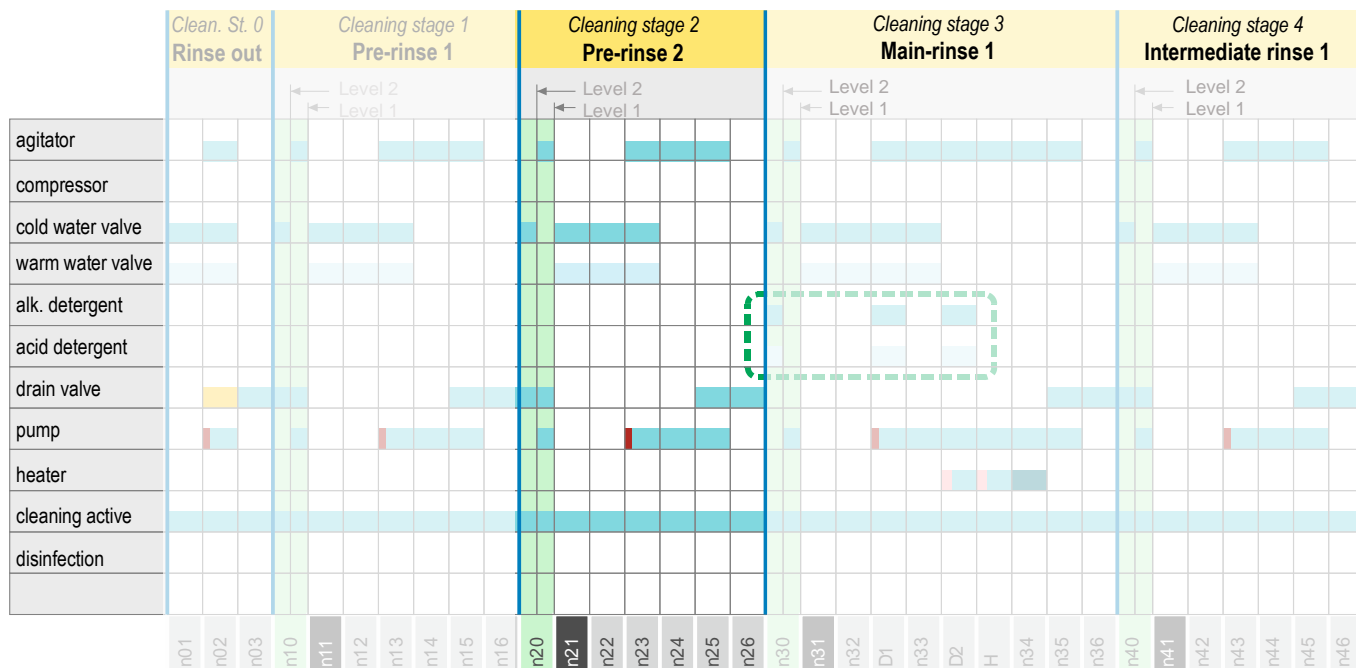Another option is to select an 'additional water intake time' using [n63].

The water circulates for the pre-set time [n64].

An additional time can be defined in parameter [n65], in which the drain valve opens (agitator and cleaning pump continue to run)

- Agitator and pump switch off.

- Drain valve opens for the pre-set time [n66]. See also [n65].

Section 6.4: Parameterization of the cleaning stages

	Cleaning stage 5 **Main rinse 2**	Cleaning stage 6 **Intermediate rinse 2**	Cleaning stage 7 **Disinfection**	Cleaning stage 8 **After-rinse**	Clean. St. 9 **Rinse out**	Abort
agitator						
compressor						
cold water valve						
warm water valve						
alk. detergent						
acid detergent						
drain valve						
pump						
heater						
cleaning active						
disinfection						

Cleaning stage 7: DISINFEKTION

Parameter [r47] = 0   'Cleaning stage 7' disabled
Parameter [r47] = 1..5   'Cleaning stage 7' execute one time

- In case of cleaning method 'green' – it is set in programme step [n30] how often the feed container is filled with water up to level 2 and water is pumped backup to level 1. The drain valve remains closed up to cleaning step [n75/n76].

  Settings for version 6.1.4 (dosing in pre-hopper))

  Parameter [r20 = 0] and parameter [n70 = min. 2] since the detergent is added when water is taken from the pre-hopper for the second time.

In case of green n71 and n72 have to be parameterized on „0"

- Water is taken in.

  Parameter [n71] is used to stipulate whether water will be taken by level or time.

  If time-controlled, the water intake time is defined in parameter [n72].

  If, in the event of intake by level, the level is not reached after a pre-set time [r32], the cleaning cycle is interrupted. See section 7.5.3 - F44

  The cleaning parameter [r57] is used to stipulate whether cold, hot or mixed water is to be taken in.

In case of green n73 have to be parameterized on „0"

- Agitator and pump start to run. Water circulates in the tank.

  Another option is to select an 'additional water intake time' using [n73].

- Depending on the setting of the parameter [r20], acidic detergent is injected at the end of the water intake time [n72] or the subsequent water intake time [n73]. The duration of the detergent dosing is set in parameter [n103].

- If a heater is present [r35], this is switched on. When the heating temperature [n108] is reached, the heater is switched off again.

  If the temperature is not reached within the pre-set time [r37], the control unit continues with the program, but a fault report is displayed at the end. See section 7.5.3 - F44

  If a switch-on delay [r36] has been parameterized for heating, heating starts only after this time has elapsed. (This is to ensure that water is in the heater.)

Section 6.4: Parameterization of the cleaning stages

- Main circulation time: The water circulates for the pre-set time [n74]. During the main circulating time, a post-heating temperature [n111] can be defined.
- An additional time can be defined in parameter [n75], in which the drain valve opens (agitator and cleaning pump continue to run)
- Agitator and pump switch off.
- Drain valve opens for the pre-set time [n76]. See also [n75].

Section 6.4:   Parameterization of the cleaning stages
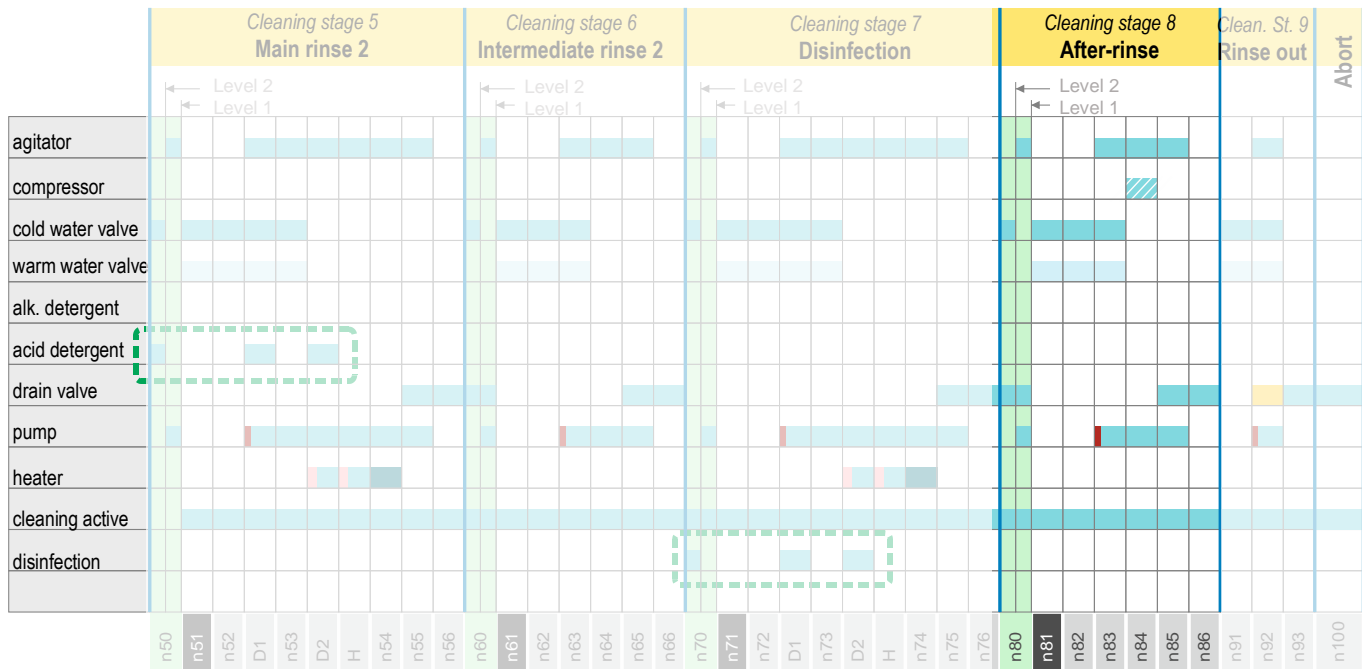
Cleaning stage 8:   NACHSPÜLEN

Parameter [r48] = 0   'Cleaning stage 8' disabled
Parameter [r48] = 1..5   'Cleaning stage 8' execute x-times

- In case of cleaning method 'green' – it is set in programme step [n80] how often the feed container is filled with water up to level 2 and water is pumped back up to level 1. As long as the rinsing pump is running, the drain valve is open.

In case of green n81 and n82 have to be parameterized on „0"

- Water is taken in.

    Parameter [n81] is used to stipulate whether water will be taken by level or time.

    If time-controlled, the water intake time is defined in parameter [n82].

    The cleaning parameter [r58] is used to stipulate whether cold, hot or mixed water is to be taken in.

    If, in the event of intake by level, the level is not reached after a pre-set time [r32], the cleaning cycle is interrupted. See section 7.5.3 - F44

In case of green n83 and n84 have to be parameterized on „0"

- Agitator and pump start to run.

    Another option is to select an 'additional water intake time' using [n83].

    The water circulates for the pre-set time [n84].

    Optionally, during the time [n84] an 'active cooling' can be parameterized [r18].

    An additional time can be defined in parameter [n85], in which the drain valve opens (agitator and cleaning pump continue to run)

- Agitator and pump switch off.

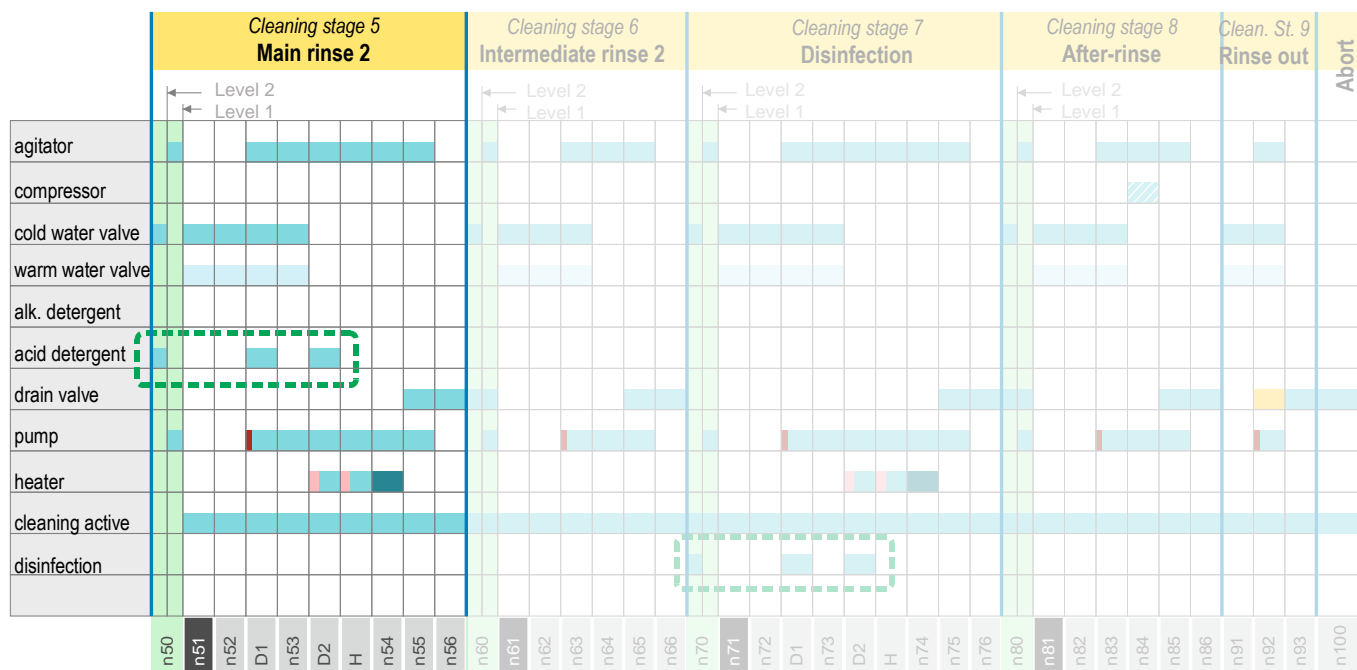- Drain valve opens for the pre-set time [n86]. See also [n85].].

Section 6.4: Parameterization of the cleaning stages
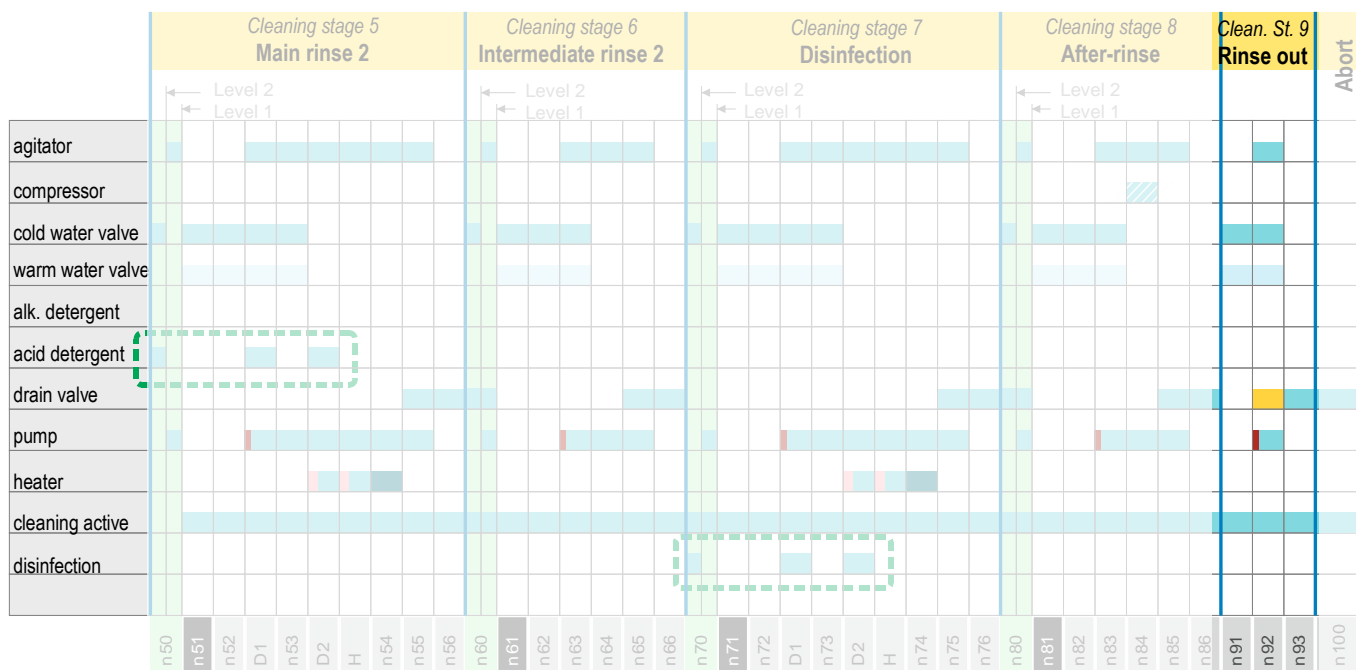
Only reasonable for yellow and pink

Cleaning stage 9: RINSE OUT

Parameter [r49] = 0   'Cleaning stage 9' disabled
Parameter [r49] = 1..5   'Cleaning stage 9' execute x-times

- Water is taken in.
- The parameter [r50] is used to stipulate whether cold, hot or mixed water is to be taken in.
- Furthermore, for "Cleaning stage 0", the water intake time was set [n01].
- Agitator and pump start to run, the outlet valve will open.
- The water circulates for the pre-set time [n02].
- Agitator and pump switch off.
- Drain valve opens for the pre-set time [n03]. The drain valve is assigned to the respective cleaning stage via the parameters [r60 to r69].
- Parameter [r24 / r25] determines whether the drain valve is normally open or normally closed. Applies to all cleaning stages.

6.5 Abort of the cleaning

6.5.1 Cleaning cycle completely finished

If all rinsing cycles have been completed, this is signalled by the "green LED". Depending on the parameterisation [P60], cleaning changes to "OFF mode" or to "cooling mode".

NOTICE: Any errors that occurred during cleaning that did not lead to cleaning being interrupted are shown on the display.

6.5.2 Manual abort of the cleaning

- Cleaning is aborted manually by pressing the OFF key:
  - *cleaning stops,*
  - *the display alternately shows 'AbL' and the current temperature,*
  - *the drain valve is opened for the time [n100] (can be stopped by pressing the OFF key again).*
  - *depending on the parameterisation [P60], cleaning changes to 'OFF mode' or 'cooling mode'.*

6.5.3 Abort of the cleaning due to faults

Fault messages are displayed:
  - flashing on the display
  - via SMS or email (optional)

The following faults cause the abort of the cleaning:
- **F40** - Tank outlet safety switch activated
- **F41** - Pressure switch for cleaning line
- **F42** - Thermal contact for washing pump
- **F44** - TIMEOUT water intake above level
- **F45** - Water in tank after emptying
- **F46** - TIMEOUT water intake quantity controlled
  - *cleaning stops,*
  - *the display alternates between 'AbL' and the fault number,*
  - *the drain valve is opened for the time [n100],*
  - *the control unit remains in cleaning mode.*
  - *Fault code is displayed and must be acknowledged.*
    NOTICE: The drain time [n100] can be stopped by pressing the OFF button. See also section 7.5.3

Reset / acknowledge the fault messages:
- Press the RESET button for approx. 4 seconds.

6.5.4 Power failure during cleaning

- After the power returns after a power failure:
    - *the display shows the current temperature alternating with 'ABL',*
    - *the drain valve is opened for the time [n100],*
    - *the control continues the cleaning at the start of the rinse cycle in which the interruption occurred.*
    - *Fault 'F30' appears in the display until it is acknowledged.*
    - *Depending on the parameterisation [P60], the cleaning changes to "OFF mode" or to "cooling mode"*

6.6 Dosing of detergent and / or water intake by flow metering

6.6.1 General information and first steps

As a rule, the functions
- dosing of cleaning agent or disinfectant' is time-controlled and / or
- water intake are optionally time- or level-controlled.

In certain applications*, however, it may be advantageous to control these functions 'quantity-controlled'. Detergent or water are flowing until the entered litre quantity is achieved.

Quantity-based dosing into the feed container is not supported!

e.g. strongly fluctuating water pressure or for the monitoring of the detergent quantity

For the quantity-controlled detergent addition the following is required:
- WELBA I/O extension module ESIO-001
- for detergent dosing:
  2 pieces of flow sensors (pulse counter) for alkaline and acid detergent
  and / or
- for water intake:
  2 pieces of flow sensors (pulse counters) for cold and warm water

Proceed as follows:
- Connect the flow sensors to the first four digital inputs (D1 to D4) of the I/O expansion module. For connection, see the documentation of the I/O expansion module.

| B | A | ● | I1 | I2 | G | X0 | D1 | D2 | D3 | D4 | D5 |

Digital inputs

ESIO-001..

As only 4 flow sensors can be connected, only a maximum of 4 of the following functions can be dosed in a quantity-controlled manner.

- alkaline detergent
- acidic detergent
- disinfectant
- cold water
- warm water

The remaining function must be dosed time- or level-controlled.

If a cleaning agent or disinfectant is to be dosed time-controlled, it must be set to '0' in the corresponding L-parameter [L101 to L103]!

NOTICE

- Activate the I/O expansion module in parameter [A74].
- Assign the connected flow sensors to the corresponding digital inputs using parameters [A29..A32]. (Selection 38 to 42)
- Enter the number of pulses per litre in each of the parameters [L121..L125]. This is usually given in the documentation of the flow sensors.

  L121 <=> alkaline detergent
  L122 <=> acidic detergent
  L123 <=> disinfectant
  L124 <=> cold water
  L125 <=> warm water

If the pulse numbers are unknown, they must be determined - as described in section 6.6.4.
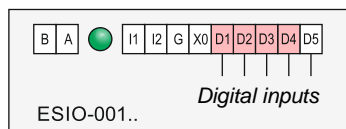
6.6.2 Dosing of the quantity-controlled detergent and disinfectant

Settings for rinsing cycles (3 + 5 + 7)

NOTICE

- Activate the function *"Volume-controlled detergent and disinfectant dosing"* in parameter [L110] for both main rinses and disinfection.
- Select the desired detergent and disinfectant dosing quantities in parameters [L101 to L103].

  If the value '0' is entered in a parameter [L101 to L103], the corresponding detergent or disinfectant is dosed via time [n101 to n103].
- Set a timeout-time for dosing in parameter [L112].

  If the desired detergent quantity is not achieved within the time [L112]:

  - the dosing is stopped,
  - the cleaning is carried out to the end,
  - the fault message (F35, F36 or F37) is given.
- Select 'Programme step' D1 or D2 in parameter [r20] for the dosing of the cleaning agent.

  - Programme step D1 => Add detergent AND water at the same time
  - Programme step D2 => Add detergent ONLY

Detergent and disinfectant are now added in each rinse cycle according to the number of litres entered. The other programme steps remain unchanged.

6.6.3 Quantity-controlled water intake

Settings separately for each rinse cycle (0 - 9)
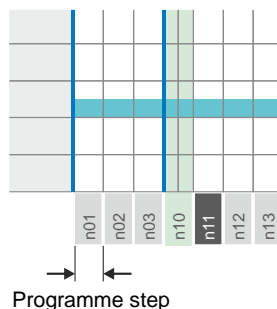
Programme step

- Activate the function *"quantity-controlled water intake"* in parameter [L105] for all rinse cycles.
- In the corresponding L-parameters [L1, L2, L12, L13... etc.], determine the desired amount of water for the associated 'programme steps' n01, n02, n12, n13... etc.

  Water is then added in each rinse cycle according to the number of litres entered. The other programme steps remain unchanged.

  NOTICE: If no water quantity is entered in one of the L-parameters, the programme step is skipped.
- if program step D1 is selected in parameter [r20]:

  Define in parameter [L104] the amount of water entering at the same time as the detergent or disinfectant.
- Set a timeout-time for water intake in parameter [L107].

  If the desired litre-indication is not achieved within the time [L107], parameter [L106] is performed as set:

0:	Same timeout [L107] for all programme steps after timeout <u>abort of cleaning</u>*.	F46
1:	Same timeout [L107] for all programme steps after timeout <u>the cleaning is continued</u>	F46
2:	Individual timeout for each programme steps (adds up from the corresponding n- parameter [n01, n02, n12, n13...] + [L107]) after timeout the <u>cleaning is continued</u>	F46

* Control stops at the end of cleaning. Robot remains stopped

Dosing pump and/or water valve

Flow-sensor

Measuring container

1 L

T1/T2
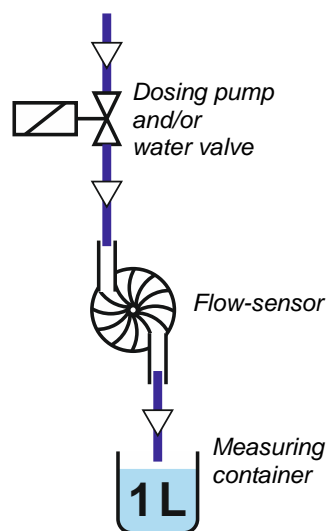
6.6.4 Testing / determining the number of pulses of the flow sensors per litre

To determine the number of pulses of each flow sensor, proceed as follows:

- Connect a hose to the first flow sensor and insert the other end into a measuring container.
- Go to the o.-parameter level by entering code '10E5'.
- Select the appropriate flow sensor [o.81 to o.85] with the arrow keys.
    - o.81 => Detergent alkaline
    - o.82 => Detergent acidic
    - o.83 => Disinfectant
    - o.84 => Cold water
    - o.85 => Warm water
- Activate the selected parameter with the SET button
- Reset the displayed number of pulses by pressing the 'Cool' key.
- By pressing the 'cleaning' key, the corresponding dosing pump can now be activated or the water valve opened. Keep the 'cleaning' key pressed until the measuring container is filled up to the 1-litre mark - and then release the key.

    The display now shows the number of pulses per litre.
- Record the number of pulses displayed and enter them in the corresponding L-parameter [L121...L125].
- Now repeat the procedure described above for each additional flow sensor.

TIP: If you do not have a 1-litre measuring container available, you can also use a bucket with a defined filling quantity, for example. The number of pulses displayed must be converted to pulses per litre.

7. Tank monitor and general fault handling

7.1 Description of tank monitor operation

IMPORTANT: *After the initial installation the tank monitor works reliably only <u>after one or two cooling cycles</u> (learning of the tank processes).*

Trouble-free operations during this time are important!

Der During the entire cooling and cleaning process, the built-in tank monitor keeps check on the correct operation of all processes, in order to guarantee the perfect state of the milk. Faults are displayed flashing in the display via corresponding fault codes. Depending on the type of alarm, two LEDs (red and green) are flashing or lit.

In the case of errors which may jeopardise the milk quality, the problem is indicated by a red LED as a "<u>critical alarm</u>". In this case milk must not be added to the tank before a careful check has been carried out.

In the "F" parameters (see section 8.10), a system alarm, an informative alarm or a critical alarm is defined for each fault. It is also parameterized, whether a relay function or an SMS message should be carried out. For this to take effect, the relay functions in the "A" parameters (see section 8.11) must be assigned to a relay or the SMS function must be activated.

The tank monitor of the WTS-300 has the following alarm types:

Critical tank monitor alarms (red LED + fault code in the display)
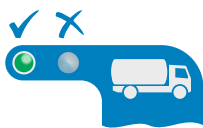
During cooling:	- min. and max. milk temperature
	- agitator function and stirring intervals
	- duration of power failure
	- milk temperature too high for too lon
During cleaning:	- cleaning temperatures
	- wash duration

Informative tank monitor alarms (green LED + fault code in the display)
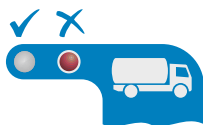
During cooling:	- milk temperature too high for too long
	- milk temperature too low
	- agitator failure and stirring times
	- max. time till next wash
	- duration of power failure
During cleaning:	- cleaning temperatures
	- detergent injection and acting time

Additional WTS-300 system alarms (only fault code in the display)
(depending on parameter settings, may be both critical and informative)

A list of all alarms and a description of how they are configured can be found in section 8.10 "Alarm -> Event assignment".

During cooling:	- Cooling time for first milking
	- broken sensor
	- sensor short-circuit, etc.
During cleaning:	- monitoring of butterfly valve, cleaning pump, etc.
	- water intake and outlet times,
	- heating times, etc.

Optical presentation of alarms
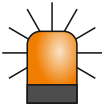
External alarm light:

In addition to the red LED, an external alarm light can optionally be connected to one of the relay outputs.

See also parameter [A47].
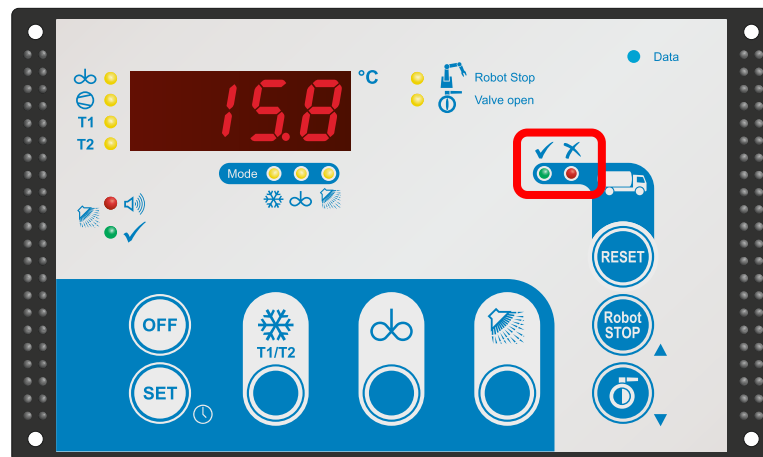
🟢 ⚪		No alarm

Each alarm has its own display code (see section 7.5 for listing)

Informative and critical alarms are also indicated by LED as follows:

Informative alarm

🟢 ⚪		active informative alarm (Green permanently again after RESET)

Critical alarm

⚪ 🔴	active critical alarm
⚪ 🔴	critical alarm after RESET (Turns off when cleaning cycle runs for at least 10 minutes ...)

Informative and critical alarm
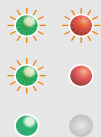
🟢 🔴	active critical + informative alarm
🟢 🔴	critical + informative alarm - 1x RESET
🟢 ⚪	critical + informative alarm - multiple RESET *If several alarms are present, the reset button must be pressed several times. See section 7.3* (Turns off when cleaning cycle runs for at least 10 minutes ...)

System alarm

F34	Is displayed as a blinking display code only.

7.2 Tank monitor: Milk removal YES or NO

Examples of use of tank monitor.

CAUTION:

⚠ WARNING

Do not simply cancel a tank monitor alarm.

It is essential to investigate and remedy the cause, in order to avoid a harmful effect on the milk.

Even without an alarm message, the plant operator has to convince himself of the transportability of the milk before picking up!!

No alarm – **Milk may be drawn off.**

✓ ✗	Green = on Red = off	No alarm

- The driver goes to the WTS-300 and checks the tank monitor.
  If the green LED is on, milk may be drawn off.
- Once the milk has been taken, the driver starts the cleaning process.

Informative alarm – **Milk may be drawn off.**

✓ ✗	Green = flashing Red = off	Informative alarm (Press RESET button)	RESET RESET
after RESET			
✓ ✗	Green = on Red = off	Informativer Alarm	
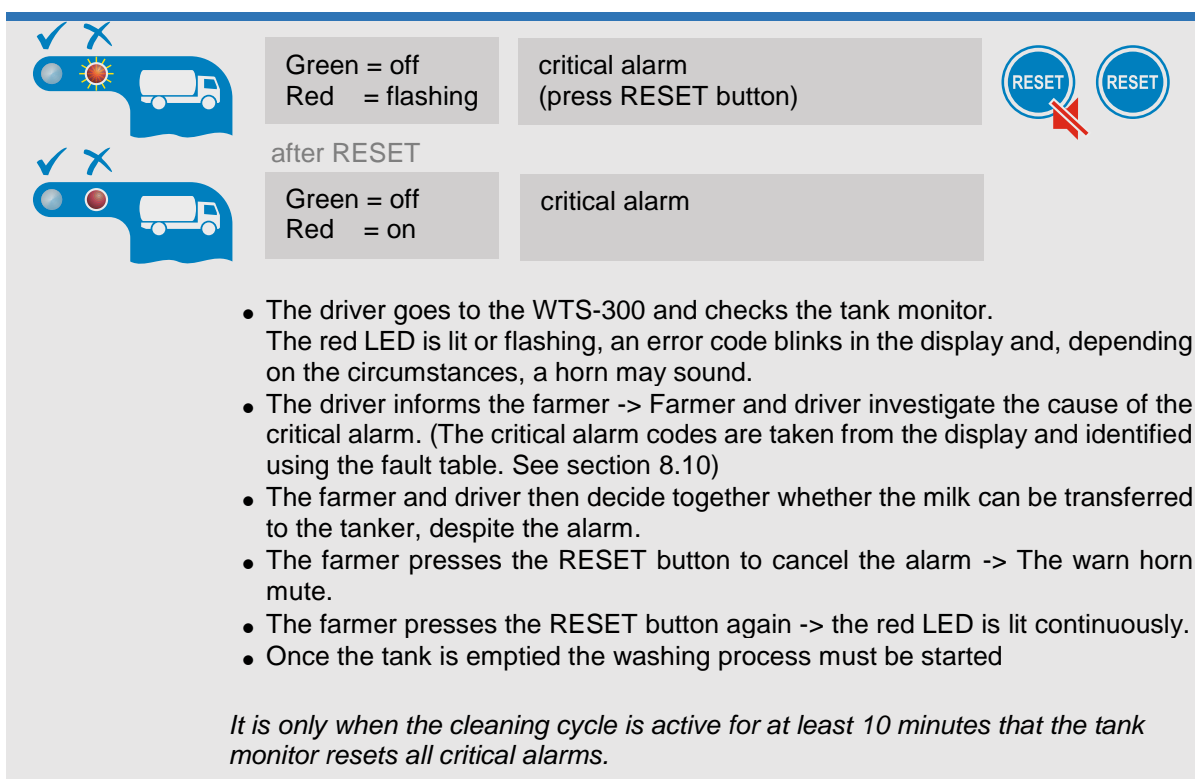
- The driver goes to the WTS-300 and checks the tank monitor.
  The green LED is flashing - the warn horn sounds - an error code is displayed.
  Milk can be drawn off -> The farmer must be informed.
- The farmer investigates (and remedies) the cause of the fault and presses the "RESET" button -> the warn horn mute.
- The farmer presses the "RESET" button again -> the green LED is now on continuously.
  (The informative alarm is accepted and deleted with the pushbutton.)
- Once the milk has been taken, the driver starts the cleaning process.

NB:

If the informative alarm is not reset, the green LED flashes and the error code continues to be displayed -> even after the next cleaning cycle.
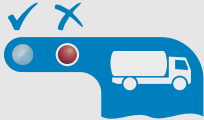
7. Tank monitor and general fault handling

Section 7.2: Tank monitor: Milk removal YES or NO

Critical alarm - **Milk must not be taken out.**
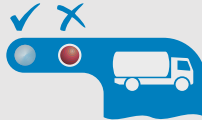
Green = off Red = flashing	critical alarm (press RESET button)	
after RESET		
Green = off Red = on	critical alarm	

- The driver goes to the WTS-300 and checks the tank monitor.
  The red LED is lit or flashing, an error code blinks in the display and, depending on the circumstances, a horn may sound.
- The driver informs the farmer -> Farmer and driver investigate the cause of the critical alarm. (The critical alarm codes are taken from the display and identified using the fault table. See section 8.10)
- The farmer and driver then decide together whether the milk can be transferred to the tanker, despite the alarm.
- The farmer presses the RESET button to cancel the alarm -> The warn horn mute.
- The farmer presses the RESET button again -> the red LED is lit continuously.
- Once the tank is emptied the washing process must be started

It is only when the cleaning cycle is active for at least 10 minutes that the tank monitor resets all critical alarms.

Section 7.2: Tank monitor: Milk removal YES or NO

Critical + informative alarm - **Milk must not be taken out.**

	Green = flashing Red = flashing	critical + informative alarm (press RESET button)	
after RESET	Green = flashing Red = on	critical + informative alarm (press RESET button)	
after second RESET	Green = off Red = on	critical + informative alarm	

- The driver goes to the WTS-300 and checks the tank monitor.
  Green and red LEDs are flashing, an error code blinks in the display and, depending on the circumstances, a horn may sound
- The driver informs the farmer -> Farmer and driver investigate the cause of the critical and informative alarms. (The critical alarm codes are taken from the display and identified using the fault table. See section 8.10)
- The farmer and driver then decide together whether the milk can be transferred to the tanker, despite the alarm.
- The farmer first presses the RESET button to cancel the critical alarm -> the horn switches of.
- The farmer presses the RESET button again -> the red LED is lit continuously.
- The farmer then cancels the informative alarm -> the green LED turns off.
- Once the tank is emptied the washing process must be started.

It is only when the cleaning cycle is active for at least 10 minutes that the tank monitor resets all critical alarms.

7.3 Tank monitor: Handling multiple faults
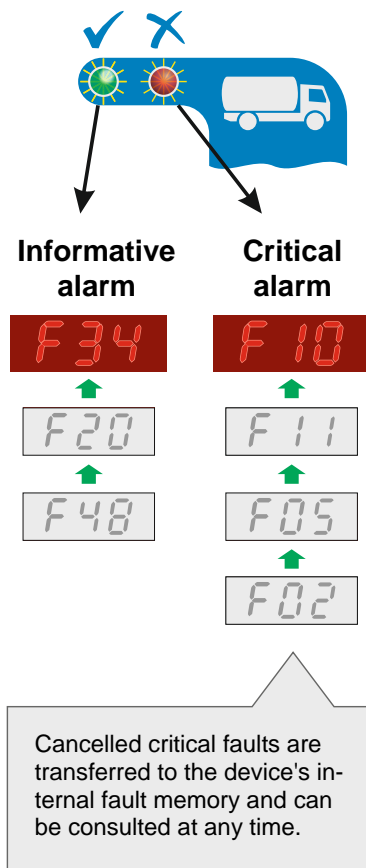
For every alarm - whether informative (green) or critical (red) – an error code blinks in the display.

If several faults occur simultaneously, the code for the most recently occurring fault blinks in the display.

If both informative and critical faults occur, priority is always given to the critical error code (in the example this would be fault F10)

Exception in cooling mode: sensor faults flash alternately with critical or informative alarms.

Informative alarm   **Critical alarm**

F34   F10

F20   F11

F48   F05

F02

Cancelled critical faults are transferred to the device's internal fault memory and can be consulted at any time.

Cancelling faults: (both LEDs flash alternately)

- The most recently occurring fault (example F10) blinks in the display.

  Press RESET button -> The horn switches off, the most recently occurring fault (example F10) continues to blink in the display.

- Identify the fault using the list of faults -> Press RESET button ->

  the red LED continues to flash in order to indicate that there are further critical faults.

- The next fault (in the example F11) blinks in the display:

  Identify the fault using the list of faults -> Press RESET button -> etc.

When the last critical fault (example F02) has been reset: (red LED permanently lit)

- Der The first informative fault (example F34) blinks in the display:

  Identify the fault using the list of faults -> Press RESET button ->

  The green LED continues to flash in order to indicate that there are further informative faults.

- The next informative fault (example F20) flashes in the display...

When the last informative fault has been reset, the green LED goes out, while the red LED stays on permanently.

It is only when the cleaning cycle is active for at least 10 minutes that the tank monitor resets all critical alarms.

7.4 Tank monitor: Display fault memory

If the tank monitor's red LED is permanently lit, it means that critical faults have already been acknowledged, but still exist. These error codes are registered in the device's internal fault memory and can be consulted as follows:

Show the last 5 critical faults from the fault memory

- SET button in OFF mode: the code for the first critical fault is displayed (in the above example F02).

- SET button again: the next error code is displayed (in the example F05).

If no button is pressed for 3 seconds, the display switches back to the time.

It is only when the cleaning cycle is active for at least 10 minutes that the tank monitor resets all critical alarms.

7.5 Listing fault codes and their description

Faults are shown flashing on the display.

Here mean:
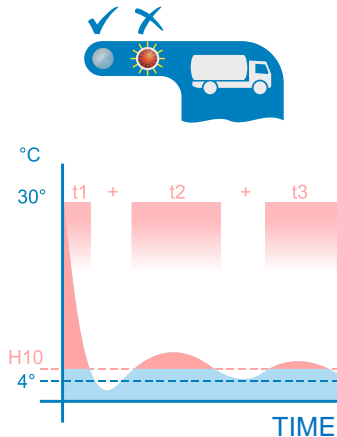
7.5.1 Critical tank monitor alarms (red)

F1 **Milk temperature too high for too long 1**

If during cooling mode the milk temperature exceeds the temperature limit value entered in [H10] for longer than the time entered in [H11], fault report F1 appears.

H11 here is the limit value for the sum of all time overshoots (t1, t2, t3 etc.)

F2 **Milk temperature too high for too long 2**

as F1, but relating to [H12 and H13]

F3 **Milk temperature too high for too long 3**

as F1, but relating to [H14 and H15]

F6 **Power cut alarm**

Alarm functions only if optional power pack is installed.

Alarm is triggered if power cut lasts longer than the time entered in parameter [H20].

F11 **Minimum washing temperature not reached**

Alarm is triggered if, in the main washing stages, the minimum water temperature selected in [H30] is not reached.

F12 **Minimum acting time not reached**

Alarm is triggered if, in the main washing stages, the minimum water temperature selected in [H30] has not had enough time to act.

Minimum acting time = [H31]

F15 **Agitator fault in cooling mode (milk not stirred)**

Alarm functions only if optional "Welba agitator monitor" is installed and parameters set [A71].

Alarm occurs after the cooling mode is started, if a backpressure by the milk has not been detected on the stirrer within the time [H40].

F16 **"No stirring" time exceeded**

Alarm functions only if optional "Welba agitator monitor" is installed and parameters set [A71].

Alarm is triggered if, after the previous stirring, more than the number of minutes set in [H41] have passed without the agitator restarting.

7.5.2   Informative tank monitor alarms (green)

F20   Cooling time exceeded for first milking
Alarm is triggered if the temperature set in parameter [h20] is not reached within the time set in parameter [h21].
The time starts when cooling of the first milking starts.

F22   Forgotten to switch on the cooling
At the milking time [h41-h43] entered, the cooling was not switched on.

F23   Milk temperature too high for too long
Same as for faults F1 - F3. Setting in parameter [h23 / h24]

F25   Excess temperature directly
When cooling starts, this alarm remains inactive until the milk temperature falls below the temperature set in [h20] for the first time. It is at this point that milk temperature monitoring starts. If the milk temperature subsequently exceeds the temperature set in [h25], the alarm is triggered.

F26   Maximum compressor running time exceeded
Alarm occurs when the total running time of all compressors during a cooling cycle exceeds the time entered in [h26].

F27   Milk temperature too low for too long
The alarm is triggered if the milk temperature is too low [h27] for too long [h28]. The timer starts when the temperature falls below [h27] and stops again when the temperature exceeds [h27]. The timer restarts each time the temperature is exceeded.

F29   Low temperature directly
The alarm is triggered as soon as the milk temperature falls below the temperature set in [h29].

F30   Power cut directly
The alarm can function only if the optional power pack is installed. Regardless of the operating mode, the alarm is triggered in the event of a power cut.

F31   Max. time without cooling (starts when cooling manually ends)

Safety function! (This is to prevent that after manual interruption of the cooling mode is forgotten, to reactivate it or to start the cleaning after the milk removal.)

Timer starts as soon as cooling mode is switched off manually. The alarm is triggered if a new cooling period or washing cycle is not started within time [h31].

F32   Max. time without cooling (starts when washing ends)

Safety function! (designed to ensure that the operator does not forget to start cooling mode after washing.)

Timer starts as soon as washing mode ends. The alarm is triggered if a new cooling period or washing cycle is not started within time [h32].

F33   min. cleaning interval
Alarm is triggered, if a new cleaning does not take place within the time [h33]

F34   Time / date not set
The alarm is triggered if the date and time are lost.

F35 **Fault detergent "alkaline"**

When the optional float switch is installed and configured [h35]:
- reports empty detergent tank

When the optional pulse counter is installed and configured [L112]:
- reports when no detergent is flowing in

F36 **Fault detergent "acidic"**

When the optional float switch is installed and configured [h36]:
- reports empty detergent tank

When the optional pulse counter is installed and configured [L112]:
- reports when no cleaning agent is flowing in

F37 **Fault disinfectant supply**

Only if the optional pulse counter is installed and configured [L112]:
- reports when no disinfectant is flowing in

F38 **Exceeding of temperature difference, monitoring sensor**
The alarm can function only if the optional monitoring sensor is installed and parameters set.

The alarm is triggered as soon as the temperatures differ by value [h38].

F39 **Battery voltage too low**
The alarm is triggered if the battery charge is no longer sufficient.

Check batteries – exchange or charge them, if necessary. See also section 9.7.

7.5.3 System alarms - cleaning

When a washing cycle has been completed successfully, this is indicated by the green LED "OK". A new mode can then be started.

If a **system-critical** fault occurs during a washing cycle:

- the cycle is interrupted, the red LED "Fault" flashes, the yellow mode indication "Wash" remains permanently lit. A code in the display indicates the type of fault.

  Press down OFF button for 3 seconds and acknowledge the fault message.

  NB: If "Automatic start to cooling" has been set, this will not happen. Cooling mode must be started manually in this special case.

OFF

3 sec.

or

If a **system-noncritical** fault occurs during a washing cycle:

- the cleaning cycle continues to the end, the yellow "Cleaning" mode indicator remains lit until then.

  After the cycle has ended, the controller switches to the OFF mode or, with the "Autostart cooling" parameterized, to the cooling mode.

  A code in the display indicates which error has occurred. This must be acknowledged with the reset button.

F40 **Safety switch for butterfly valve** (only if [r10] = 2)

  - washing stops
  - outlet valve is opened for time [n100]
    (during the emptying phase the display alternates between F40 and AbL)
  - the red LED "FAULT" then flashes, with error code F40

  During washing the digital input for the tank outlet safety switch [r10] was triggered.

  Possible cause of fault:
  - manual butterfly valve on tank outlet was closed..

F41 **Pressure switch for cleaning line**

  - washing stops
  - outlet valve is opened for time [n100]
    (during the emptying phase the display alternates between F41 and AbL)
  - the red LED "FAULT" then flashes, with error code F41

  During cleaning the pressure switch has not recognised pressure for a period longer than that set in [r11].

  Possible cause of fault:
  - leak in washing line
  - pressure switch faulty
  - air in washing line
  - washing pump faulty

F42 **Thermal contact for washing pump**

  - washing stops
  - outlet valve is opened for time [n100]
    (during the emptying phase the display alternates between F42 and AbL)
  - the red LED "FAULT" then flashes, with error code F42

  During washing the thermal contact of the washing pump has triggered (if parameter set in [r12].

  Possible cause of fault:
  - Cleaning pump overheated.

F43   **Washing aborted manually**

- washing stops

- outlet valve is opened for time [n100]
  (during the emptying phase the display alternates between F43 and AbL)

- the red LED "FAULT" then flashes, with error code F43

Washing was stopped manually using the OFF button.

Note: press OFF button again to stop the draining phase ahead of time.

(OFF)

F44   **Timeout for water intake by level / pulse counter**

- washing stops

- outlet valve is opened for time [n100]
  (during the emptying phase the display alternates between F44 and AbL)

- the red LED "FAULT" then flashes, with error code F44

Possible cause of fault:
- Water valve faulty
- No pressure in water pipe
- Water circuit damaged / interrupted

F45   **Water in tank after emptying**

- level electrode reports water
- the red LED "FAULT" flashes

At the end of the draining phase there is still water in the tank.

Possible cause of fault:
- Water valve has not closed / is faulty
- Draining phase set too short

Function is activated in parameter [r33].

F46   **Water intake monitoring**

- washing completed
- fault is shown in the display

Before the expiration of the minimum water intake time, the level electrode reports the water level.

Possible cause of fault:
- Level electrode defective or incorrectly connected.

F48   **Timeout for heating for washing**

- washing completed
- fault is shown on the display

During the heating phase the pre-set temperature [n106 / n107 / n108] was not reached within the pre-set time [r37].

Possible cause of fault:
- Heater faulty
- Pressure switch has triggered
- Water circuit damaged / interrupted

F49   **Excess temperature monitor for heater**

- washing completed
- fault is shown on the display

During washing the heater's dry-running protection has triggered (if set in [r39]).
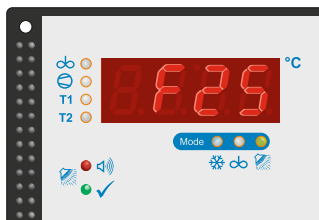
7.5.4 System alarms - cooling

F51 Tank overflow protection

Fault is displayed, when the maximum filling quantity of the tank has been achieved. See section 10.7

F52 Water in tank during cooling

In cooling mode, water has been detected in the washing line through one of the level inputs.

Possible cause of fault:
- one of the water valves open

Parameters set in [P40] to determine whether only a fault report blinks in the display or whether the outlet valve of the washing line is also opened.

F53 Thermal protection or fault monitoring compressor

The compressor's motor protection has triggered.

Possible cause of fault:
- Compressor overheated / faulty

F54 Monitoring agitating unit (directly)

The alarm can only be triggered if an agitator monitoring is parameterised in parameter [P24 or P25].

Alarm is triggered when one of the following agitator faults is detected:

- no agitating unit activity, although agitator was switched on.
- agitating unit activity, although agitator was not switched on.
- Fault contact of the frequency converter triggered

ATTENTION: Depending on the setting in parameters [P24 or P25], ONLY fault message F54 is displayed - or the compressor is also switched off. If this is the case, it must be ensured that an alarm is noticed!!!!

*Tip: **use** optional ESIPM-001 or ESGSM-001!*

F55 Timeout quantity-dependent cooling start

Timeout compressor downtime (in case of "milk-volume-dependent cooling start delay"). See also parameter [P55].

Alarm is only active if parameter [P61] is parameterized to 6 or 7.

F56 Broken sensor

The control unit is not receiving any signals from the sensor.

Possible cause of fault:
- Temperature sensor faulty
- Sensor cable damaged

Function "EMERGENCY cooling" is possible, if parameters set in [P4].

Consequence:
-    Defective temperature sensor
-    Sensor cable damaged

The "EMERGENCY cooling" function is possible if parameterized in [P4].

Consequence::
-    in OFF mode: - fault code F56 is indicated
-    in cooling mode: - fault code F56 is indicated,
                            - compressor is switched off,
                            - alarm is indicated and stored
-    in cleaning mode: - fault code F56 is indicated,
                            - heating is stopped,
                            - cleaning continues, cleaning fault

F57 Sensor short circuit

as F56, but fault code F57 is displayed.

F58 Sensor range exceeded

Sensor reports upward or downward exceeding of measuring range as F56, but fault code F58 is displayed.

WARNING

7.5.5 System alarms - external sensors

F60 **Error agitator monitoring**

- no communication with the agitator monitoring module
See also section 9.8

F61 **Error ESGSM modem / ESIPM modem**

- no communication with the ESGSM or ESIPM modem

F62 **Error I/O expansion module**

- no communication with the I/O extension module

7.5.6 System alarms in general

F80 **Low pressure error**

Error is displayed if a low pressure malfunction is detected at the low pressure input (optionally programmed)..

F81 **High pressure error**

Error is displayed if a high pressure malfunction is detected at the high pressure input (optionally programmed).

F82 **Fault "external fault"**

Fault is displayed if a corresponding signal is present at the digital input [A21..A33] defined as a fault indicator. Thus, external system components can be monitored.

F83 **Malfunction 4-20 mA**

Error is displayed if an input current < 4 or > 20 mA is detected at the activated current input 4-20 mA.

An activated antifreeze function [A54 = 2] is temporarily deactivated in the event of an error.

F85 **Phase error**

Error is displayed when the power module ESVAW-003 (if available) detects a phase error.

Depending on the parameterization of the parameter [A85], the cleaning is aborted in the event of a phase error.

7.5.7 Test alarm

F99 **Test alarm** (see section 9.5)

8. Setting of parameters

8.1 Change and save parameter values

The WTS-300 is configured in 11 different parameter levels.

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

CODE

Working level for normal daily operation	
General cooling parameters	code: C212
Extended cooling parameters	code: D345
General cleaning parameters	code: B454
Extended cleaning parameters 1	code: C567
Extended cleaning parameters 2	code: D432
Service parameters	code: EA03
General tank monitor parameters	code: 4711
Extended tank monitor parameters	code: F94A
Alarm configuration	code: FFFF
Configuration	code: A384
I/O test parameters	code: 10E5

Enter the level code

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

- Press the "OFF" button for 5 seconds:
  The display shows '0000' - the first '0' flashes.
- Use the arrow keys to set the first digit or letter of the desired code
- Confirm the correct digit with "SET".
  The set digit has been accepted - the second '0' flashes.
- Use arrow keys to set the second digit.
- Set third and fourth digits as well:
  The first parameter of the selected level now appears.

If an incorrect code is entered, the control switches back to the OFF mode.
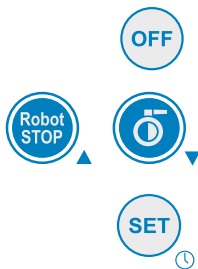
Display parameter value:
- Use the arrow keys to select the desired parameter.
- Press the "SET" button: The parameter value is displayed

Change parameter value:
- Use the arrow keys to select the desired parameter.
- Hold down the "SET" button and use the arrow buttons to set the desired value. (If the arrow buttons are held, the value starts to run)

NOTICE

Note:

In order to store the value in the memory, first release the arrow button and then the "SET" button.

Return to working level:

(possible from any parameter)

Standard <u>with</u> saving the values:
- Press both arrow buttons simultaneously. The display shows "STOR" for a short time - changes are accepted. The control switches to the OFF mode - the display shows the current time.

Return <u>without</u> saving the values:
- Press the OFF button – or
- If no button is pressed for 60 seconds:
  The controller automatically returns to the OFF mode. All changes are lost.

8.2 Level "General cooling parameters"   (c parameters)

<table>
<tr><td colspan="2">Working level
for normal daily operation</td></tr>
</table>

C parameters

Code: C212

Switch to level
"General cooling parameters"
see section 8.1

	code
General cooling parameters	code: C212
Extended cooling parameters	code: D345
General cleaning parameters	code: B454
Extended cleaning parameters 1	code: C567
Extended cleaning parameters 2	code: D432
Service parameters	code: EA03
General tank monitor parameters	code: 4711
Extended tank monitor parameters	code: F94A
Alarm configuration	code: FFFF
Configuration	code: A384
I/O test parameters	code: 10E5

			Range	*Default*
	Temperature settings			
c1	**Target temperature for T1**		*Setting range*	*4,0*
c2	**Target temperature for T2**		*defined in*	*4,0*
	The target temperature is the temperature to which the milk is to be cooled down. When the target temperature is reached the compressor switches off. See diagram.		*parameters [P10..P13]*	
c10	**Hysteresis for target temperature 1**		*Setting range*	*0,7*
c11	**Hysteresis for target temperature 2**		*defined in*	*0,7*
	The hysteresis determines the amount by which the milk temperature is allowed to differ from target temperature T1 or T2 before the cooling compressor is switched on again. See diagram.		*parameters [P15..P18]*	
	Agitator running time settings		*Range*	*Default*
c20	**Duration of after-stirring**		*0 .. 999 sec.*	*120*
	Period in seconds for which the agitator continues to operate after compressor is switched off.			
c21	**Pause duration**		*0 .. 999 min.*	*20*
	Period in minutes between agitator switching off and switching on again (for the duration of the after-stirring period selected).			
c23	**Duration of 'intermediate stirring SHORT'**		*0 .. 999 min.*	*2*
	Period in minutes during which the agitator operates if the UP arrow button is pressed for <u>approx. 1 second</u> during a cooling pause.			
c24	**Duration of 'intermediate stirring LONG'**		*0 .. 999 min.*	*10*
	Period in minutes during which the agitator operates if the UP arrow button is pressed for <u>approx. 3 seconds</u> during a cooling pause.			
c25	**Maximum continuous stirring period in mode 'continuous stirring'**		*0 .. 999 min.*	*30*

	Setting of maximum continuous stirring period.
	   0: indefinite stirring
	      (to end, the OFF button must be pressed)
	   1..999: max. stirring period in minutes			

Target-temperature
T1
Target-temperature
T2
0°

Hysteresis for T1

Hysteresis for T2

Sensor correction adjustment   *Range*   *Default*

(see section 9.3)

c90   **Display actual temperature sensor 1**

c91   **Sensor correction sensor 1**   *-10 .. 10 K*
         A correction can be applied to the value meas-
         ured by the sensor. Then applies it cumulatively
         throughout the entire measurement range.

c92   **Display actual temperature sensor 2**
         (hidden if A50 = 0)

c93   **Sensor correction sensor 2**   *-10 .. 10 K*
         (hidden if A50 = 0)
         A correction can be applied to the value meas-
         ured by the sensor. Then applies it cumulatively
         throughout the entire measurement range.

Software version

c98   **Installed software version**
         The software version installed is shown to help
         service technicians.

8.3 Level "Extended cooling parameters" (P parameters)

Working level for normal daily operation	
General cooling parameters	code: C212
Extended cooling parameters	code: D345
General cleaning parameters	code: B454
Extended cleaning parameters 1	code: C567
Extended cleaning parameters 2	code: D432
Service parameters	code: EA03
General tank monitor parameters	code: 4711
Extended tank monitor parameters	code: F94A
Alarm configuration	code: FFFF
Configuration	code: A384
I/O test parameters	code: 10E5

P parameters

Code: D345

Switch to level
"Extended cooling parameters"
See section 8.1

EMERGENCY COOLING, behaviour on sensor failure	*Range*	*Default*
P4 **Manual start of compressor for x min. in case of sensor failure.** *Function see 10.3*	*0 .. 60 min.*	*0*

Compressor protection when filling from below	*Range*	*Default*
P6 **Compressor switch-on delay / pre-agitating** *Function see section 9.15.2* 0: Function deactivated 1 to 180: Time delay compressor in sec.	*0 .. 180 sec.*	*0*

Limit setting for set temperatures and hysteresis	*Range*	*Default*
Setting of limitations for target temperatures and hysteresis in C parameter level.		
P10 Lower limit for target temperature T1 - for C1	*0 .. 50,0 °C*	*2,0*
P11 Upper limit for target temperature T1 - for C1	*0 .. 50,0 °C*	*8,0*
P12 Lower limit for target temperature T2 - for C2	*0 .. 50,0 °C*	*2,0*
P13 Upper limit for target temperature T2 - for C2	*0 .. 50,0 °C*	*8,0*
P15 Lower limit for hysteresis T1 - for C10	*0,1 .. 30,0 K*	*0,1*
P16 Upper limit for hysteresis T1 - for C10	*0,1 .. 30,0 K*	*2,0*
P17 Lower limit for hysteresis T2 - for C11	*0,1 .. 30,0 K*	*0,1*
P18 Upper limit for hysteresis T2 - for C11	*0,1 .. 30,0 K*	*2,0*

Agitator settings	*Range*	*Default*
P22 **Function intermediate stirring** *see section 5.6.3* 0: deactivated 1: short / long 2: toggling by button	*0 .. 2*	*1*
P23 **Automatic start to continuous stirring when cooling mode ends** *see section 10.1.1* 0: deactivated 1: activated	*0 .. 1*	*0*

Section 8.3: Level "Extended cooling parameters"   (P parameters)

		Range	Default
		0 .. 2	*0*

ATTENTION with P24

If selection "2" is activated for P24, it must be ensured that an alarm is noticed!!!!!!

(Use the optional ESIPM or ESGSM!).

P24 **Status monitoring agitator (direct)** (F54) **via monitoring module, agitator sensor or switching contact** related to setting in [A71] *(see also section 7.5.4)*   *0 .. 2*   *0*

0: deactivated
1: ONLY fault message when ONE of the agitators fails
2: Fault message + shutdown compressor in case of a shutdown of at least 50% of all agitators

ATTENTION with P25

If the selection "3 or 4" is activated for P24, it must be ensured that an alarm is noticed!!!!!

(Use optional ESIPM or ESGSM!)

P25 **Fault monitoring agitator (direct)** (F54) **via fault contact of motor protection switch for example, Klixon etc.** *(see also section 7.5.4)*   *0 .. 4*   *0*

Precondition:
- Input function 35 must be assigned to one of the digital inputs [A21..A33].

0: deactivated

Fault message only
1: High-active   (fault, when contact is closed)
2: Low-active   (fault, when contact is opened)

Fault message and shutdown of compressor in case of a fault
3: High-active   (fault, when contact is closed)
4: Low-active   (fault, when contact is opened)

Automatic agitating before next pickup	*Range*	*Default*

P28 **Automatic pre-stirring prior to next collection** *see also section [E40 + E41]*   *0 .. 72 h*   *0*

0:      deactivated
1..72: x-hours after start of last cleaning an automatic stirring is activated

P29 **Limitation of running time.**   *0,1..10,0 h*   *4,0*

Pre-stirring stops after the set time if there is no milk collection with a subsequent cleaning.

8. Setting of parameters

Section 8.3: Level "Extended cooling parameters"   (P parameters)

		Range	Default
	Drawing off milk through pneum. butterfly valve in cooling mode		

P32 **Milk removal options**   *0 .. 2*   *0*

(hidden if A40 = 0 or 1)

Function is also operable via external button.

(see parameters A21 – A33- setting 26)

0: Deactivated - not possible to open manually

1: Button function
Opens the butterfly valve directly, for as long
as the button is held down.
The maximum open time can be limited in [P33].

2: Toggle function
Press butterfly valve button for 2 seconds:
Valve opens until button is pressed again (briefly).
The maximum open time can be limited in [P33].

P33 **Max. open time for butterfly valve**   *0 .. 60 sec.*   *5*
For drawing off milk manually

(hidden if A40 = 0 or 1)

0: no time limit on valve being open
1 to 60:   seconds

P34 **Lock the butterfly valve in OFF mode,**   *0 .. 2*   *0*
if robots have not stopped yet

0: Butterfly valve can always be opened
1: can only be opened when robot stopped
2: activated, requires an additional RobotStop
feedback via digital input

Note on [P34] - Selection 2:

Function 34 must be assigned to one of the digital inputs [A21..A33].

Section 8.3: Level "Extended cooling parameters"   (P parameters)

	Range	*Default*

"Milk decanting function" for buffer tanks

With the decanting function, it is possible to use the rinsing pump (at the same time the milk pump) or via a switching valve to fill milk into another tank. Decanting can only be started in OFF mode using an external button on the digital input.

Settings:

Start decanting function =>   via dig. input signal of approx. 5 seconds
                                parameter [A21-A33] = 22

End decanting function =>
  - via external float switch   parameter [A21-A33] = 23
                                       parameter [P36] = 1 or 2
  - or time-controlled   parameter [P36] = 3
  - or via internal level input   parameter [P36] = 4

P36   Setting milk decanting function   *0 .. 4*   *0*

0: Deactivated

1*: End level-controlled "high-active" via external float switch at digital
    input (if there is a signal, pumping is stopped))

2*: End level-controlled "low-active" via external float switch at digital input
    (if there is no signal, pumping is stopped)

3: End time-controlled (pumping time = [P37])

4*: End level input 2
    (if electrode no longer detects milk, pumping is stopped.)

* with Timeout [P37]

P37   Maximum pumping time or Timeout   *1,0..50,0 min.*   *10,0*

P38   possibilities premature stop decanting   *0 .. 3*   *0*
function and AUTOSTART cleaning

with premature stop option

0:*   - premature stop possible by repeated pressing of the
          external button
        - no Autostart of the cleaning after successful decanting

1:*   - premature stop possible by repeated pressing of the
          external button
        - Autostart of the cleaning (after successful decanting)

without premature stop option

2:      - no premature stop possible
        - no Autostart of the cleaning after successful decanting

3:      - no premature stop possible
        - Autostart of the cleaning (after successful decanting)

* Parameter [A21..A33] must be parameterized to 22
(decanting function start button).

8. Setting of parameters

Section 8.3: Level "Extended cooling parameters"   (P parameters)

		Range	Default
	Alarm "Water detection in cleaning pipe"		

Alarm / prevention of water intake into tank during
cooling mode *(see also section 10.4)*

P40 **Alarm activation level monitoring 1 / 2 in cooling mode**   *0 .. 4*   *0*

If the level electrode detects water in the
cleaning pipe during cooling mode:

0: deactivated = no consequence
1: activates fault indication [F52] when level 1 is reached
2: as 1, plus outlet valve 1 opens
3: activates fault indication [F52] when level 2 is reached
4: as 3, plus outlet valve 1 opens

		Range	Default
	Alarm „tank overflow protection"		

Explanation see section 10.7

P42 **Activation tank overflow protection**   *0 .. 4*   *0*

0: deactivated

1: Level switch "tank full" – signal applied = alarm

2: Level switch "tank full" – no signal = alarm

3: In case of activated litre recording [A54]:
    Achievement of litres [P43] entered, triggers alarm.

4: Detection at level input 2 triggers alarm.

P43 **Maximum filling quantity in litre**   *0 .. 500*   *100*
input in hectolitres (=100 l)
0...500 (is equivalent to 0 to 50.000 litres)

Section 8.3: Level "Extended cooling parameters"   (P parameters)

Milk-volume-dependent cooling start delay
(Cooling power reduction in case of robot operation)

| Compressor | OFF | ON | OFF | ON | OFF | ON | OFF |

calculated running time see [P53]

[P54]

first start compressor [P51] *50 litres*
restart compressor [P53] *20 litres*
restart compressor [P53] *20 litres*
Switch over to regular cooling mode

Cleaning *
Kühlmodus *

* Setting in [P61]
6: START Cooling mode
7: START Cleaning mode

-------- > [P55] minutes = alarm

		Range	Default
P50	**Capacity of the milk pump in litres / minute**	*1,0 .. 99,9*	*30,0*
	Is needed to calculate the milk quantity in the tank from the measured pump running time.		
P51	**Minimum milk quantity in the tank before compressor starts for the first time**	*10 .. 300 ltr.*	*50*
	Prevents the freezing of small amounts of milk in the tank.		
	The compressor running time from this point is calculated from [P52 and P53]		
P52	**Compr. running time per X litres milk quantity** in connection with parameter [P53]	*10 .. 500 sec.*	*60*
P53	**Milk quantity in connection to compressor running time**	*10 .. 99 ltr.*	*20*
	Example based on the default values: per **20 liters** of milk the compressor runs **60 seconds =** 70 litres of milk = 210 seconds compressor running time		
P54	**Minimum milk quantity in the tank until switching to regular cooling operation**	*10 .. 999 ltr.*	*200*
P55	**Error message if no milk feed is detected for X minutes from the last stop of the compressor** (a switchover to the regular cooling mode does not take place)	*0. 999 min.*	*60*
P56	**Behaviour in case of fault** (P55) **"no milk intake"** 0: ONLY fault message 1: Fault message and change to regular cooling 2: ONLY change into regular cooling	*0 .. 2*	*0*
P57	**Post-cooling** if no milk intake is detected for the time entered, the compressor is switched on for the time set in parameter [P58].	*0 .. 999 min.*	*0*
P58	**Running time for post-cooling** The specified cooling time is indicated together with the time accumulated up to that point.	*0,5 .. 15,0 min.*	*2,0*

For the parameterization of the „milk-volume-dependent cooling start delay", please see parameter [P61] and section 10.2 as well.

Regular cooling =
temperature-dependent cooling operation

8. Setting of parameters

Section 8.3: Level "Extended cooling parameters"   (P parameters)

> See section 10.2 for the setting of cooling start parameters
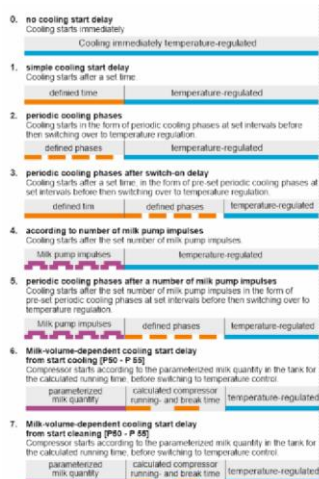
Cooling start settings		*Range*	*Def.*
P60	**Auto start cooling mode after successful cleaning** *see also section 10.1.2.*	*0 .. 1*	*0*

0: Auto start deactivated
1: Auto start activated (in case of successful cleaning)

P61	**Variations of the cooling start delay**	*0 .. 7*	*0*

0: deactivated (without cooling start delay)
1: simple cooling start delay
2: Interval cooling boosts (power reduction by cycles)
3: Interval cooling boosts after switch-on delay
4: Start cooling according to number of boosts of milk pump
5: Interval cooling boosts according to number of impulses milk pump
6: Milk-volume-dependent cooling start delay (from start cooling) [P50-55]
7: Milk-volume-dep. cooling start delay (from start cleaning) [P50-55]]

P62	**Duration of cooling start delay** [P61] = 1 or 3	*1..999 min.*	*30*
P63	**„ON" time cooling boost** [P61] = 2, 3, 5	*1 .. 30 min.*	*5*
P64	**„OFF" time cooling boost** [P61] = 2, 3, 5	*5 .. 60 min.*	*20*
P65	**Number of cooling boosts** [P61] = 2, 3, 5	*1 .. 50*	*5*
P66	**Number of impulses milk pump** [P61] = 4 or 5	*1 .. 100*	*10*
P67	**Timeout delay via milk pump** only if [P61] = 4 or 5	*1..999 min.*	*60*

Safety function: In the absence of milk pump impulses (for example, wire breakage), cooling is started after [P67] has elapsed.

Compressor settings		*Range*	*Def.*
P69	**Compressor mode continuous pulse operation**	*0 .. 1*	*0*

Here can be activated that the compressor works in continuous pulse operation (reduction of the cooling performance)
(after delay of cooling start it uses the times of P63, P64)

0: deactivated
1: activated

P70	**Compressor stop via digital input**	*0 .. 4*	*0*

Possible control of the cooling start by robot.
See section 9.15.3

0: deactivated
1: Signal at the digital input blocks the compressor
2: no signal at digital input blocks the compressor
3: as 1, however, the compressor lock can be stopped
    up to the next cooling start with button "cooling"
4: as 2, however, the compressor lock can be stopped
    up to the next cooling start with button "cooling"

INFORMATION: Assign function 19 to one of the digital inputs [A21..A33]!

Section 8.3: Level "Extended cooling parameters"   (P parameters)

		Range	Def.
P71	**Minimum pause time compressor**	*0..999 sec.*	*120*

Definition of the minimum pause time for the refrigeration compressor. Serves to reduce the switching frequency (oscillation protection) of the compressor. Should also prevent the compressor from starting against pressure. During the pause the compressor LED flashes

		Range	Def.
P72	**Thermo protection and fault monitoring compressor.** See also section 10.9	*0 .. 4*	*0*

The fault monitoring is used to indicate problems during the operation of the compressor.

0: deactivated

Evaluation via motor protection relay or motor protection switch
1: Thermal protection contact "high-active" (fault "F53" when open)
2: Thermal protection contact "low-active" (fault "F53" when closed)

Evaluation via auxiliary contact compressor contactor
3:* Fault monitoring via switch-on feedback from the compressor contactor auxiliary contact (N/O contact).
4:* As selection 3, but switch-on feedback from the compressor contactor auxiliary contact (N/C contact).

   * *When the compressor is switched on, feedback is expected at the digital input of the controller after 60 seconds at the latest. If this feedback is not received, fault "F53" is triggered.*

   Assign a digital input [A21..A33] with function 6 to each compressor.

		Range	Def.
P73	**Method of activation of the 2nd and / or 3rd cooling stage** *Explanations see also section 10.6*	*0 .. 5*	*0*

0: deactivated
1: Delayed after cooling start delay by the time [P74 / P75]
2: Controlled via level sensor
   (Assign a digital input [A21..A33] with function 16, 17 or 18 to each level switch)
3: Filling quantities controlled (litre detection via pressure sensor)
4: Parallel operation (already active in the cooling start delay)
5: As selection 2 - with additional timeout [P74 + P75]

* Parameter [P74 + P75]:

- are used in method 1 as a time delay

- are used as timeout times in method 5

		Range	Def.
P74	**Time delay 2nd cooling level** Start at the end of the cooling start delay	*1..999 min*	*60*
P75	**Time delay 3rd cooling level** Start with activation of the 2nd cooling stage	*1..999 min*	*60*
P76	**Min. fill.-quantity to switch the 2nd cooling level on**	*1..5000 ltr.*	*2000*
P77	**Min. fill.-quantity to switch the 3nd cooling level on**	*1..5000 ltr.*	*4000*
P78	**Mutual switch-on delay of the compressor stages**	*2..25 sec.*	*3*

8. Setting of parameters

Section 8.3: Level "Extended cooling parameters"   (P parameters)

	Settings for target temperature switchover T1 / T2	*Range*	*Def.*
P80	**Settings for target temperature switchover**	*0 .. 4*	*0*

Definition of the "Switch target temperature" function:

0: deactivated (always T1 active)

1: only manual switchover T1 / T2 via button.
Press "Cooling" button in cooling mode to change to the other target temperature.
The corresponding LED lights up.

2*: manual switchover to T2 with switch-back after a period.
Press "Cooling" button in cooling mode: control unit switches to T2 for period [P81] and then back to T1.

3*: Automatic switchover to T2 to programmed times [P82, P83]. Reset to T1 after duration [P81]. (Manual switchover as 2: remains)
If only one time shall be used, [P82] and [P83] have to be set to same time).)

4: Switchover T1 / T2 externally (via digital input)
NOTE: Observe assignment of functions [A21..A33]!

- -

*   *In the case of 2 and 3:*
   - If T1 is active, the LED for T1 is permanently on.
   - If T2 is active, the LED for T2 flashes and shows
     that switch-back to T2 will happen automatically.

P81	**Duration until switch-back to T1** [P80] = 2 or 3	*1 .. 999 min.*	*60*
P82	**Time 1 for automatic switchover to T2** see also [P80]	*00:00 .. 23:59*	*4:00*
P83	**Time 2 for automatic switchover to T2** see also [P80]	*00:00 .. 23:59*	*16:00*

Section 8.3: Level "Extended cooling parameters"   (P parameters)

		Range	Def.
Freezing protection by low pressure monitoring *Explanations see also section 10.8*			

NOTICE

P84 **Selection of sensor type** — Range: 0 .. 2   Def.: 0

0: Pressure detection via analogue input.
Is only active when one of the analog inputs
[A54, A56 or A57] => 2 (low pressure monitoring)
is parameterized.

1: Pressure detection via low pressure switch.
"High-active" – signal at input switches the
compressor off.

2: Pressure detection via low pressure switch.
"Low-active" – no signal at input switches the
compressor off.

NOTE: When recording pressure via the low pressure
switch, function assignment [A21..A33] => 20
(low pressure error input)

P85 has no function when using a low pressure switch!

		Range	Def.
P85	**Pressure trigger limit (pressure too low)**	1 .. 99,9 %	20
P87	**Monitoring delay after start compressor**	10 .. 999 sec.	120
P88	**Switch off time compressor in case of too low pressure**	1 .. 15 min.	10
P89	**Time limit after cooling start**	*0 .. 999 min.*	*0*

0: no limitation

1..999: x minutes after start of the cooling, the low-pressure monitoring
switches off until the next cooling activation takes place.

		Range	Def.
Fault message compressor *Explanations see also section 10.10 and 10.11*			

P90 **Fault message low pressure** (F80) — Range: 0 .. 2   Def.: 0

0: deactivated

Independent of freeze protection

1:* High-active => Signal on digital input triggers alarm
2:* Low-active => NO signal at digital input triggers alarm

In connecction with low pressure monitoring (freeze protection)

3..30 min.:   If the fault message is present for longer than the time set
here after the low-pressure monitoring [P89] has ended with the compres-
sor switched on, the error (F80) is displayed..

P91 **Fault message high pressure** (F81) — Range: 0 .. 2   Def.: 0

0: deactivated
1*: high-active, signal at input triggers alarm
2*: low-active, no signal at the input triggers an alarm

NOTE: Observe function assignment [A21 - A28]!

* Note function assignment [A21..A33]!

8.4 Level "General cleaning parameters"   (n parameters)

Working level for normal daily operation	
General cooling parameters	code: C212
Extended cooling parameters	code: D345
General cleaning parameters 1	code: B454
Extended cleaning parameters 1	code: C567
Extended cleaning parameters 2	code: D432
Service parameters	code: EA03
General tank monitor parameters	code: 4711
Extended tank monitor parameters	code: F94A
Alarm configuration	code: FFFF
Configuration	code: A384
I/O test parameters	code: 10E5

n parameters

Code: B454

Switch to level
"General cleaning parameters"
See section 8.1

			Range	*Default*
Running times cleaning stage 0 (rinse out) - hidden, if [r40] = 0				
n01	Water intake time		0 .. 999 sec.	10
n02	Rinse out time with water intake		0 .. 999 sec.	120
n03	Drain time		0 .. 999 sec.	30
Running times cleaning stage 1 (pre-rinse 1) - hidden, if [r41] = 0				
n10	Water intake by feed container *		0 .. 10	0
n11	Water intake by level 1 **		0 .. 1	0
n12	Water intake by time		0 .. 999 sec.	90
n13	Additional water intake time + circulation		0 .. 999 sec.	0
n14	Main circulation time		0 .. 999 sec.	30
n15	Rinse out time		0 .. 999 sec.	0
n16	Drain time		0 .. 999 sec.	60
Running times cleaning stage 2 (pre-rinse 2) - hidden, if [r42] = 0				
n20	Water intake by feed container *		0 .. 10	0
n21	Water intake by level 1 **		0 .. 1	0
n22	Water intake by time		0 .. 999 sec.	90
n23	Additional water intake time + circulation		0 .. 999 sec.	0
n24	Main circulation time		0 .. 999 sec.	30
n25	Rinse out time		0 .. 999 sec.	0
n26	Drain time		0 .. 999 sec.	60
Running times cleaning stage 3 (main rinse 1)				
n30	Water intake by feed container *		0 .. 10	0
n31	Water intake by level 1 **		0 .. 1	0
n32	Water intake by time		0 .. 999 sec.	120
n33	Additional water intake time + circulation		0 .. 999 sec.	0
n34	Main circulation time		0 .. 999 sec.	120
n35	Rinse out time		0 .. 999 sec.	0
n36	Drain time		0 .. 999 sec.	90

* ***For all*** *"water intake by feed container" the following applies:*

0 = deactivated
1..10 = Number of repetition

** ***Applies to all*** *"water in take by level 1" situations:*

0 = deactivated
1 = activated

Section 8.4:   Level "General cleaning parameters"   (n parameters)

		Range	Def.
Running times cleaning stage 4 (intermediate rinse) - hidden, if [r44] = 0			
n40	**Water intake by feed container** *	*0 .. 10*	*0*
n41	**Water intake by level 1** **	*0 .. 1*	*0*
n42	**Water intake by time**	*0 .. 999 sec.*	*90*
n43	**Additional water intake time + circulation**	*0 .. 999 sec.*	*0*
n44	**Main circulation time**	*0 .. 999 sec.*	*30*
n45	**Rinse out time**	*0 .. 999 sec.*	*0*
n46	**Drain time**	*0 .. 999 sec.*	*60*
Running times cleaning stage 5 (main rinse 2) - hidden, if [r45] = 0			
n50	**Water intake by feed container** *	*0 .. 10*	*0*
n51	**Water intake by level 1** **	*0 .. 1*	*0*
n52	**Water intake by time**	*0 .. 999 sec.*	*120*
n53	**Additional water intake time + circulation**	*0 .. 999 sec.*	*0*
n54	**Main circulation time**	*0 .. 999 sec.*	*120*
n55	**Rinse out time**	*0 .. 999 sec.*	*0*
n56	**Drain time**	*0 .. 999 sec.*	*90*
Running times cleaning stage 6 (intermediate rinse 2) - hidden, if [r46] = 0			
n60	**Water intake by feed container** *	*0 .. 10*	*0*
n61	**Water intake by level 1** **	*0 .. 1*	*0*
n62	**Water intake by time**	*0 .. 999 sec.*	*90*
n63	**Additional water intake time + circulation**	*0 .. 999 sec.*	*0*
n64	**Main circulation time**	*0 .. 999 sec.*	*30*
n65	**Rinse out time**	*0 .. 999 sec.*	*0*
n66	**Drain time**	*0 .. 999 sec.*	*60*
Running times cleaning stage 7 (disinfection) - hidden, if [r47] = 0			
n70	**Water intake by feed container** *	*0 .. 10*	*0*
n71	**Water intake by level 1** **	*0 .. 1*	*0*
n72	**Water intake by time**	*0 .. 999 sec.*	*120*
n73	**Additional water intake time + circulation**	*0 .. 999 sec.*	*0*
n74	**Main circulation time**	*0 .. 999 sec.*	*120*
n75	**Rinse out time**	*0 .. 999 sec.*	*0*
n76	**Drain time**	*0 .. 999 sec.*	*90*
Running times cleaning stage 8 (after-rinse) - hidden, if [r48] = 0			
n80	**Water intake by feed container** *	*0 .. 10*	*0*
n81	**Water intake by level 1** **	*0 .. 1*	*0*
n82	**Water intake by time**	*0 .. 999 sec.*	*120*
n83	**Additional water intake time + circulation**	*0 .. 999 sec.*	*0*
n84	**Main circulation time**	*0 .. 999 sec.*	*60*
n85	**Rinse out time**	*0 .. 999 sec.*	*0*
n86	**Drain time**	*0 .. 999 sec.*	*150*

8. Setting of parameters

Section 8.4:   Level "General cleaning parameters"   (n parameters)

		Range	*Def.*
Running times cleaning stage 9 (rinse out) - *hidden, if [r49] = 0*			
n91	**Water intake time**	*0 .. 999 sec.*	*10*
n92	**Rinse out time with water intake**	*0 .. 999 sec.*	*120*
n93	**Drain time**	*0 .. 999 sec.*	*30*
Runtime abort for all cleaning stages			
n100	**Drain time after cleaning has been aborted**	0 .. 999 sec.	150
Dosing time settings			
n101	**Dosing time alkaline detergent**	0 .. 999 sec.	30
n102	**Dosing time acid detergent**	0 .. 999 sec.	30
n103	**Dosing time disinfection** (hidden if r47 = 0)	0 .. 999 sec.	30
Temperature settings (see also section 11.3)			
n106	**Pre-heat. temp. main cleaning stage 1** (alkal./acid) (hidden if r35 = 0)	0 .. 99,9 °C	45,0
n107	**Pre-heat. temp. main cleaning stage 2** (acid) (hidden if r35 = 0 or 1)	0 .. 99,9 °C	45,0
n108	**Pre-heat. temp. main cleaning stage disinfection** (hidden if r35 = 1 or 2)	0 .. 99,9 °C	45,0
n109	**Post-heating temp. during circulation in main cleaning stage 1** [n34] (hidden if r35 = 0)	0 .. 99,9 °C	40,0
n110	**Post-heating temp. during circulation in main cleaning stage 2** [n54] (hidden if r35 = 0 / 1)	0 .. 99,9 °C	40,0
n111	**Post-heating temp. during circulation in cleaning stage disinfection** [n74] (hidden if r35 = 0 / 1 / 2)	0 .. 99,9 °C	40,0

8.5 Level "Extended cleaning parameters 1" (r parameters)

Working level	
for normal daily operation	

r parameters

Code: C567

Switch to level
"Extended cleaning parameters"

See section 8.1

General cooling parameters	code: C212
Extended cooling parameters	code: D345
General cleaning parameters	code: B454
Extended cleaning parameters 1	code: C567
Extended cleaning parameters 2	code: D432
Service parameters	code: EA03
General tank monitor parameters	code: 4711
Extended tank monitor parameters	code: F94A
Alarm configuration	code: FFFF
Configuration	code: A384
I/O test parameters	code: 10E5

Adjustment to safety elements   *Def.*

r10 Safety switch butterfly valve (F40) see section 9.2   *0*

Parameter is hidden, if parameter [A40] = 2 or 3
0: no safety switch
1: prevents the start of cooling / cleaning, when switch is
     not in proper position
2: as 1 + abort of cleaning when switch in the wrong position

r11 Cleaning pump monitoring via pressure switch (Fault F41)   *0*
For dry running protection of cleaning pump (open in case of fault)
0:         deactivated
1 .. 20:   Stop cleaning after x seconds without pressure

r12 Cleaning pump fault thermo contact switch (Fault F42)   *0*
To protect the cleaning pump (open in case of fault)
0: no thermo contact switch
1: thermo contact switch active

r18 Active cooling in after-rinsing   *0*

If this function is activated, the compressor is switched on in the circulation
step n84, provided that the tank temperature is between 4 ° and 40 °.
0: deactivated
1: activated with compressor lock   - see [P70]
2: activated without compressor lock   - see [P70

Detergent options	*Range*	*Def.*
r20 Dosing position (see section 6.2 and 6.3.6) 0: dosing in feed container (displacement cleaning) 1: position D1 in cleaning diagram 2: position D2 in cleaning diagram	*0..2*	*2*
r21 Detergent sequence in case of 3-cycles see section 6.3.4 (if second main cleaning stage is deactivated) 0: only alkaline 1..10: x times alkaline, before one time acid	*0..10*	*3*
r22 Premature switching off of the rinsing pump when **adding detergent via beaker** in dosing step D1/D2 (see section 11.1)	*0..120 sec.*	*0*

Section 8.5:   Level "Extended cleaning parameters 1"   (r parameters)

Drain valve settings	*Def.*

r23 **Behavior in pre-rinse 2 when fetching water via the reservoir**   *1*
   0: Drain valve is closed
   1: Drain valve is open

r24 **Switching mode drain valve 1**   *0*
   0: normally closed
   1: currentless open

r25 **Switching mode drain valve 2**   *0*
   0: normally closed
   1: currentless open

r26 **Switch-on delay drain valve** (rinsing cycle 0 and 9)   *0*

   Time delay with which the drain valve opens after the agitator and flushing pump have started.

   0:        deactivated
   1..60 sec.:   Delay time of the activation of the drain valve

Settings to start cleaning	*Def.*

r27 **Cleaning enable via digital input**   *0*
   (see section 9.15.1)
   0: deactivated
   1: activated

If a quick cleaning pro-gramme (1..8) is parame-terized here, it can be started as follows:

- Hold down SET-button,
- right after that press button CLEANING

r28 **Activation quick cleaning programme via button**   *0*
   0: deactivated
   1: 1x pre-rinse 1   (cleaning stage 1)
   2: 1x pre-rinse 2   (cleaning stage 2)
   3: 1x after-rinse   (cleaning stage 8)
   4: 1x rinse-out   (cleaning stage 9)
   5: 2x pre-rinse 1   (cleaning stage 1)
   6: 2x pre-rinse 2   (cleaning stage 2)
   7: 2x after-rinse   (cleaning stage 8)
   8: 2x rinse-out   (cleaning stage 9)

8. Setting of parameters

Section 8.5: Level "Extended cleaning parameters 1"   (r parameters)

		Def.
	Settings for level detection (see also section 11.6)	*Def.*

r29 **Inertia level input**   *3*
    1: fast
    2: medium
    3: sluggish

r30 **Sensitivity level input 1**   *0*
    -10: less sensitive | +10: more sensitive

r31 **Sensitivity level input 2**   *0*
    -10: less sensitive | +10: more sensitive

r32 **Timeout water intake by level**   (Fault F44)   *5*
    Maximum time to cleaning abort: 1 .. 60 min.

r33 **Level monitoring at the end of the rinsing cycle** (Fault F45)   *0*

    0: deactivated

    Termination of cleaning in the event of a fault

    1: Monitoring of level 1 after last rinsing stage only
    2: Monitoring of level 1 after each rinsing stage
    3: Monitoring of level 2 after last rinsing stage only
    4: Monitoring of level 2 after each rinsing stage

    No termination of cleaning in the event of a fault (only fault message)

    1: Monitoring of level 1 after last rinsing stage only
    2: Monitoring of level 1 after each rinsing stage
    3: Monitoring of level 2 after last rinsing stage only
    4: Monitoring of level 2 after each rinsing stage

r34 **Monitoring of water intake time during intake**   (Fault F46)   *0*
    above level (not in case of "water intake via pre-hopper")

    0: deactivated
    1..300: A minimum-water intake time (in seconds) is set.

        If water is detected at the level electrode before this
        time has elapsed, the water still continues to run
        until the time has elapsed - fault F46 is reported.

	Setting of heater	*Def.*

r35 **Heater activation**   *1*
    0: no heater
    1: only in main cleaning stage 1
    2: in both main cleaning stages 1+2
    3: in both main cleaning stages 1+2 and disinfection

r36 **Start delay heater**   *10*
    Range: 0 .. 120 sec.

r37 **Max. running time heater** (Timeout programme step "H")   60
    Range: 10 .. 999 min.   (Fault F48)

r38 **Heater protection via pressure switch**   0
    0:            deactivated
    1.. 8 sec.: Switch off the heater after x seconds without pressure

r39 **Over temperature protection heater** (Fault F49)   0
    To protect the heater (open in the event of a fault)
    0: No protective contact
    1: Protective contact active

Section 8.5:   Level "Extended cleaning parameters 1"   (r parameters)

	Number of passes of seperate cleaning stages See also section 6.3	Range.	Def.
r40	**Number of passes clean. stage 0: Rinse out**	0 .. 5	0
r41	**Number of passes clean. stage 1: Pre-rinse 1**	0 .. 5	1
r42	**Number of passes clean. stage 2: Pre-rinse 2**	0 .. 5	0
r43	**Number of passes clean. stage 3: Main rinse 1** (not changeable)	1	1
r44	**Number of passes clean. stage 4: Intermed. rinse 1**	0 .. 5	0
r45	**Number of passes clean. stage 5: Main rinse 2**	0 .. 1	0
r46	**Number of passes clean. stage 6: Intermed. rinse 2**	0 .. 5	0
r47	**Number of passes clean. stage 7: Disinfection**	0 .. 1	0
r48	**Number of passes clean. stage 8: After-rinse**	0 .. 5	1
r49	**Number of passes clean. stage 9: Rinse out**	0 .. 5	0

	Selection of water valve (cold / hot water)	Range.	Def.
r50	**Valve selection clean. stage 0: Rinse out**	1 .. 7	1
r51	**Valve selection clean. stage 1: Pre-rinse 1**	1 .. 7	1
r52	**Valve selection clean. stage 2: Pre-rinse 2**	1 .. 7	2
r53	**Valve selection clean. stage 3: Main rinse 1**	1 .. 7	2
r54	**Valve selection clean. stage 4: Intermed. rinse 1**	1 .. 7	1
r55	**Valve selection clean. stage 5: Main rinse 2**	1 .. 7	1
r56	**Valve selection clean. stage 6: Intermed. rinse 2**	1 .. 7	1
r57	**Valve selection clean. stage 7: Disinfection**	1 .. 7	1
r58	**Valve selection clean. stage 8: After-rinse**	1 .. 7	1
r59	**Valve selection clean. stage 9: Rinse out**	1 .. 7	1

From option 4 onwards, the function A 16 (hot water valve) must additionally be assigned to one of the relays in the A parameters.

1: Cold water
2: Warm water
3: Cold and warm water (mixed)
4: Hot water / Beaker dosing
5: Hot water and cold water
6: Hot water and warm water
7: Hot water and warm water and cold water

	Selection of drain valve	Range.	Def.
r60	**Drain valve select. clean. stage 0: Rinse out**	1 .. 2	1
r61	**Drain valve select. clean. stage 1: Pre-rinse 1**	1 .. 2	1
r62	**Drain valve select. clean. stage 2: Pre-rinse 2**	1 .. 2	1
r63	**Drain valve select. clean. stage 3: Main rinse 1**	1 .. 2	1
r64	**Drain valve select. clean. stage 4: Intermed. rinse 1**	1 .. 2	1
r65	**Drain valve select. clean. stage 5: Main rinse 2**	1 .. 2	1
r66	**Drain valve select. clean. stage 6: Intermed. rinse 2**	1 .. 2	1
r67	**Drain valve select. clean. stage 7: Disinfection**	1 .. 2	1
r68	**Drain valve select. clean. stage 8: After-rinse**	1 .. 2	1
r69	**Drain valve select. clean. stage 9: Rinse out**	1 .. 2	1

In case of selection 2, the function A 15 (drain valve) must additionally be assigned to one of the relays in the A parameters.

1: Drain valve 1
2: Drain valve 2

8. Setting of parameters

Section 8.5:   Level "Extended cleaning parameters 1"   (r parameters)

Selection 1, 2, 3:
If the digital input is to be used to terminate the pause, the function 15 must additionally be assigned to one of the digital inputs A21-A28 in the A- parameters.

Settings cleaning breaks	*Range*	*Def.*
r70 Activation of break in cleaning programme *(see section 11.2)*		*0*
0: deactivated		
1: activated, finish of break only with button or digital input		
2: activated, finish of break after time [r72] or button or digital input		
3: activated, finish of break at a certain time [r73] or button or digital input		
r71 Position break	*0 .. 8*	*1*
After which cleaning stage is the break integrated Setting range: after cleaning stage 0….8		
r72 Break time	*0...999 min.*	*120*
r73 Finish of the break at time	*00:00..23:59*	*00:00*

Settings of cleaning pump *(see section 11.9)*	*Range*	*Def.*
r80 Cleaning pump venting	*0 .. 4*	*0*
0: deactivated		
1: On-/off-impulses with a fixed quantity for all cleaning stages		
2: as 1, however, premature termination if pressure via pressure switch		
3: as 1, however, unlimited impulses when rinsing (cleaning stages 0+9)		
4: as 2, however, unlimited impulses when rinsing (cleaning stages 0+9)		
r81 Number of on / off impulses cleaning pump	*0 .. 10*	
r82 ON impulse length cleaning pump	*0 .. 10 sec.*	*5*
r83 OFF impulse length cleaning pump	*0 .. 10 sec.*	*5*

Settings for rinsing cycle-optimisation	*Range*	*Def.*
r86 Water pressure-controlled rinse-out step.	*0..6 sec.*	*0*
If the water pressure in the rinse-out step (n15, n25...n85) drops out for x seconds, the rinse sequence is continued with the drain step (n16, n26...n86).		
0: deactivated		
1..6: activated, seconds without pressure.		
r87 Avoidance of rinsing shadows on the agitator blade	*0..1*	*0*
0: deactivated		
1: in the circulation phase (n14, n24, n34...n84) the agitator stops every 25 seconds for 5 sec.		

Section 8.5: Level "Extended cleaning parameters 1"   (r parameters)

Service settings and commissioning *(see also section 6.6)*	*Range*	*Def.*
r92 **Start cleaning at the beginning of cleaning stages 0..8**	*0 .. 8*	*0*
r93 **Number of cleaning cycles with step function**	*0 .. 4*	*0*

See section 11.10.2

This function is used to manually advance all programme steps of the cleaning sequence. The setting 1..3 is mainly used by the service technician during commissioning if a permanent activation is not desired.

0: deactivated
1..3:* active in the next 1..3 rinsing cycles
4: seconds in cleaning mode. "StP" is shown in the display. By pressing the CLEANING key repeatedly, the cycle can now be advanced step by step

r97 **Display during cleaning**	*0 .. 2*	*0*

0: Display of programme step
1: Display of temperature
2: Display changes between step and temperature

r98 **Display of the maximum cleaning temperature achieved in OFF after cleaning**	*0 .. 1*	0

0: deactivated
1: alternating with the time

* only for the installer

8.6 Level "Extended cleaning parameters 2"   (L parameters)

L parameters

Code: D432

Switch to level
"Extended cleaning parameters"
See section 8.1

	Working level for normal daily operation	
	General cooling parameters	code: C212
	Extended cooling parameters	code: D345
	General cleaning parameters	code: B454
	Extended cleaning parameters 1	code: C567
	Extended cleaning parameters 2	code: D432
	Service parameters	code: EA03
	General tank monitor parameters	code: 4711
	Extended tank monitor parameters	code: F94A
	Alarm configuration	code: FFFF
	Configuration	code: A384
	I/O test parameters	code: 10E5

For information on quantity-controlled dosing, see also section 6.5

		Range	Def.
Rinse cycle quantity setting 0 (Rinse out)			
L1	**Amount of water in step n1**	*0…500 l*	*5*
L2	**Amount of water in step n2**	*0…500 l*	*50*
Rinse cycle quantity setting 1 (Pre-rinse 1)			
L12	**Amount of water in step n12**	*0…500 l*	*35*
L13	**Amount of water in step n13**	*0…500 l*	*0*
Rinse cycle quantity setting 2 (Pre-rinse 2)			
L22	**Amount of water in step n22**	*0…500 l*	*35*
L23	**Amount of water in step n23**	*0…500 l*	*0*
Rinse cycle quantity setting 3 (Main-rinse 1)			
L32	**Amount of water in step n32**	*0…500 l*	*50*
L33	**Amount of water in step n33**	*0…500 l*	*0*
Rinse cycle quantity setting 4 (Intermediate-rinse 1)			
L42	**Amount of water in step n42**	*0…500 l*	*35*
L43	**Amount of water in step n43**	*0…500 l*	*0*
Rinse cycle quantity setting 5 (Main-rinse 2)			
L52	**Amount of water in step n52**	*0…500 l*	*50*
L53	**Amount of water in step n53**	*0…500 l*	*0*
Rinse cycle quantity setting 6 (Intermediate-rinse 2)			
L62	**Amount of water in step n62**	*0…500 l*	*35*
L63	**Amount of water in step n63**	*0…500 l*	*0*
Rinse cycle quantity setting 7 (Disinfection)			
L72	**Amount of water in step n72**	*0…500 l*	*50*
L73	**Amount of water in step n73**	*0…500 l*	*0*
Rinse cycle quantity setting 8 (After-rinse)			
L82	**Amount of water in step n82**	*0…500 l*	*50*
L83	**Amount of water in step n83**	*0…500 l*	*0*
Rinse cycle quantity setting 9 (Rinse out)			
L92	**Amount of water in step n92**	*0…500 l*	*5*
L93	**Amount of water in step n93**	*0…500 l*	*50*
Detergent / disinfectant quantity setting			
L101	**Amount of detergent alkaline**	*0…10,00 l*	*0,30*
L102	**Amount of detergent acid**	*0…10,00 l*	*0,30*
L103	**Amount of disinfectant**	*0…10,00 l*	*0,30*

Section 8.6: Level "Extended cleaning parameters 2"   (L parameters)

Settings for quantity-controlled water intake				
L104	**Water quantity in dosing position 1**		*0…50 l*	*5*
	only active if quantity-controlled water intake is activated			
L105	**Activation of quantity-controlled water intake**		*0…1*	*0*
	0: deactivated 1: activated			
L106	**Timeout settings for water intake**		*0…2*	*1*
	<u>Same timeout (L107) for all programme steps</u> 0: After timeout stop of the cleaning with fault message 1: Continue cleaning after timeout with fault message			
	<u>Individual timeout for each programme step (L107 plus step time from the corresponding n-parameter)</u> 2: Continue cleaning after timeout and report fault			
L107	**Timeout time for water intake**		*1,0..25,0 min.*	*5,0*
Settings for quantity-controlled detergent and disinfectant dosing				
L110	**Activation of dosing of quantity-controlled detergent and disinfectant**		*0…1*	*0*
	0: deactivated 1: activated			
L112	**Dosing of timeout-time**		*0,1..10,0 min.*	*1,0*
Setting of the pulse counters: Pulses per litre				
L121	**Impulse counter "acidic"**		*1…9999*	*2000*
L122	**Impulse counter "alkaline"**		*1…9999*	*2000*
L123	**Impulse counter "disinfectant"**		*1…9999*	*2000*
L124	**Impulse counter "cold water"**		*1…9999*	*2000*
L125	**Impulse counter "warm water"**		*1…9999*	*2000*

8.7 Level "Service parameters"   (E parameters)

<table>
<tr><td colspan="2">Working level
for normal daily operation</td></tr>
<tr><td>General cooling parameters</td><td><i>code: C212</i></td></tr>
<tr><td>Extended cooling parameters</td><td><i>code: D345</i></td></tr>
<tr><td>General cleaning parameters</td><td><i>code: B454</i></td></tr>
<tr><td>Extended cleaning parameters 1</td><td><i>code: C567</i></td></tr>
<tr><td>Extended cleaning parameters 2</td><td><i>code: D432</i></td></tr>
<tr><td>Service parameters</td><td><i>code: EA03</i></td></tr>
<tr><td>General tank monitor parameters</td><td><i>code: 4711</i></td></tr>
<tr><td>Extended tank monitor parameters</td><td><i>code: F94A</i></td></tr>
<tr><td>Alarm configuration</td><td><i>code: FFFF</i></td></tr>
<tr><td>Configuration</td><td><i>code: A384</i></td></tr>
<tr><td>I/O test parameters</td><td><i>code: 10E5</i></td></tr>
</table>

E parameters

Code: EA03

Switch to level
"Service parameters"

See section 8.1

These parameters are only used to query ACTUAL states.

Display tank monitoring time counter and values	*Range*	*Def.*
Display off...		
E1 ... over- / under time temperature / time 1	*0…900 min.*	*- - -*
E2 ... over- / under time temperature / time 2	*0…900 min.*	*- - -*
E3 ... over- / under time temperature / time 3	*0…900 min.*	*- - -*

Based on the error messages F1 - F3, it can be
read here how long the milk temperature has
already been above the respectively set limit value.

E6 ... the last cleaning temperature reached	*0…99,9 °C*	*- - -*

Displays the maximum temperature during the last
cleaning cycle.

E15 ... battery voltage	*0,0V..12,0V*	*- - -*

Display the current battery voltage
(Only if optional power pack is installed)

E16 ... of the analog input 4-20 mA	*0,0..20,0 mA*	*- - -*

Display of the currently measured current

Display of the presently measured current of the analogue 4..20 mA inputs	*Display area*
E16 **Display of the analogue input 4..20 mA** Display of the presently measured current*.	*0,0..20,0 mA*
E17 **Display of the analogue input 4..20 mA** as [E16] but on IO expansion module I1*.	*0,0..20,0 mA*
E18 **Display of the analogue input 4..20 mA** as [E16] but on IO expansion module I2*.	*0,0..20,0 mA*

* If the respective input is deactivated, "- -" is displayed

Section 8.7:   Level "Service parameters"   (E parameters)

		Display area.	*Def.*
E31	**Display of the last dosed detergent quantity** only with quantity-controlled detergent dosing. The amount of detergent dosed in the last rinsing cycle can be read here.	*x ltr.*	*- - -*
E40	**Display Start-DATE** * automatic stirring prior to collection	*DD : MM*	*- - -*
E41	**Display Start-TIME** * automatic stirring prior to collection	*hh : mm*	*- - -*
E50	**SIM PIN entry for optional ESGSM** for otional remote maintenance module -1 = no PIN deposited 0000 … 9999 = SIM PIN	*-1..9999*	*-1*

* With [E40 / E41] you can check at which date or time the next automatic stirring is activated, which was set under [P28]. The control unit calculates the time displayed on the basis of the last cleaning.

<u>*Display of cycle times compressor*</u>   *Display area*

Used in robot applications to detect faults in the cooling system
(e.g. loss of refrigerant).

The display shows:
- [E61..E63] Compressor running times in the current cooling cycle
- [E65..E67] Compressor running times in the previous cooling cycle

Display of…

E61	**… current cycle time of compressor 1**	*0 .. 99,9h*
E62	**… current cycle time of compressor 2**	*0 .. 99,9h*
E63	**… current cycle time of compressor 3**	*0 .. 99,9h*
E65	**… last cycle time of compressor 1**	*0 .. 99,9h*
E66	**… last cycle time of compressor 2**	*0 .. 99,9h*
E67	**… last cycle time of compressor 3**	*0 .. 99,9h*

8.8 Level "General tank monitor parameters" (h parameters)

H parameters

Code: 4711

Switch to level "General tank monitor parameters"

See section 8.1

Working level for normal daily operation	
General cooling parameters	code: C212
Extended cooling parameters	code: D345
General cleaning parameters	code: B454
Extended cleaning parameters 1	code: C567
Extended cleaning parameters 2	code: D432
Service parameters	code: EA03
General tank monitor parameters	code: 4711
Extended tank monitor parameters	code: F94A
Alarm configuration	code: FFFF
Configuration	code: A384
I/O test parameters	code: 10E5

		Fault	Range	Def.
Fault messages tank monitor during cooling mode				
h20	**Target temperature 1st milking** * (Starting from this point the monitoring of the over / under temperature begins [h25] + [h29])	F20	*0 .. 30,0 °C*	*5,0*
h21	**Max. time to reach target temperature [h20]** *		*0..999 min.*	*120*
h23	**Max. overtemperature for a time** (from cooling start) * Start of monitoring from the start of cooling	F23	0 .. 30,0 °C	10,0
h24	**Max. time of overtemperature** (from cooling start) *		0..999 min.	180
h25	**Max. overtemperature with direct alarm triggering** * Start of the counter from the 1st milking	F25	0..99,9 °C	25,0
h26	**Max. running time compressor cycle** * Max. total running time of all compressors from the start of cooling to the collection of the milk. If the time entered is exceeded, the alarm is triggered. Serves the service technician to determine problems with the cooling cycles.	F26	0..99,9 h	0,0
h27	**Min. undertemperature for a time** * Start of monitoring from cooling start. An alarm is triggered if the temperature falls below the value set for longer than the time set [h28].	F27	0..30,0 °C	2,0
h28	**Max. time of undertemperature** (from cooling start) *		0..999 min	120
h29	**Min. undertemperature with direct alarm triggering** * (from 1st milking) Start the counter from cooling start	F29	0..30,0 °C	0,5
h31	**Max. cooling interruption** *	F31	0..999 min.	60
h32	**Max. time in off mode after cleaning** *	F32	0..5000 min	600
h33	**Min. cleaning cycle** *	F33	0 .. 250 h	78
h35	**Detergent monitoring alkaline by float switch**	F35	0 .. 5	0
h36	**Detergent monitoring acid by float switch** 0: deactivated 1: high-active only in cleaning 2: low-active only in cleaning 3: high-active, permanently 4: low-active, permanently 5: Flow switch. Feedback via the flow switch is expected when the respective pump is activated.	F36	0 .. 5	0
h38	**Max. temperature difference monitoring sensor during cooling mode**	F38	1,0 .. 5,0	2,0

* 0: deactivated

		Fault	Range	Def.
Setting milk times to monitor „cooling activated"				
This function triggers an alarm if cooling has not been activated at the entered milk times. This is to prevent to forget the activation of the cooling in case of the first milking after the cleaning.				
h41	**milk time 1**	**F22**	*00:00..23:59*	*--:--*
h42	**milk time 2**	**F22**	*00:00..23:59*	*--:--*
h43	**milk time 3**	**F22**	*00:00..23:59*	*--:--*

Settings tank monitor LOG files

		Fault	Range	Def.
h82	**Fault indicator for external faults**	**F82**	*0 .. 2*	*0*
	Input function digital input [A21..A33] => 37 (fault indicator)			
	0: deactivated			
	1: „High-active" * Fault when contact opened			
	2: „Low-active" * Fault when contact closed			
	* The signal must be permanently ready for use			
h89	**Saving of additional information in LOG-memory**		*0 .. 3*	*0*
	0: deactivated			
	1: Temperature 2			
	2: Performance of stirring unit first stirring unit			
	3: Measuring size analogue input (4..20 mA)			
h90	**Selection period (in days) of the recording data (Konsoft)**		*1 .. 365*	*90*
h91	**Logging intervals cleaning mode in minutes**		*1 .. 10*	*1*
h92	**Logging intervals OFF and cooling mode in minutes**		*1 .. 30*	*15*

Tank identification

		Range	Def.
h93	**Customer number part 1** (the first 4 digits...)	*0 .. 9999*	*0*
h94	**Customer number part 2** (the last 4 digits...)	*0 .. 9999*	*0*
h96	**Tank number part 1** (the first 4 digits...)	*0 .. 9999*	*0*
h97	**Tank number part 2** (the last 4 digits...)	*0 .. 9999*	*0*

Parameter level-locking

		Range	Def.
h98	**Password protection**	*0 .. FFFF*	*0*
h99	**Password protection**	*0 .. FFFF*	*0*

Explanations to the password protection:

In addition to the level code the level "General tank monitor parameter" can be protected by another password. A 4-digit password (not 0000) has to be entered in parameter [h98]. For the activation of the password protection the password in parameter [h99] has to be repeated exactly.

After the level code is re-entered the password query takes place.

8.9 Level "Extended tank monitor parameters" (H parameters)

Working level for normal daily operation	
General cooling parameters	code: C212
Extended cooling parameters	code: D345
General cleaning parameters	code: B454
Extended cleaning parameters 1	code: C567
Extended cleaning parameters 2	code: D432
Service parameters	code: EA03
General tank monitor parameters	code: 4711
Extended tank monitor parameters	code: F94A
Alarm configuration	code: FFFF
Configuration	code: A384
I/O test parameters	code: 10E5

H parameters

Code: F94A

Switch to level "Extended tank monitor parameters"

See section 8.1

		Fault	Range	Def.
Don't add milk - temperature conditions				
H10	**Milk temperature too high for too long**	**F1**	*0 .. 50,0 °C*	*13,0*
H11	**Time limit for [H10] ***		*0 .. 999 min.*	*600*
H12	**Milk temperature too high for too long**	**F2**	*0 .. 50,0 °C*	*16,0*
H13	**Time limit for [H12] ***		*0 .. 999 min.*	*360*
H14	**Milk temperature too high for too long**	**F3**	*0 .. 50,0 °C*	*28,0*
H15	**Time limit for [H14] ***		*0 .. 999 min.*	*300*
Power failure times				
H19	**Temperature limit for fault F6** 0 = temperature-independent	**F6**	*0 .. 50 °C*	*7,0*
H20	**Max. power failure time in cooling mode ***	**F6**	*0 .. 999 min.*	*300*
Cleaning temperature monitoring				
H30	**Minimum cleaning temperature ***	**F11**	*0 .. 50,0 °C*	*40,0*
H31	**For min. time ***	**F12**	*0 .. 999 min.*	*2*
Agitator monitoring				
H40	**Agitator fault in cooling mode - no stirring of milk ***	**F15**	*0 .. 999 min.*	*450*
H41	**Timeout "No agitator" ***	**F16**	*0 .. 999 min.*	*60*
H42	**Min. run time agitator** [zu H41]	**F16**	*0 .. 500 sec.*	*60*

* 0 = deactivated

Tank monitor activation   *Range*   *Def.*

H90 **Activation delay** *(see section 12.1)*   *0 .. 300 min.*   *180*
         0 = deactivated

Parameter level lock

H98 **Password protection**   *0 .. FFFF*   *0*

H99 **Password protection**   *0 .. FFFF*   *0*

Information on password protection:

The level "extended tank monitor parameters" can additionally be protected with another password. For this purpose, a 4-digit password (not 0000) must be entered in parameter [H98]. In order to activate the password protection, the password in parameter [H99] must be repeated exactly.

If the level code is entered again, the password is requested afterwards.

8.10 Level "Alarm - Event assignment" (F parameters)

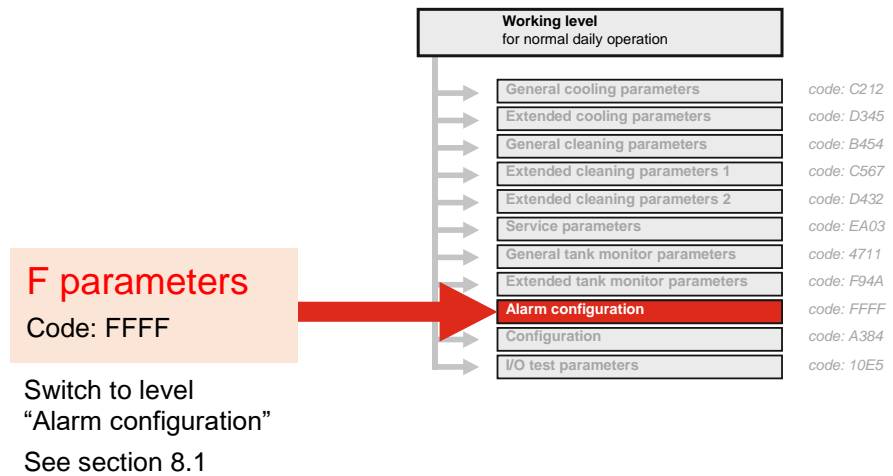| Working level for normal daily operation	
General cooling parameters	code: C212
Extended cooling parameters	code: D345
General cleaning parameters	code: B454
Extended cleaning parameters 1	code: C567
Extended cleaning parameters 2	code: D432
Service parameters	code: EA03
General tank monitor parameters	code: 4711
Extended tank monitor parameters	code: F94A
Alarm configuration	code: FFFF
Configuration	code: A384
I/O test parameters	code: 10E5

F parameters

Code: FFFF

Switch to level "Alarm configuration"

See section 8.1

In this level, each fault message F1 to F61 is assigned the effect of this alarm.

See the table below.

Alarm effect

Setting	display code (flashes)	"green" LED	"red" LED	stores in 'Konsoft	alarm relay in general	alarm relay tank monitor	SMS / Email

WTS-300 system alarms (only display)

Setting	display code (flashes)	"green" LED	"red" LED	stores in 'Konsoft	alarm relay in general	alarm relay tank monitor	SMS / Email
1:	•	—	—	—	—	—	—
2:	•	—	—	•	—	—	—
3:	•	—	—	•	•	—	—
4:	•	—	—	•	—	•	—
5:	•	—	—	•	•	—	•
6:	•	—	—	•	—	•	•

Informativ tank monitor alarms (green LED)

Setting	display code (flashes)	"green" LED	"red" LED	stores in 'Konsoft	alarm relay in general	alarm relay tank monitor	SMS / Email
7:	•	•	—	•	—	—	—
8:	•	•	—	•	•	—	—
9:	•	•	—	•	—	•	—
10:	•	•	—	•	•	—	•
11:	•	•	—	•	—	•	•

Critical tank monitor alarms (red LED)

Setting	display code (flashes)	"green" LED	"red" LED	stores in 'Konsoft	alarm relay in general	alarm relay tank monitor	SMS / Email
12:	•	—	•	•	—	•	—
13:	•	—	•	•	—	•	•

	Fault configuration...	Setting	Def.
Critical tank monitor alarm (always red LED)	**F1** ... **milk temperature too high for too long high1**	*12 .. 13*	*13*
	F2 ... **milk temperature too high for too long high2**	*12 .. 13*	*13*
	F3 ... **milk temperature too high for too long high3**	*12 .. 13*	*13*
	F6 ... **power failure alarm**	*12 .. 13*	*13*
	F11 ... **minimum cleaning temperature not reached**	*7 .. 13*	*11*
	F12 ... **minimum cleaning time at temp. not reached**	*7 .. 13*	*11*
	F15 ... **agitator fault in cooling mode**	*7 .. 13*	*11*
	F16 ... **timeout "No agitator action"**	*7 .. 13*	*11*
	F20 ... **cooling time exceeded for first milking**	*7 .. 13*	*11*
	F22 ... **Cooling not switched on**	*7 .. 13*	*11*
	F23 ... **milk temperature too high for too long**	*7 .. 13*	*11*
Depending on the setting, it is an informative or a critical tank monitor alarm (green or red LED)	**F25** ... **over-temperature directly**	*7 .. 13*	*11*
	F26 … **max. running time of compressor cycle exceeded**	*7 .. 13*	*11*
	F27 ... **milk temperature too long too low**	*7 .. 13*	*11*
	F29 ... **under-temperature directly**	*7 .. 13*	*11*
	F30 ... **power failure (direct)**	*7 .. 13*	*11*
	F31 ... **max. time without cleaning (after end cool. mode)**	*7 .. 13*	*11*
	F32 ... **max. time without cooling (after cleaning mode)**	*7 .. 13*	*11*
	F33 ... **min. cleaning interval**	*7 .. 13*	*11*
	F34 ... **time / date not set**	*7 .. 13*	*11*
	F35 ... **Detergent dispenser empty ‚alkaline'**	*7 .. 13*	*11*
	F36 ... **Detergent dispenser empty ‚acid'**	*7 .. 13*	*11*
	F37 … **Disinfectants**	*7 .. 13*	*11*
	F38 ... **temp. difference exceeded monitoring sensor**	*7 .. 13*	*11*
	F39 ... **battery voltage too low**	*7 .. 13*	*11*
	F40 ... **safety switch butterfly valve**	*1 .. 13*	*6*
	F41 ... **pressure switch cleaning pipe**	*1 .. 13*	*6*
	F42 ... **thermos contact cleaning pump**	*1 .. 13*	*6*
	F43 ... **manual interruption of cleaning**	*1 .. 13*	*6*
	F44 ... **timeout water intake by level**	*1 .. 13*	*6*
	F45 ... **water in the tank after draining**	*1 .. 13*	*6*
	F46 ... **Fault water intake**	*1 .. 13*	*6*
	F48 ... **timeout heating time cleaning**	*1 .. 13*	*6*
	F49 ... **over-temperature monitor heater**	*1 .. 13*	*6*
je nach Einstellung informativer oder kritischer Tankwächteralarm oder auch Systemalarm (grüne oder rote LED oder nur Displayanzeige)	**F51** ... **Tank-overflow protection**	*1 .. 13*	*6*
	F52 ... **water in tank cooling mode**	*1 .. 13*	*6*
	F53 ... **Thermal protec. - / fault monitoring compressor**	*1 .. 13*	*6*
	F54 ... **agitator-condition monitoring direct**	*1 .. 13*	*6*
	F55 ... **Timeout quantity-dependent cooling start**	*1 .. 13*	*6*
	F56 ... **broken sensor**	*1 .. 13*	*6*
	F57 ... **sensor short circuit**	*1 .. 13*	*6*
	F58 ... **sensor range exceeded**	*1 .. 13*	*6*
	F60 ... **Error external sensors**	*1 .. 13*	*6*
	F61 ... **Error ESGSM or ESIPM module**	*1 .. 13*	*4*
	F62 ... **I/O expansion module**	*1 .. 13*	*6*
	F80 ... **Message low pressure**	*1 .. 13*	*6*
	F81 ... **Message high pressure**	*1 .. 13*	*6*
	F82 … **external fault**	*1 .. 13*	*6*
	F83 ... **Malfunction analog input 4..20 mA**	*1 .. 13*	*6*
	F85 ... **Phase error**		
	F99 ... **Test alarms** *(see section 9.5)*	*1 .. 13*	*11*

8.11 Level "Configuration"   (A parameters)

A parameters

Code: A384

Switch to level
"Configuration"

See section 8.1
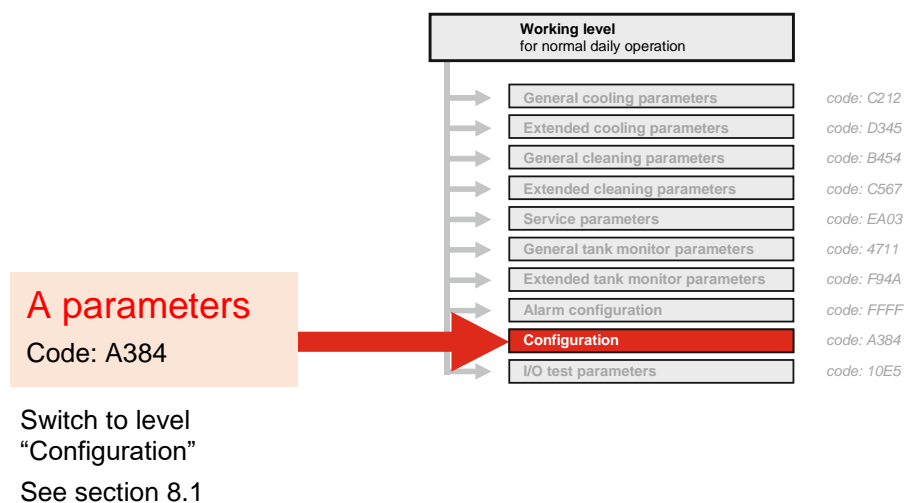
This configuration is very important and should be the first step when setting the parameters for a system.

The WTS-300 supports a large number of different system configurations (with or without robot operation), milk tanks with more than one compressor, different outlet valves etc.). In total, the control unit supports more output functions than there are relays and digital inputs on the printed circuit board.

Normally, however, not all functions are used at the same time. When starting configuration please give careful consideration to how you want to allocate all the various components to the relays and digital inputs.
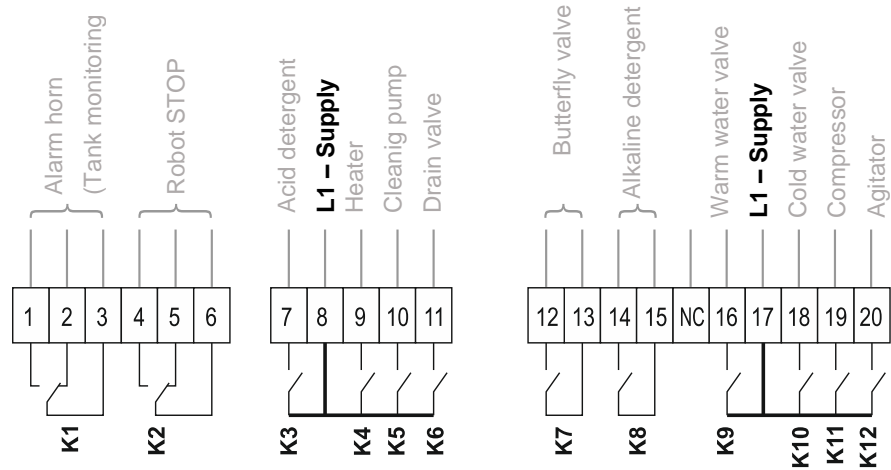
Allocation of output relays:

In [A1 .. A20] the functions needed are assigned to the output relays.

Allocation of digital inputs:

In [A21 .. A33] input functions are assigned to the digital inputs.

⚠️ **WARNING**   *Incorrectly set parameters can lead to serious malfunctions and damage to the milk-cooling tank.*

Terminal labels (top to bottom along wiring diagram):

- Alarm horn
- (Tank monitoring)
- Robot STOP
- Acid detergent
- L1 – Supply
- Heater
- Cleanig pump
- Drain valve
- Butterfly valve
- Alkaline detergent
- Warm water valve
- L1 – Supply
- Cold water valve
- Compressor
- Agitator

Terminals: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | NC | 16 | 17 | 18 | 19 | 20

Relays: K1, K2, K3, K4, K5, K6, K7, K8, K9, K10, K11, K12

The alarm relay configuration for output functions 1 and 14 is done in parameters A45 and A46.

Assignment of output functions to relays

No.	Function
0:	deactivated
1:	alarm tank monitor *
2:	robot stop
3:	detergent „acid"
4:	heater
5:	cleaning pump
6:	drain valve 1
7:	pneumatic butterfly valve
8:	detergent „alkaline"
9:	warm water
10:	cold water
11:	compressor 1 / 1. cooling level
12:	agitator
13:	cleaning active
14:	alarm in general *
15:	drain valve 2
16:	hot water valve / Beaker cleaning
17:	disinfection
18:	compressor 2 / 2. cooling level
19:	external alarm light
20:	compressor 3 / 3. cooling level
21:	Boost pump
22:	Output multifunction relay
23:	Set level 2 on the relay (see section 11.7)
24:	Off mode active
25:	Cooling active
26:	Milk transfer valve

		Range	*Def.*
A1	**assignment relay K1**	*0 .. 26*	*1*
A2	**assignment relay K2**	*0 .. 26*	*2*
A3	**assignment relay K3**	*0 .. 26*	*3*
A4	**assignment relay K4**	*0 .. 26*	*4*
A5	**assignment relay K5**	*0 .. 26*	*5*
A6	**assignment relay K6**	*0 .. 26*	*6*
A7	**assignment relay K7**	*0 .. 26*	*7*
A8	**assignment relay K8**	*0 .. 26*	*8*
A9	**assignment relay K9**	*0 .. 26*	*9*
A10	**assignment relay K10**	*0 .. 26*	*10*
A11	**assignment relay K11**	*0 .. 26*	*11*
		0 .. 26	*12*
A15	**assignment relay K1 – I/O module (optionally)**	*0 .. 26*	*0*
A16	**assignment relay K2 – I/O module (optionally)**	*0 .. 26*	*0*
A17	**assignment relay K3 – I/O module (optionally)**	*0 .. 26*	*0*
A18	**assignment relay K4 – I/O module (optionally)**	*0 .. 26*	*0*
A19	**assignment relay K5 – I/O module (optionally)**	*0 .. 26*	*0*
A20	**assignment relay K6 – I/O module (optionally)**	*0 .. 26*	*0*

8. Setting of parameters

Section 8.11: Level "Configuration"   (A parameters)

Assignment of output functions to digital inputs 1 to 8

0: deactivated
1: safety switch (manual butterfly valve)
2: remote start cooling
3: dry protection heating (can be assigned 2x)
4: thermal protection / fault contact pump
5: water pressure switch
6: thermal protection compressor (can be assigned 3x)
7: cleaning release robot
8: milk pump impulse 1
9: milk pump impulse 2
10: milk pump impulse 3
11: Inductive stirring unit sensor / switch 1
12: Inductive stirring unit sensor / switch 2
13: Float switch / flow switch ‚alkaline'
14: Float switch / flow switch ‚acidic'
15: Start from rinse stop
16: Level switch 1 (release 2nd cooling level)
17: Level switch 2 (release 3rd cooling level)
18: Level switch 3 (tank full)
19: Compressor lock /release
20: Error input low pressure
21: Error input high pressure
22: Start button milk-decanting function
23: Level sensor milk-decanting function
24: Signal input multi-function relay
25: external switchover of temperature
26: Milk removal button
27: Remote start   => OFF-Mode
28: Remote start   => CLEANING   - see also parameter [A38]
29: Remote start   => COOLING   - see also parameter [A38]
30: Remote start   => STIRRING   - see also parameter [A38]
31: Remote triggering   => RobotStop
32: Remote triggering   => Disc valve OPEN
33: Remote triggering   => Tank monitor reset
34: Feedback RobotStop
35: Fault message converter agitator
36: Release remote start
37: Fault indicator
38: Pulse counter "acidic"
39: Pulse counter "alkaline"
40: Pulse counter "disinfect" (without function)
41: Pulse counter "cold water"
42: Pulse counter "warm water"

		Range	*Def.*
A21	**assignment digital input 1**	*0 .. 37*	*1*
A22	**assignment digital input 2**	*0 .. 37*	*2*
A23	**assignment digital input 3**	*0 .. 37*	*3*
A24	**assignment digital input 4**	*0 .. 37*	*4*
A25	**assignment digital input 5**	*0 .. 37*	*5*
A26	**assignment digital input 6**	*0 .. 37*	*6*
A27	**assignment digital input 7**	*0 .. 37*	*7*
A28	**assignment digital input 8**	*0 .. 37*	*8*
A29	**assignment digital input 1 – I/O module (optionally)**	*0 .. 42*	*0*
A30	**assignment digital input 2 – I/O module (optionally)**	*0 .. 42*	*0*
A31	**assignment digital input 3 – I/O module (optionally)**	*0 .. 42*	*0*
A32	**assignment digital input 4 – I/O module (optionally)**	*0 .. 42*	*0*
A33	**assignment digital input 5 – I/O module (optionally)**	*0 .. 37*	*0*

Section 8.11:   Level "Configuration"   (A parameters)

		Range	Def.
Safety chain function "remote start"		*Range*	*Def.*

A38 Safety chain for function 'remote start' — Range *0..1*, Def. *0*

Monitoring of manhole and rinsing tank.
See parameter [A21..A33] selection 28: 29: 30:

Connection see section 9.12

0: Safety chain in control line of remote push-buttons

1: Safety chain via digital input

Output signal configuration robot — *Range*, *Def.*

A40 Robot operation / control pneum. butterfly valve — Range *0..3*, Def. *0*

0: without robot and without pneumatic butterfly valve
1: only with robot
2: only butterfly valve control (pneumatic)
3: robots and pneum. butterfly valve control active

A41 Robot stop signal configuration *(see section 4.6)* — Range *0..3*, Def. 0

0: closing contact, robot stopped when closed
1: closing contact, robot stopped when open
2: opening contact, robot stopped when closed
3: opening contact, robot stopped when open

A42 Robot release delay — Range 0..60 sec., Def. 0

Delays the robot release by the set time.
During this time, the "Robot STOP" LED flashes.

The settings in A45 to A47 are only active if the corresponding output function is assigned to a relay in the parameters A1 to A20:
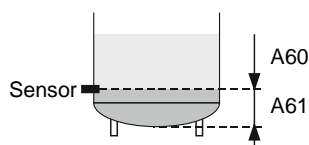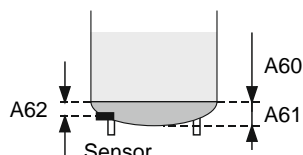*A45 = 14*
A46 = 1
A47 = 19

Alarm relay configuration — *Range*, *Def.*

A45 Relay configuration "alarm in general" — Range *0..3*, Def. *0*
Parameter [A1..A20] => 14

0: closing contact, alarm if closed
1: closing contact, alarm if open (non-volatile)
2: opening contact, alarm if closed (non-volatile)
3: opening contact, alarm if opened

A46 Configuration "alarm tank monitor" — Range *0..3*, Def. *0*
Parameter [A1..A20] => 1

0: closing contact, alarm if closed
1: closing contact, alarm if open (non-volatile)
2: opening contact, alarm if closed (non-volatile)
3: opening contact, alarm if opened

A47 Configuration „red warning light" — Range *0..1*, Def. *0*
Parameter [A1..A20] => 19

0: is reset during the cleaning (same as red LED)
1: is reset with pressure

8. Setting of parameters

Section 8.11: Level "Configuration"   (A parameters)

	Range	Def.
Configuration temperature sensor		

A50 Function of second sensor   *0 .. 4*   *0*

    0: deactivated
    1: Safety temperature sensor
    2: Heating temperature sensor
    3: Sensor activation
       (only for recording, no control function)
    4: as 3: - but temperature is shown on the display
       in OFF mode

A51 Sensor type (Sensor 1 / sensor 2)   *0 .. 3*   *0*

    0: KTY81/210
    1: PT100 three-wire
    2: PT1000
    3: KTY81/110

	Range	Def.
Configuration analogue input		

A54* Function analogue input 4 .. 20 mA   *0 .. 2*   *0*

    0: deactivated
    1: Determination of litres via filling pressure
       (see section 10.5)
    2: Low pressure monitoring (antifreeze function)
       (see section 10.8)

A55 Error monitoring 4-20mA input (F83)   *0 .. 2*   *0*

    0: deactivated
    1: Alarm is activated when < 3.5 mA and > 21 mA
    2: Alarm is activated when < 3.5 mA

	Range	Def.
Configuration of analog inputs (I/O extension module)		

A56* Function analogue input I1 (4..20 mA)   *0 .. 2*   *0*
(optional via I/O extension module)

    0: deactivated
    1: litre determination via filling pressure
    2: Low pressure monitoring (see section 10.8)

A57* Function analogue input I2 (4..20 mA)   *0 .. 2*   *0*
(optional via I/O extension module)

    0: deactivated
    1: litre determination via filling pressure
    2: Low pressure monitoring (see section 10.8)

A58 Fault monitoring 4..20 mA input   (F83)   *0 .. 3*   *0*
Alarm at less than 3.5 mA

    0: deactivated
    1: activated, alarm when I1 is less than 3.5mA
    2: activated, alarm when I2 is less than 3.5mA
    3: activated, alarm if I1 or I2 is less than 3.5 mA

   * *Prioritisation of analogue inputs (parameter [A54 => A56 => A57]).*

    Example: If low pressure monitoring was parameterised in parameter [A54],
    the same setting in parameters [A56 + A57] would be ignored.

Section 8.11: Level "Configuration"   (A parameters)

Sensor **within** linear area

Scaling determination of litres via pressure sensor   Range   Def.
See section 10.5

		Range	Def.
A60	☐ **Litre per cm filling height (linear area)**	*0..100,0 l*	*50,0*
A61	▨ **Offset in litre**	*0..1000 l*	*500*
A62	**Distance sensor to the beginning of linear area**	*0..300 cm*	*0*

Sensor **below** linear area

Configuration external modules   Range   Def.

		Range	Def.
A71	**Configuration stirring unit monitoring**	*0 .. 15*	*0*

look also section 9.8

  0: deactivated
  5: Clear bands
     (after deleting of the bands, the number of agitators must be readjusted)

Agitator monitoring module ESVAW-001-A
Switching on of the agitator by a WTS-300 relay

  1: one agitator
  2: two agitators
  3: three agitators
  4: four agitators

Agitator monitoring module ESVAW-002-A
with two agitator switch-on-relays that are integrated in the module

  6: one agitator
  7: two agitators
     (if not used with [A14] other functions are selectable)

Agitator monitoring without a separate module
If agitator monitoring is made via inductive agitator sensor
(max. 2 channels)

  8:*   one agitator
  9: *   two agitators

Agitator monitoring without a separate module
If agitator monitoring is made via switch contact of the WTS-300

  10:*   one agitator
  11:*   two agitators

Agitator monitoring module ESVAW-003-A
with one agitator switch-on-relay that is integrated in the module

  12:   One agitator 3-phases 400 V
  13:   Two agitators 3-phases 400V (over second module. Note addressing)
  14:   One agitator 2-phases 400V
  15:   Two agitators 2- phases 400V (over second module. Note addressing)

Agitator monitoring module ESVAW-004-A
(same as ESVAW-001-A)

* Precondition: Input function 35 must be assigned
to one of the digital inputs [A21..A33].

8. Setting of parameters

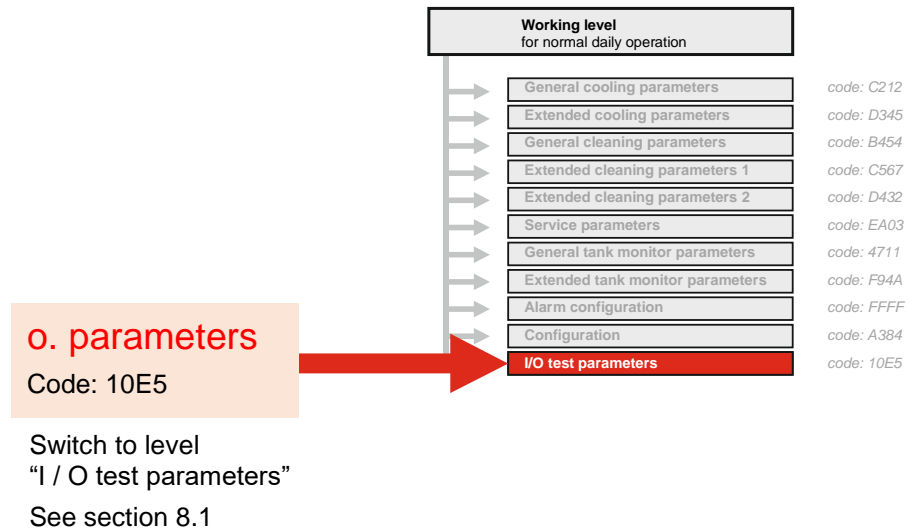Section 8.11:   Level "Configuration"   (A parameters)

			Range	Def.
A72	**activation detergent monitoring by conductometry**		*0 .. 1*	*0*

0: deactivated
1: activated

				Range	Def.
A73	**activation alarm module monitoring ESGSM modem / ESIPM modem**	**F61**		*0 .. 4*	*0*

0: deactivated
1: activated, do not forward alarm messages
2: activated, forward tank guard alarms
3: activated, forward general alarms
4: activated, forward all alarms

				Range	Def.
A74	**Activation of the I/O extension module**	**F62**		*0 .. 2*	*0*

0: deactivated
1: activated, no current monitoring
2: activated, fault monitoring 1st channel
    (cable break <3.5 mA) active

			Range	Def.
A75	**Operating mode 12V input** *See section 9.7*		*0 .. 2*	*0*

0: Input not used
1: Battery operation with power failure monitoring
2: Operation via external power pack,
    Power failure monitoring is deactivated

Automatic change of daylight saving time			*Range*	*Def.*
A78	**Automatic change of daylight saving time**		*0 .. 3*	*2*

0: deactivated
1: Western European time zone (change at 1:00)
2: Central European time zone (change at 2:00)
3: Eastern European time zone (change at 3:00)

Test parameter for the agitator rating			*Range*	*Def.*
A80	**Rating limit agitator**		*-1 .. 1*	*0*

-1: more sensitive
0: normal
1: less sensitive

Activate phase monitoring relay ESVAW-003			*Range*	*Def.*
A85	**Activate phase monitoring relay ESVAW-003** (F85)		0 .. 4	1

0: deactivated
1: activated, the relay on the module drops off in case of an error
2: Additional compressor protection. In case of an error
    the compressor is switched off
3: Additional cleaning pump protection. In case of an error
    the cleaning is interrupted
4: Additional compressor protection and cleaning pump protection.

Section 8.11: Level "Configuration"   (A parameters)

Multifunction time relay (see also section 9.11)	*Range*	*Def.*
A86 Multifunction time relay function selection	*0 .. 8*	*1*

    0: deactivated
    1: On-delay T1
    2: Off-delay T2
    3: On- and off-delay T1 and T2
    4: On-impulse T1
    5: Off-impulse T2
    6: Clock T1 on, T2 off
    7: Switch-on pulse T2 delayed by T1
    8: Switch-off pulse T2 delayed by T1

	Range	*Def.*
A87 Assignment of multi-function timing relay input	*0 .. 26*	*0*

    0: digital input (multifunction time relay)
    1…26: freely selectable output function
         see parameter [A1..A20]

	Range	*Def.*
A88 T1 (time 1)	*1..5000 sec.*	*30*
A89 T2 (time 2)	*1..5000 sec.*	*30*

PC-Interface configuration	*Range*	*Def.*
A95 Baud setting	*1 .. 4*	*4*

    1: 9600
    2: 19200
    3: 38400
    4: 76800

	Range	*Def.*
A96 Device adress	*1 .. 8*	*1*

Language setting	*Range*	*Def.*
A98 Language setting for Konsoft monitor	*0 .. 2*	*0*

    0: german
    1: english
    2: french

Factory reset	*Range*	*Def.*
A99 Factory reset	*0 .. 999*	*000*

8.12   Level "I/O test parameters"   (o. parameters)

Working level for normal daily operation	
General cooling parameters	code: C212
Extended cooling parameters	code: D345
General cleaning parameters	code: B454
Extended cleaning parameters 1	code: C567
Extended cleaning parameters 2	code: D432
Service parameters	code: EA03
General tank monitor parameters	code: 4711
Extended tank monitor parameters	code: F94A
Alarm configuration	code: FFFF
Configuration	code: A384
I/O test parameters	code: 10E5

o. parameters

Code: 10E5

Switch to level
"I / O test parameters"

See section 8.1

Meaning of the parameters

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

Depending on the parameterization, individual o.-parameters can be hidden.

However, the two relays for the supply of acid and alkaline detergents are locked against each other since never acid and alkaline detergents may never enter the tank together!

The operating level does NOT automatically jump back to the working level!
(must be exited by simultaneously pressing the two arrow keys.)

NOTICE

NOTE:

The 4 functions

- Tank monitor alarm
- system alarm
- OFF mode active
- Robot stop

maintain their state when the I/O test parameter level is accessed.

However, during testing, the state of these 4 functions can be changed with

- 0: Relay de-energised
- 1: Relay energised

When leaving the level, the original state is restored.

Test relay outputs   *Range*   *Def.*

Switched-on relays remain switched on until they are reset manually.

    0: Off
    1: On

		Range	Def.
o.1	Test Relay 1	0 .. 1	0
o.2	Test Relay 2	0 .. 1	0
o.3	Test Relay 3	0 .. 1	0
o.4	Test Relay 4	0 .. 1	0
o.5	Test Relay 5	0 .. 1	0
o.6	Test Relay 6	0 .. 1	0
o.7	Test Relay 7	0 .. 1	0
o.8	Test Relay 8	0 .. 1	0
o.9	Test Relay 9	0 .. 1	0
o.10	Test Relay 10	0 .. 1	0
o.11	Test Relay 11	0 .. 1	0
o.12	Test Relay 12	0 .. 1	0
o.15*	Test Relay 1 – ext. I/O module (optionally)	0 .. 1	0
o.16*	Test Relay 2 – ext. I/O module (optionally)	0 .. 1	0
o.17*	Test Relay 3 – ext. I/O module (optionally)	0 .. 1	0
o.18*	Test Relay 4 – ext. I/O module (optionally)	0 .. 1	0
o.19*	Test Relay 5 – ext. I/O module (optionally)	0 .. 1	0
o.20*	Test Relay 6 – ext. I/O module (optionally)	0 .. 1	0

* is only displayed if ext. I / O extension module is activated and parameterized.

Section 8.12:   Level "I / O test parameters"   (o. parameters)

Test digital inputs

All inputs [o.21 to o.33] can be selected via the arrow keys and tested as follows::

- Select the desired parameters with the arrow keys.
- Press the SET key briefly: '0' or '1' appears in the display (depending on the current switching state of the respective component).
- Change switch state (e.g. safety switch).
- The display toggles between '0' and '1'.
- Press the SET key again: The display shows the current parameter name again.

0: switched
1: unswitched

		Range	*Def.*
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.24	**Test digital input 4**	*0 .. 1*	- - -
o.25	**Test digital input 5**	*0 .. 1*	- - -
o.26	**Test digital input 6**	*0 .. 1*	- - -
o.27	**Test digital input 7**	*0 .. 1*	- - -
o.28	**Test digital input 8**	*0 .. 1*	- - -
o.29*	**Test digital input 1 external I/O module** (optionally)	*0 .. 1*	- - -
o.30*	**Test digital input 2 external I/O module** (optionally)	*0 .. 1*	- - -
o.31*	**Test digital input 3 external I/O module** (optionally)	*0 .. 1*	- - -
o.32*	**Test digital input 4 external I/O module** (optionally)	*0 .. 1*	- - -
o.33*	**Test digital input 5 external I/O module** (optionally)	*0 .. 1*	- - -

* is only displayed if ext. I / O extension module is activated and parameterized

Set and test level inputs		*Range*	*Def.*
o.41	**Level 1**	*-10 .. 10*	*0*
o.42	**Level 2**	*-10 .. 10*	*0*

-10: less sensitive
  0: normal
+10: more sensitive

Adjust sensitivity:
green LED "OK" lights up if o.41 / o.42 detects level

Test ESVAW (agitator monitoring module)

o.70* **test of relay on optional ESVAW 002 or 003**

o.71* **Agitator 1** in watt

o.72* **Agitator 2** in watt

o.73* **Agitator 3** in watt

o.74* **Agitator 4** in watt

* is only displayed if the agitator monitoring module is activated and parameterized

8. Setting of parameters

Section 8.12:   Level "I/O test parameters"   (o. parameters)

Test flow sensors (pulse counters)

Display as impulses

Select the desired parameter with the SET button:
- Button cooling   => the displayed value is reset
- Button cleaning   => switches on the assigned valve or pump
See also section 6.6.4

o.81* Pulse counter 1   *"acidic"*

o.82* Pulse counter 2   *"alkaline"*

o.83* Pulse counter 3   **"***Disinfectants"*

o.84* Pulse counter 4   *"Cold water"*

o.85* Pulse counter 5   *"Warm water"*

* is only displayed if flow sensors are activated and configured

Display of the Software version adaptor

o.98   Display of the Software version adaptor

9. Other information – General

9.1 Butterfly valve (manual or pneumatic)

manual

In the case of a manual butterfly valve, the position of the lever (open / closed) can be monitored via an optional safety switch. See also section 9.2

pneumatic

In the case of a pneumatic butterfly valve, this must be set in parameter [A40]. The corresponding function must then be assigned to a relay in one of parameters [A1 to A12]. Only then can the valve be opened or closed manually via the "Butterfly valve" button.

Convenience function (only with pneumatic butterfly valve)

Significance: if the COOLING button is pressed in OFF mode, the pneumatic butterfly valve is automatically closed.

9.2 Safety switch for manual butterfly valve

The safety switch monitors the correct position of the lever on the tank outlet.

The function of the safety switch is configured in parameter [r10].

Parameter [r10] is not available if a pneumatic butterfly valve is configured in [A40]

Fault indication

The "butterfly valve" LED flashes if, in OFF mode:

- the COOLING button is pressed while the valve is open.
- the WASHING button is pressed while the valve is closed.

If the butterfly valve is closed in washing mode, the cycle is interrupted, provided [r10=2] is configured.

Roboter Stop
Valve open

9.3 Sensor correction procedure

Sensor correction means:

A correction is applied to the value measured by the sensor. This is then cumulatively effective over the whole measurement range.

An adjustment to the sensor correction is then necessary only:
- in conjunction with first installation,
- if the sensor cable length is altered,
- when replacing a faulty sensor.

In order to adjust the sensor correction, a reference thermometer is needed.

Proceed as follows:
- Switch off power supply
- Install / change sensor
- Use the reference thermometer to establish the milk temperature.
- Switch on control unit and set [c90] to the measured number of degrees.
- The control unit calculates the difference between the reference thermometer reading and temperature sensor 1 and automatically sets this in parameter [c91].
- Parameter [c91] can be displayed and adjusted at any time.
- Hold down the up and down arrow buttons simultaneously: The settings are stored.

Proceed with the setting for sensor 2 (if present) in the same way. In this case parameters [c92 and c93] must be set.

9.4 Function second temperature sensor

The second temperature sensor can take over different tasks or functions. The sensor input FÜ2 must be activated via a corresponding parameterisation [A50] as follows:

0. **Deactivated**
1. **Safety temperature sensor**
   used as monitoring sensor (redundancy) for the first sensor. In [h38], the maximum temperature difference of the monitoring sensor FÜ2 to the control sensor FÜ1 is set. If the set temperature difference is exceeded for more than 5 min., fault code F38 occurs.
2. **Heating temperature sensor**
   used to control the heating or holding temperature during cleaning.
3. **Sensor activation**
   the measured temperature is stored in the saved data for later checking. There is no control function.
4. **Sensor activation**
   as 3: - but the temperature is shown on the display in OFF-mode.

If FÜ2 develops a fault (break or short-circuit), fault code [F38] will also be displayed after 5 minutes.

9.5 Test functions

9.5.1 Test alarm F99

The function "test alarm" is required to test the impacts of an error on the parameterized outputs in the F-parameters (relays, SMS etc.).

Method:

- Set and store the configuration to be tested in parameter [F99].
- Trigger test errors from the OFF mode by pressing buttons OFF and SET simultaneously for four seconds.
- Check if the required reaction has taken place.
- Reset the error triggered with the reset button.
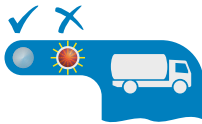
9.5.2 Function test "Do-Not-Load LED" and "external alarm light"

Used to test the function of the red "Do-Not-Load LED" and the associated relay contact "external alarm light".

Method:

- Hold the "Reset button" for approx. 4 seconds:

  For approx. 10 seconds, the red "Do-Not-Load LED" is switched on and the relay "external alarm light" is energized.

9.6 Procedure following power failure

After any interruption to the electricity supply, the control unit automatically switches back to the mode it was in before the outage.

Date and time...

...are retained for at least 3 days. If the interruption is longer they may have to be reset. When the power is restored the control unit will automatically ask for this to be done.

Exception: If the control unit was in cleaning mode, cooling starts again immediately and only fault code (F34) is displayed.

Is the control unit was in cleaning mode ...

...as soon as power is restored, a draining period is run for the time in [n100] in order to empty the tank. Cleaning then continues from the start of the cleaning stage the system was in at the time of the power failure.

The tank monitor functions ...

...are maintained during a power failure, provided the optional power pack is installed. Depending on the parameter settings, the fault code is also displayed.

Incorrect parameter configuration when switching on:

Factory configuration is restored automatically

If "dEFA" occurs in the display after switching on, the standard configuration (factory setting) has been restored automatically. The control will not be ready for use until confirmed with the SET-button.

This behavior occurs after a firmware-update or a factory reset.

Procedure:

- Hold down the SET button for 5 seconds to confirm the factory reset
- Set and store original parameterization for the tank.

Displayed when invalid storage areas are detected.

When the control is switched on, it checks whether the parameter values in the EEprom-storage have been changed inappropriately. (This is possible in rare cases due to EMC-effect or lightning, for example).

If an impermissible change is detected, "F.EEP" is displayed, the control is not ready for operation.

Procedure:

- Press and hold the OFF / SET / UP / DOWN buttons simultaneously until "dEFA" appears in the display: The default configuration (factory setting) has been restored.
- Press button SET to confirm the factory reset.
- Set and store original parameterization for the tank.

NOTICE

NOTE:

If "F.EEP" appears again on the display after the factory reset and after another OFF and ON-switching, the control is irreparably defective.

9.7 Power pack or operation via external power supply

NOTICE

The optional battery pack is essential for full function of the tank monitor of the WTS-300.

Thus, the tank monitor function is guaranteed in the event of a power failure. During the power failure, the fault code [F30] flashes in the display.

The use of the battery pack must be specified in parameter [A75] = 1. The charge status of the batteries is monitored (fault F39).

Installation:

Only the suitable original WELBA-power pack may be connected..

WELBA Power pack | 21 | 22 | + | –

- Connect the power pack to terminals 21 + 22 (observe polarity)
- activate power pack in parameter [A75]
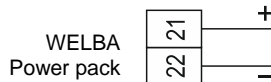
NOTICE

IMPORTANT NOTE

The life of the rechargeable batteries is limited. Those fitted must be replaced by new ones every two years at the latest.

Only (!) rechargeable batteries of the following specification may be used:

1,2 V NiMh - size AA (min. 2.000 mAh)

The new batteries must always be charged!

⚠ DANGER!

DO NOT USE ORDINARY BATTERIES !!!

EXPLOSIVE !!!!!!

Operation via external power supply

External 12V power supply | 21 | 22 | + | –
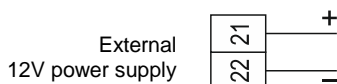
In the event of extreme voltage fluctuations in the power supply (or if no 230V power supply is available), the WTS-300 can also be operated via an external 12 V power supply. The connection must be made via terminals 21 + 22.

The use of the external power supply must be specified in parameter [A75 = 2].

9.8 Agitator monitoring module (optionally)

For different applications 4 different agitator monitoring modules are available:

ESVAW-001-A   Operating instructions

The ESVAW-001-A monitoring module is designed for monitoring up to 4 agitator motors. In the standard version only the motors A and B are supported motors C and D are optional usable.

ESVAW-002-A   Operating instructions

The agitator monitoring module ESVAW-002-A is used to monitor max. 2 agitator motors in milk cooling tanks. The agitator motors can be switched on or off directly via the module via the integrated relays. Thus, e.g. on a cooling tank control no relay for switching the agitator motors are occupied.

ESVAW-003-A   Operating instructions

The agitator monitoring module ESVAW-003-A is designed to monitor a three-phase AC motor with 400V AC.

ESVAW-004-A   Operating instructions

The ESVAW-004-A monitoring module is designed for monitoring up to 4 agitator motors. In the standard version only the motors A and B are supported motors C and D are optional usable.

The monitoring module is determining the power input independently for each connected motor and hereof it will be deduced whether the respective motor rotates and whether it runs with or without load so that a defective stirring wing can be detected for example.

The module has to be configured in parameter [A71].

For the correct installation please pay attention to the supplied documentation of the respective module.
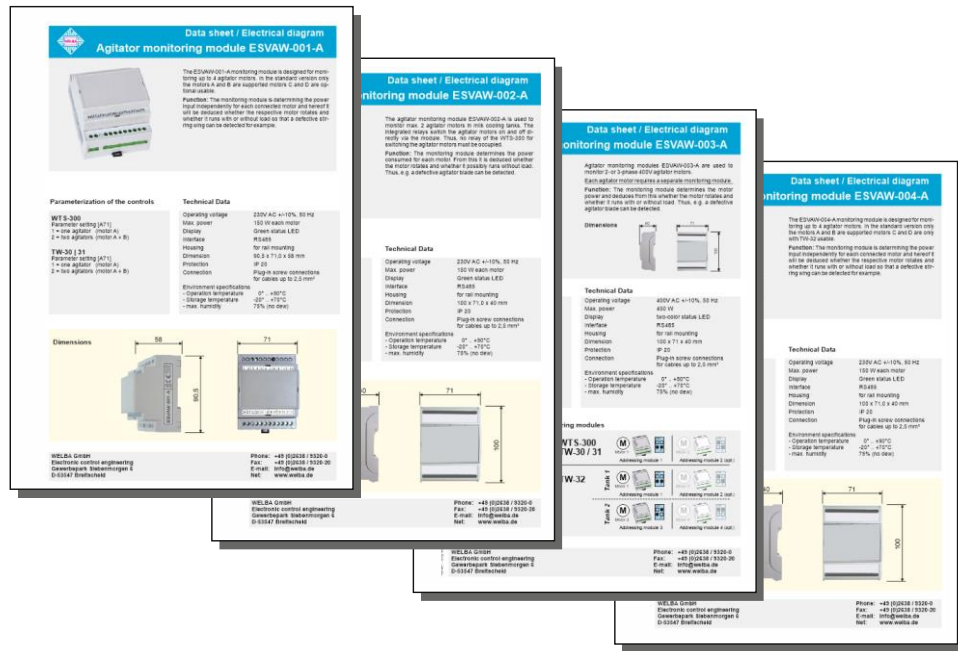
9.9 I/O Expansion module ESIO

With I/O extension modules, WELBA controllers can be extended with additional digital and analogue inputs or outputs.

- The 6 output relays can be operated either all with 24V DC or all with 230V AC.
- The 5 digital inputs (24V DC) can be configured via jumper as NPN or PNP inputs. The inputs 1..4 can additionally measure a frequency up to 10 kHz.
- The 2 current inputs 4..20mA with supply voltage connection can be used for the connection of corresponding sensors

For proper installation, please pay attention to the documentation supplied.

Configuration:

- Assignment of relays 1 to 6   => Parameters [A15..A20]
- Assignment of digital inputs 1 to 5 => Parameters [A29..A33]
- Activation I/O extension module => Parameters [A74]

9.10 USB module ESUSB
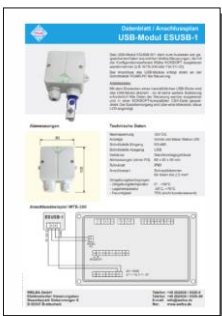
The USB module ESUSB-001 is used to read out stored data from Welba controllers that can be read out with the Welba KONSOFT configuration software (e.g. WTS-300 or TW-31/-32).

The USB module is connected directly to the 'RS485 PC' interface of the control unit.

For proper installation, please pay attention to the documentation supplied.

9.11 Integrated multifunction-time relay

The WTS-300 has an integrated time relay function by which external components can be switched. There is no need of an additional time relay.

Setting as follows:

- Select time relay function via parameter [A86] (selection 1..8).
- Assign output function '22' to a free relay [A1..A20].
- Determine the trigger signal:
  - [A87] = 0:   Function '24' must be assigned to a free digital input [A21..A33].
  - [A87] = 1..x: 1..x: the trigger signal is provided by the corresponding output function. '1..26' of the control - see [A1..A20]
- Set the desired switching times in parameters T1 [A88] and T2 [A89].

Selection 1:	Delayed switch-on T1

When the trigger signal is given, 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.

Trigger signal

Relay output

T1

Selection 2:	Switch-off delay T2

When the trigger signal is given, the relay output is switched on at the same time. If the trigger signal drops off, a time T2 starts. The relay is only switched off after T2 has elapsed.

Trigger signal

Relay output

T2
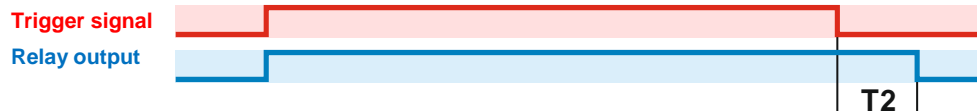
Selection 3:	Switch-on and switch-off delay T1 and T2

If the trigger signal is given, 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 drops off, a time T2 starts. The relay is only switched off after T2 has elapsed.

Trigger signal
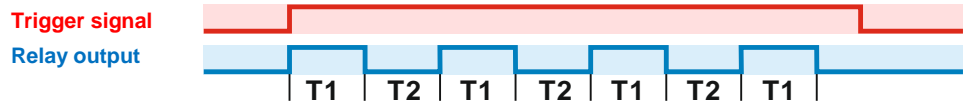
Relay output

T1 **T2**

Selection 4:	Switch-on pulse T2

If the trigger signal is given, 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 drops off within the time T2, the relay also drops off, too.

Trigger signal

Relay output

T2

Section 9.11: Integrated multifunction-time relay

| Selection 5:	Switch-off pulse T2
	If the trigger signal drops off, a pulse of length T2 is given at the relay output (but only as long as the trigger signal remains dropped off). If the trigger signal returns within T2, the relay also drops off, too.

Trigger signal
Relay output

T2

Selection 6:	Impulse generator T1 on, T2 off
	As long as the trigger signal is present, the relay output is alternately switched ON for time T1 and OFF for time T2. If the trigger signal disappears, the relay switches off again.

Trigger signal
Relay output

T1 T2 T1 T2 T1 T2 T1

Selection 7:	Delayed pulse, ON-switched-triggered (Event-controlled -> cannot be stopped!)
	If the trigger signal is given, the relay output is switched on for the time T2 after a delay time T1. The relay output also remains switched on, if the trigger signal should drop off again before the time T2 has elapsed.

Trigger signal
Relay output

T1 T2   T1 T2
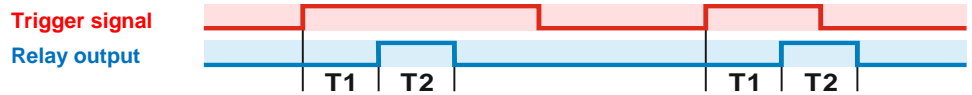
Selection 8:	Delayed pulse, OFF-switch triggered (Event-controlled -> cannot be stopped!)
	After the omission of trigger signal, a delay time T1 starts. The relay output is switched on for time T2.

Trigger signal
Relay output

T1 T2   T1 T2   T1 T2

9.12 Safety chain for 'remote start' functions

DANGER!

If the functions CLEANING, COOLINGL and/or STIRRING are triggered by remote start (push button), the system operator must ensure that the manhole and the rinsing tank are monitored by a safety chain.

- -

Parameter [A38] => Selection '0'
safety chain in the control line of the remote push buttons

Safety switch manhole

Safety switch rinsing tank

Push button remote start CLEANING
and / or
Push button remote start COOLING
and / or
Push button remote start STIRRING

- -
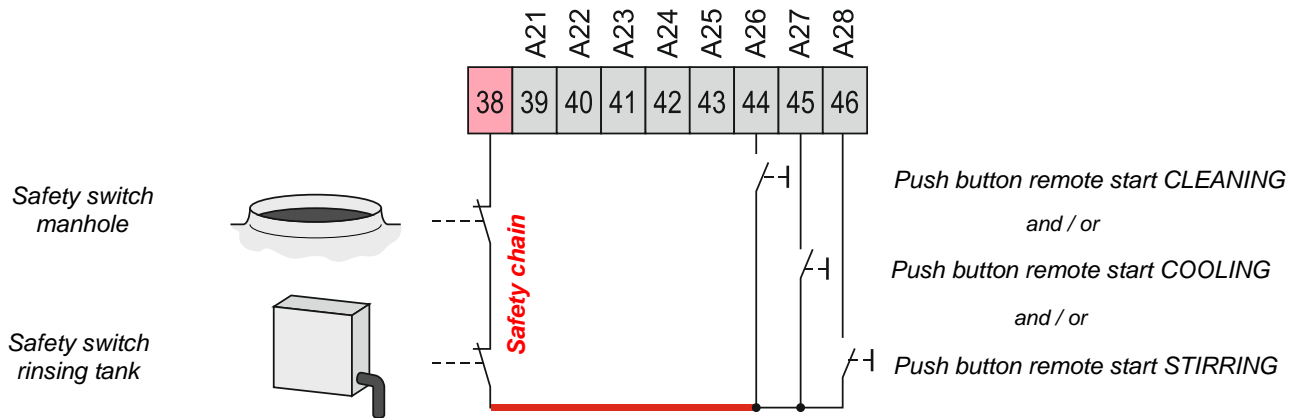
Parameter [A38] => Selection ‚1'
Safety chain via digital input

- Assign function '36' (release remote start) to one of the digital inputs [A21..A33].

Safety switch manhole

Safety switch rinsing tank

Push button remote start CLEANING
and / or
Push button remote start COOLING
and / or
Push button remote start STIRRING
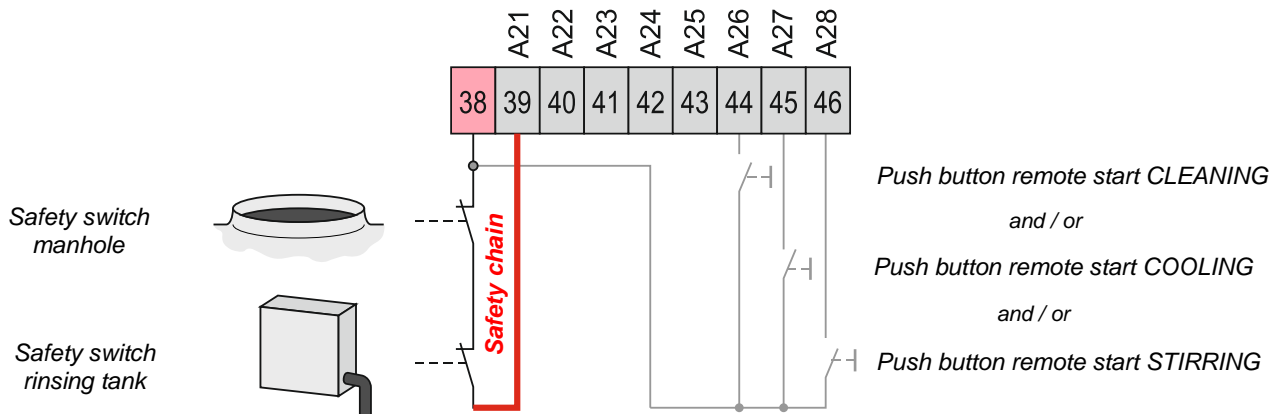
9.13 RS485 interface

The WTS-300 has two RS485 interfaces as connection options for:

RS485 PC

- A PC with the Welba Konsoft
  for parameterizing, updating and reading the data
- Remote maintenance module ESGSM
  for a remote configuration and sending SMS-error messages
- USB module ESUSB
  for reading the stored tank monitor data onto a USB stick

RS485 INT

- Agitator monitoring module ESVAW
  for monitoring the agitator motors.
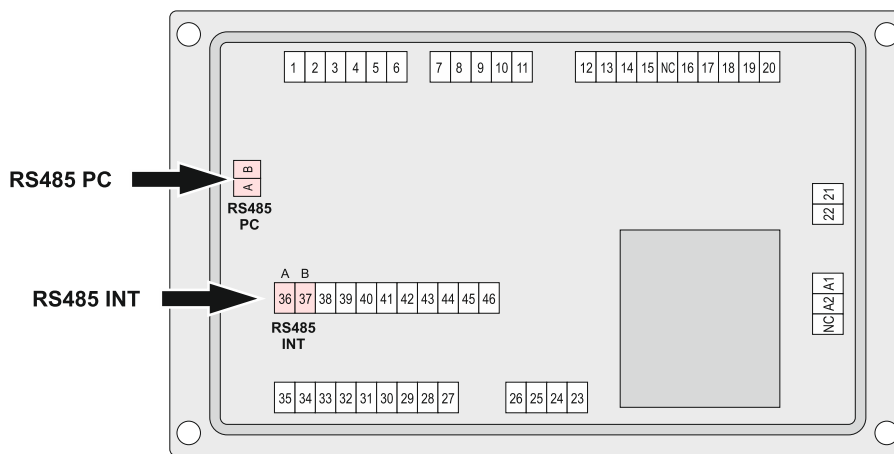
9.14 General measures when using electronic control systems

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

Section 9.14:   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 !
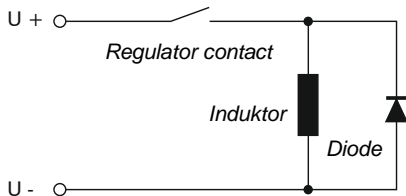
DC voltage

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.
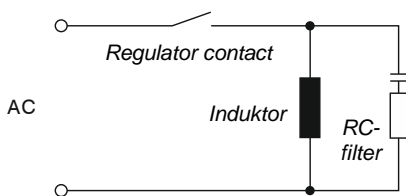
AC voltage

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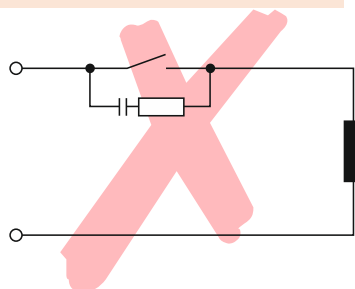
An RC filter should not be fitted directly to the regulator's switching contact (as shown on the left), as an idle current will flow through the RC combination even when the switching contact is open. This current may be enough to mean that a downstream contactor is not de-energised and a closed protective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

Section 9.14:   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.

9.15 Robot control

The WTS-300 offers two possibilities of controlling a connected robot:

- via the button **"Robot Stop"**
- via the signal **"Cleaning active"**

For both functions, the appropriate parameter settings must be done beforehand..

- -

If the cleaning button is pressed before the robot is stopped, the ROBOT LED flashes rapidly.

Signal **"Robot-Stop"** *(Robot stop via button)*

In [A40] robot operation must be configured and assigned to an output relay

[default = A2 = 2].

Also pay attention to the setting in [A41], so that in the event of a power failure the robot is correctly controlled. See section 4.6

🟡 Roboter Stop

⚪ Valve open

In OFF mode

- Press "ROBOT STOP" button: The robot is started or stopped again (toggle function). The LED indicates the present status.
- If the robot is active (LED "Robot Stop" off) washing will not start. If the washing button is pressed, the LED will flash.
- If cooling mode is activated while the robot is switched off, the robot will start automatically.

In cooling mode

- switching to OFF mode, the robot remains active.
- If the button "Robot Stop" is pressed for 3 seconds, the robot is stopped and cooling mode ends.

In cleaning mode

- The button "Robot Stop" does not have a function.
- If a fault occurs during washing: the robot is stopped.

When washing is successfully completed:

- the robot is automatically released, and
- the control unit switches to OFF mode
(cooling must then be started manually or by the robot)

    or

- if "Automatic start to cooling" is set: cooling mode is activated automatically.

- -

Signal **"cleaning active"** *(robot button has no function)*

is given only during washing or in the event of a fault (washing stopped), if the control unit has not yet switched back to OFF mode.

Parameter setting: setting "13" must be assigned to one of the relays [A1 to A12].

When washing is successfully completed the robot can start cooling via a digital input. (Digital input [A22..A33] => must be set to 2).

9.15.1 Cleaning release by robot

r27   Cleaning release via digital input

      0:      deactivated
      1:      activated

Explanation

Setting the parameter [r27] to 'active' is only useful for robot operation.

If the cleaning button is pressed after the tank has been emptied by the truck driver, it may be that the robot is not ready for the cleaning process, depending on the configuration of the connected robot.

The WTS-300 can be configured in such a way that washing is not started directly by pushing the button, but in addition a robot release signal is needed.

Procedure

If the cleaning release in parameter [r27] is set to 'active' and the CLEANING button is pressed,

- the display shows 'CLEn'
- the "washing" mode LED flashes

As soon as the robot is released, the cleaning process is started - the mode LED remains lit permanently and the programme step for the cleaning process appears in the display

Note: The function can be deactivated by pressing the OFF key during the waiting period until the cleaning release 'CLEn' is activated.

Parameter setting - IMPORTANT

In order for the cleaning release to take place, the robot release signal must be assigned to one of the digital inputs. It is preferable to use terminal 45, since this is already configured at the factory via parameter [A27].

Contact closed -> release
Contact open -> no release
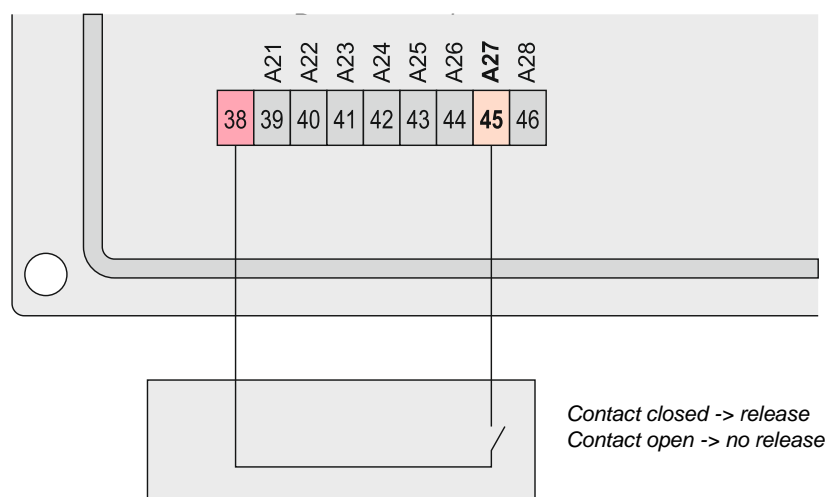
9.15.2 Compressor switch-on delay / pre-agitating

(Only useful when using a robot)

If the milk cooling tank is filled by a robot, filling from below takes place via the tank outlet. For some tank types, the temperature sensor is positioned very close to the tank outlet. For this reason, an increase in the milk temperature is measured during filling, although the actual milk temperature has not yet risen (due to a heat bubble at the outlet by the type of filling). This leads unnecessarily to the frequent switching on of the compressor and thus to an increased wear of the cooling system.

The parameter [P6] can be used to parameterize a 'pre-agitating time' in which the agitator starts before the compressor is switched on. This is intended to ensure that the warm milk at the outlet is mixed with the remaining cold milk in the tank and the compressor is switched on only after the pre-agitating time has elapsed if the total milk quantity is above the target temperature.

9.15.3 Compressor lock via digital input (by robot)

With this function it can be set that a robot influences the cooling performance. If the robot sends a signal to the correspondingly configured digital input, the compressor is switched off as long as the signal is present.

NOTICE

Note: With settings 3 and 4 in parameter [P70], the compressor lock can be deactivated via button "Cooling" until the next cooling start.

Cancel compressor lock:
- Press the OFF button,
- Start cooling mode immediately (without cooling start delay) by double-clicking the "COOLING" button.

  The compressor lock is deactivated once (until the next cooling start).

10. Other information - Cooling

10.1 Automatic start continuous agitating or cooling mode

10.1.1 Automatic start to continuous agitating mode after exiting cooling mode

Setting in parameter [P23].

When the cooling operation is stopped by the milk truck driver, a continuous agitating mode can be initiated automatically in order to achieve better mixing of the milk in the tank.

10.1.2 Automatic start to cooling mode after successful cleaning

Setting in parameter [P60].

When using a robot, it is possible to start the cooling mode automatically after a successful cleaning.

If cleaning is not successful, the control remains in cleaning mode and manual acknowledgement is necessary.

10.2 Different variants for cooling start delay

Cooling start delay is set using parameters [P61 - P67].

The control can be programmed to delay the start of the compressor after the cooling mode has been triggered, to prevent a slight freezing of milk in the tank. This delay takes place only in case of first milking after the cleaning.

A new manual activation of the cooling start delay can be triggered only by a long pressing of the button "COOLING".

To cover all the different system configurations possible, the WTS-300 offers a range of variants for cooling start delay.

0. **no cooling start delay**
Cooling starts immediately

Cooling immediately temperature-regulated

1. **simple cooling start delay**
Cooling starts after a set time.

defined time	*temperature-regulated*

2. **periodic cooling phases**
Cooling starts in the form of periodic cooling phases at set intervals before then switching over to temperature regulation.

defined phases	*temperature-regulated*

3. **periodic cooling phases after switch-on delay**
Cooling starts after a set time, in the form of pre-set periodic cooling phases at set intervals before then switching over to temp. regulation.

defined time	*defined phases*	*temperature-regulated*

4. **according to number of milk pump impulses**
Cooling starts after the set number of milk pump impulses.

Milk pump impulses	*temperature-regulated*

5. **periodic cooling phases after a number of milk pump impulses**
Cooling starts after the set number of milk pump impulses in the form of pre-set periodic cooling phases at set intervals before then switching over to temperature regulation.

Milk pump impulses	*defined phases*	*temperature-regulated*

6. **Milk-volume-dependent cooling start delay**
from start cooling [P50 - P 55]
Compressor starts according to the parameterized milk quantity in the tank for the calculated running time, before switching to temperature control.

Parameterized milk quantity	*calculated compressor running- and break time*	*temperature-regulated*
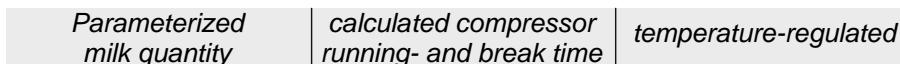
7. **Milk-volume-dependent cooling start delay**
from start cleaning [P50 - P 55]
Compressor starts according to the parameterized milk quantity in the tank for the calculated running time, before switching to temperature control.

Parameterized milk quantity	*calculated compressor running- and break time*	*temperature-regulated*
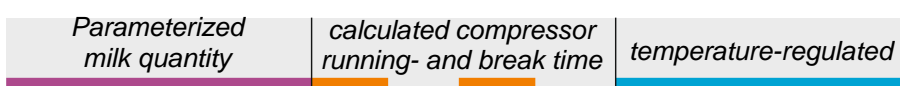
Information on cooling start versions 6 and 7
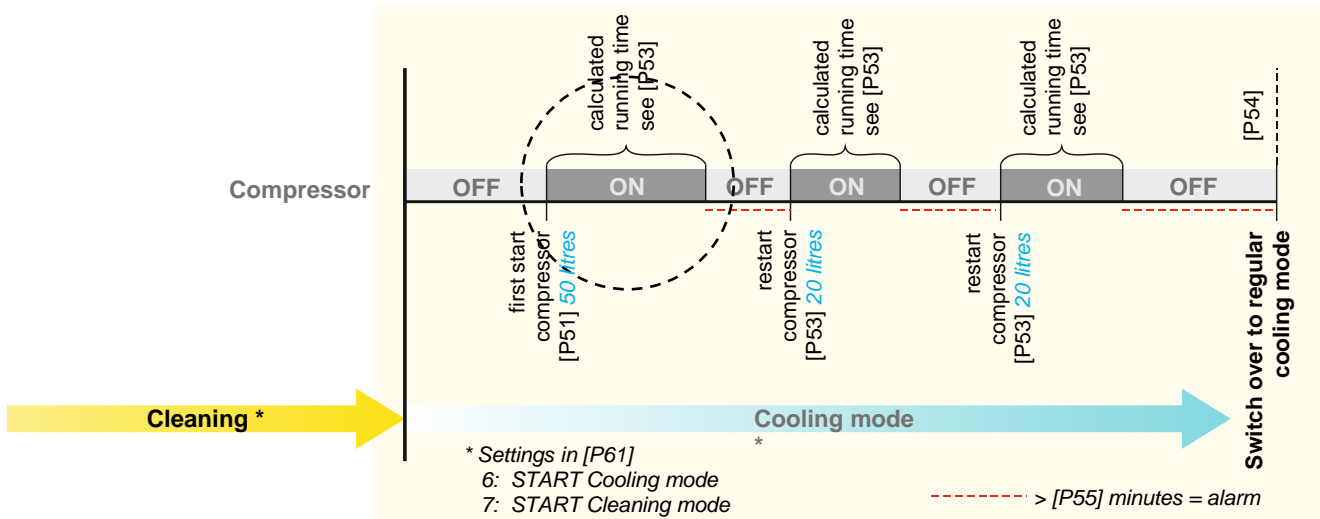
Both settings "6" and "7" are used for volume-dependent switching on of the compressor in order to prevent the milk from freezing during robot operation when the cooling mode starts. Depending on the quantity of milk *, the compressor is switched on either sooner or later and then longer or shorter.

 * *The control calculates the current milk quantity in the tank from the entered capacity of the feed pump [P50] and the measured duty cycle of the feed pump.*

   *Measured milk quantity = P50 x measured running time milk feed pump ***

 ** *The running time of the milk feed pump(s) is determined via digital inputs. I.e. the digital inputs in the parameters [A21 - A28] need the assignment of the settings 8, 9 or 10 (depending on the number of milk pumps). For several milk pumps, the total pump running capacity is added -> and from this it is the total quantity of milk.*

Depending on setting „6" or „7" the calculation of the milk quantity starts already

  - Setting „6" = only with the beginning of the cooling mode
  - Setting „7" = or in the cleaning mode

Setting "7" is selected if during the cleaning of the main tank milk has already been milked into a buffer tank and this milk is pumped into the main tank after the end of cleaning to start the cooling mode. This amount of milk is added to the amount of milk from the start of cooling mode.
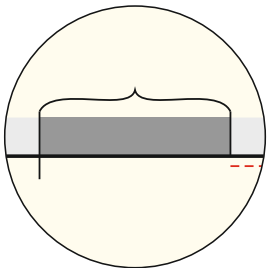
The running time of the compressor is calculated from the formula:

$$Running\ time\ compressor = \frac{measured\ quantity\ of\ milk}{P53}\ x\ P52$$

If milk is transported from the feed pump into the tank while the compressor is running, the running time of the compressor will be extended accordingly.

If the compressor is switched off, it cannot start again until at least the quantity of milk set in parameter [P53] has been added.

10.3 Emergency cooling / Sensor fault

In the event of a faulty temperature sensor, a fault code is displayed:
- F56 fault configuration broken sensor
- F57 fault configuration sensor short circuit
- F58 fault configuration sensor range exceeded

Emergency programme

- A timer can be set in parameter [P4].

- On pressing the COOL button, the compressor and agitator will run continuously until the time set on the timer expires.

The timer can be switched off manually at any time using the OFF button.

10.4 Level alarm during cooling (Fault code F52)

Safety function:

The level input will be monitored during cooling.

In the case of systems with robot operation, depending on the layout of the system, the washing line may be connected permanently. If, for example, a water valve jams and the water level rises, water could be forced into the tank via the washing line. In this case, once the electrode is reached, an alarm is given and the outlet valve is opened.

All relevant settings are found in [P40].

10.5 Connection /Parameterization external analogue pressure sensor

Analogue input

Pressure sensor "filling level" *

*either / or ***

Pressure sensor "cooling agent"

Cooling level control *(see section 10.6)*   **Tank overflow protection** *(see section 10.7)*

Anti-freezing proteciton *(see section 10.8)*

* The pressure sensor „filling level" must have a measuring range of 0..1000 mbar.

** in connection with the optional IO extension-module, both functions can be used simultane-ously.
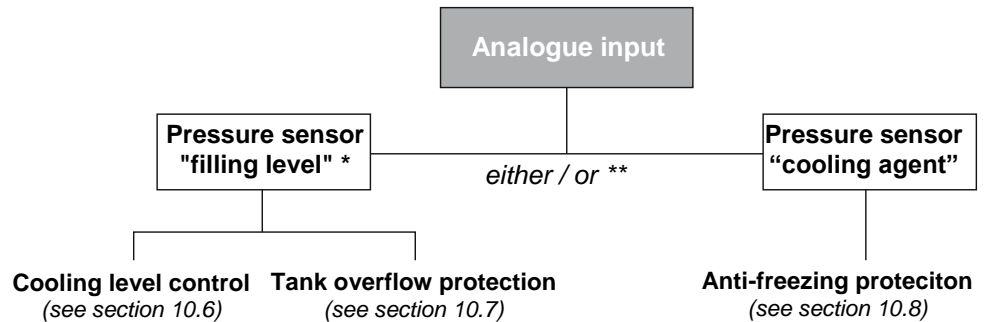
Either a pressure sensor for the filling level or the cooling agent can be connected to the analogue input of the WTS-300. See graphic.

When using the pressure sensor „filling level", it has to be set as follows:

Installation case "A"

Mounting sensor **within** the linear area

Linear area

A60

A61

⊠ = *Sensor*
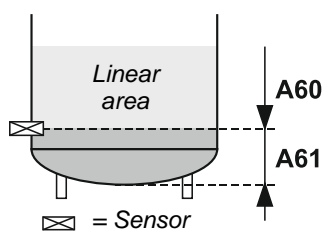
Installation case "A"
- Set parameter [A54] to 1
- Set parameter [A60] (litres per cm filling height) to your tank.
  Example: tank-inside diameter "D" = 250 cm
  Formula: D² x 3.14 ÷ 4 ÷ 1000 = litres
  Corresponds in the example: 250 x 250 x 3.14 ÷ 4 ÷ 1000 = 49 litre per cm filling height.
  Set parameter [A61] (offset in litres) to your tank.
  Quantity of milk in the tank below the pressure sensor that is not determined
- Set Parameter [A62] to "0".

Installation case "B"

Mounting sensor **below** the linear area

Linear area

A60

A62

A61

⊠ = *Sensor*
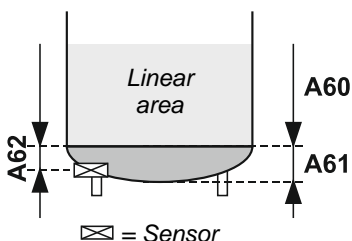
Installation case "B"
- Set parameter [A54] to 1
- Set parameter [A60] (litres per cm filling height) to your tank.
   Example: as before
- Set parameter [A61] (offset in litres) to your tank.
  Quantity of milk in the tank below the linear area*.
- In parameter [A62] enter the distance 'Center sensor' to 'Start linear area' in cm.

Level indicator on the display (in litres)

With a pressure sensor "filling level" the filling level in the tank can be displayed in the cooling mode by pressing the SET-button (in hectolitres).

Display L.125 = 12,500 litres

* Linearer Linear area = Start of the cylindrical shape of the tank.
    From here the incoming milk quantity is linear to the pressure on the sensor.

10.6 Tanks and silos with multiple cooling stages (cooling step control)

The WTS-300 supports silos with up to three cooling stages. 5 different methods are possible to control the second and third cooling steps.

Applicable for all methods:

In the parameters [A1..A20] the connected cooling levels and compressors have to be assigned to the corresponding output relays.

1. Cooling steps are switched on with a time delay

- Set parameter [P73] to method 1.
- Set parameter [P74] (time delay 2nd cooling step - from end of cooling start delay) to the desired delay time.
- Set parameter [P75] (time delay 3rd cooling step - from activation of 2nd cooling step) to the desired delay time.
- Set the desired time delay of the cooling steps to each other in parameter [P78] (effective after the first switch-off of the cooling steps).

**2. Cooling steps are switched on by level switch** (silo only)
Precondition: installed level switch per cooling step

- Set parameter [P73] to method 2.
- Assign the level switches to one of the digital inputs [A21... A33]. (Setting 16 or 17 for "Level switch 1 or 2").
- Set the desired time delay of the cooling steps to each other in parameter [P78] (effective after the first switching off of the cooling steps).
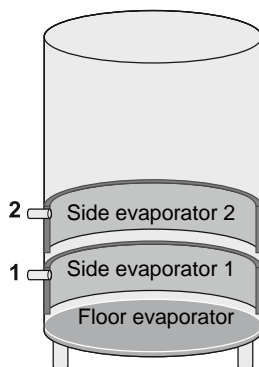
3. Cooling steps are switched on depending on the filling quantity (silo only)
Precondition: installed analogue pressure sensor "filling level"

- Set the level switch as described in section 10.5.
- Set parameter [P73] to method 3.
- Set the filling quantity in [P76] in litres to switch on cooling level 2.
- Set the filling quantity in [P77] in litres to switch on cooling level 3.
- Set the desired time delay of the cooling steps to each other in parameter [P78] (effective after the first switching off of the cooling steps).

4. Cooling steps are switched on simultaneously (parallel operation)
All cooling steps are simultaneously switched on to each other with a short time delay [P78]. Parallel operation is already active during the cooling start delay.

- Set parameter [P73] to method 4.
- Set the desired time delay of the cooling steps to each other in parameter [P78]. (Immediately effective)

5. As method 2 - with additional timeout*.
Precondition: installed level switch per cooling step

- Set parameter [P73] to method 5.
- Assign the level switches to one of the digital inputs [A21... A33]. (Setting 16 or 17 for "Level switch 1 or 2").
- Set the desired timeout times* for cooling level 1 + 2 in parameter [P74 + P75].
- Set the desired time delay of the cooling steps to each other in parameter [P78]. (Effective after the first switching off of the cooling steps).

* Timeouts:

If the set levels are not achieved within the timeouts, the relevant cooling steps are still

2 Side evaporator 2
1 Side evaporator 1
Floor evaporator

10.7 Tank overflow protection
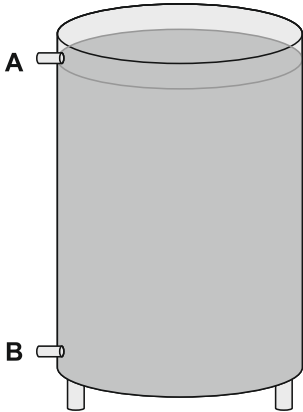
Especially for silo-tanks a „tank overflow protection" can be set in three different ways:

<u>Via level switch **A** "tank full"</u>

Precondition: installed "level switch tank full"

- Set parameter [P42] to 1 or 2, depending on the switch used
- Assign to one of the digital inputs [A21..A33] the function 18 "level sensor tank full"

<u>Via level electrode **A**</u> (connected to level 2 of the control)

Precondition: installed level electrode

- Set parameter [P42] to 4.

<u>Via litre-recording by pressure sensor **B**</u>

Precondition: installed analogue pressure sensor "filling level"

- Set parameter [P42] to 3
- Enter the maximum filling quantity of the silo-tank in hectolitres ((= 100 litres) in parameter [P43]
- Set level switch as described in section 10.5

Fault display: When the upper filling level is achieved fault [F51] "tank overflow protection" is triggered.

10.8 Anti-freezing protection by means of low pressure monitoring

With the WTS-300 "freeze protection" can be set up via the low pressure monitoring of the compressor. This prevents small quantities of milk from freezing in the tank or silo.

Two variants are possible:

NOTICE

If there are several compressors, the low-pressure monitor acts on ALL the compressors at the same time.

A) Via an analogue pressure sensor at the analogue 4..20 mA -input

If the pressure falls below a set monitoring pressure [P85], the compressor is switched off for a time which can be set [P88].

When restarting the compressor, the monitoring is delayed by the set time [P87].

Other settings: [A54 or A56 or A57] => 2
                         [P84] => 0

If the fault monitoring of the analogue input [A55] is activated and there is an error, the anti-freeze protection is temporarily deactivated.

If this function is activated, the current pressure (in %) can be displayed in the cooling mode by pressing the SET-button.

NOTICE

SET   `19.7P`

B) Via a pressure switch on one of the digital inputs

If the pressure switch signals (pressure too low) the compressor is switched off for a time which can be set [P88].

When restarting the compressor, the monitoring is delayed by the set time [P87].

Other settings: - P84 = 1 or 2
                         - The assignment of function 20 (low pressure fault input)
                            to a digital input [A21..A33].

Time limit for the function "low pressure monitoring"

After activation of cooling the "low pressure monitoring" function can be temporally limited via parameter [P89].

10.9 Thermal protection - / Fault monitoring compressor [P72]

Fault monitoring is used to indicate problems when running up to three separate compressors.

The fault message occurs depending on the parameterisation
- by evaluation of the potential-free auxiliary contact of the motor protection switch (setting 1, 2), or
- by evaluation of the potential-free auxiliary contact of the compressor contactor (setting 3, 4),

The following settings for fault monitoring are possible:
- **Parameter [P72] is at 0**
  Fault monitoring is deactivated
- **Parameter [P72] is at 1**
  The auxiliary contact of the motor protection relay or of the motor protection switch is queried.
  Is this auxiliary contact <u>opened</u> = fault "F53" is displayed.
- **Parameter [P72] is at 2**
  The auxiliary contact of the motor protection relay or of the motor protection switch is queried.
  Is this auxiliary contact <u>closed</u> = fault "F53" is displayed.

- -

- **Parameter [P72] is at 3***
  Fault monitoring via switch-on feedback from the compressor contactorauxiliary contact (N/O contact).
- **Parameter [P72] is at 4***
  As selection 3, but switch-on feedback from the compressor contactorauxiliary contact (N/C contact).

  * Settings 3 and 4:

  When the compressor is switched on, feedback is expected at the digital input of the controller after 60 seconds at the latest. If this feedback is not received, fault "F53" is triggered.

Assignment of digital inputs

Fault monitoring is only possible if a digital input [A21..A33] with function 5 is assigned for each compressor.

The first assigned digital input monitors compressor 1, the second one compressor 2 and the third one compressor 3.

10.10 Fault messages low pressure (F80)

Based on the setting for low pressure monitoring (section 10.8), a fault message can also be generated as follows:

Function assignment digital input [A21..A33] => 20 (fault input low pressure)

Parameter [P90] - Setting 1 + 2
- digital pressure switch required
- independent of the low-pressure monitoring

Parameter [P90] - Setting 3..30

If a low-pressure message stands longer than the time set after the finishing of the low pressure monitoring [P89] with the compressor switched on, fault (F80) is displayed.
- digital pressure switch or analogue pressure sensor required
- depending on low pressure monitoring (only possible if [P89] > 0)

10.11 Fault Messages High Pressure (F81)

Via parameter [P91], the signal of an external high-pressure switch can be generated as fault message.

Function assignment digital input [A21..A33] => 21 (fault high-pressure)

Parameter [P91] - Setting 1 + 2
- independent of the low-pressure monitoring

11. Other information - Cleaning

11.1 Detergent supply via beaker

Option 1: Usage of the 'alkaline detergent' function'

If parameter [r21 = 0] is set, only the relay for alkaline detergent is activated. The selection of the cleaning agent (alkaline / acidic) is up to the farmer.

Option 2: Usage of the 'Hot water valve' function'

- Assign function 16 'Hot water valve / beaker cleaning' to one of the relays A1..A20.
- Select the hot water valve for the main cleaning in parameter [r53].

NOTICE

NOTE: By activation of parameter [n30] (water intake via level) the hot water valve to flood the beaker when the level is achieved would be switched off again.

With the beaker dosing a premature switching off of the rinsing pump may be necessary, i.e. prior to the finishing of the dosing process. This can be set in parameter [r22].

11.2 Setting of a break in the cleaning programme
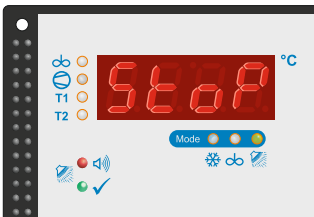
During the automatic cleaning programme it is possible to add a break after a cleaning cycle.

Example: Setting a break after the pre-cleaning until sufficient quantities of warm water from the heat recovery for the main cleaning cycle is available.

The following settings are necessary

- After which cleaning cycle the break shall take place [r71]
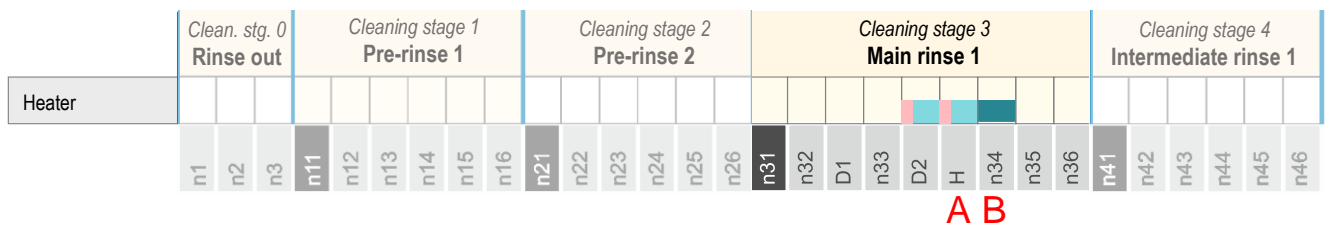- How the break shall be finished [r70]

Options:

When the break should be finished ...

- ... via a signal at the digital input
  assign the function 15 "Start from rinse stop" to a digital input A21 to A28.
- ... after a certain amount of time
  enter this time in parameter [r72].
- ... at a certain time
  enter them in parameter [r73].

A parameterized elapsed time of the break or the countdown-timer is displayed alternately with "STOP".

11.3 Heating control

	Clean. stg. 0	Cleaning stage 1	Cleaning stage 2	Cleaning stage 3	Cleaning stage 4
	Rinse out	**Pre-rinse 1**	**Pre-rinse 2**	**Main rinse 1**	**Intermediate rinse 1**

The WTS-300 distinguishes between two heating phases:

A - **Heating-up phase** - programme step "H"

B - **Further heating phase** - during the main circulation (n34 or n54 and n74).

During the heating-up phase, the water is heated to the temperature set (the display shows the temperature measured by sensor 1 instead of the programme stage). The next programme stage then follows. The heating-up time is, however, limited by an adjustable timeout. Once the time has expired the control unit switches to the next programme stage. The completion of washing is followed by a corresponding fault report.

During the following further heating phase, the circulating washing solution is maintained at the further heating temperature that has been set.

NB:

NOTICE

If a second sensor has been configured as a washing sensor, temperature regulation and the display switch over to the second sensor. See also the section "Function of second temperature sensor 9.4".

Heater start delay

Depending on the system layout, a start delay for the heater can be set. This applies only at the beginning of the heating-up phase (depending on whether this starts in programme stage "D2" or "H").

This delay can be used to prevent the system switching on to the next programme stage too soon ...

- ... if pre-heated water- e.g. from a boiler - is cooled down by the cold walls of the tank and needs to be reheated, or
- ... if, as a result of pre-set pump venting, the pressure switch triggers and the heater is switched off (see also the sections "Pressure switch" and "Pump venting").

11.4 Influence on the temperature of the tank wall

By repeating warm pre-rinsing cycles, it is possible to warm up a cold tank or to cool it down again at the end of cleaning with cold after-rinsing cycles.

In addition, it is possible to switch on the cooling compressor in parameter [r18] during the after-rinsing in order to cool down the tank quickly with the cooled water before the milk enters the tank.

11.5 Boost pump function (booster pump)

With the function "Boost-Pump", a booster pump can be controlled in water supply networks with low water pressure.

For this, the function '21' "Boost Pump has to be assigned to a free output relay.

The booster pump is now always controlled when a water valve is opened.

11.6 Level control setting

The level control is pre-set in the factory to "average" water quality. Depending on the hardness of the local water supply, sensitivity can be adjusted as follows:

Setting under the I/O test parameters:

- In the level "I/O test parameters" (see section 8.12), open the water intake relay until the level is reached. (Visual check of electrode)
- Setting level 1: Select parameter [o.41].
- Press and hold down SET - simultaneously set the displayed value to "-10" using the DOWN ARROW button.
- Keep the SET key pressed - simultaneously increase the value slowly with the UP ARROW button until the green LED is lit (and then increase by 1). Releasing the SET button saves the last set value.
- Setting level 2: Select parameter [o.42] -> then see level 1
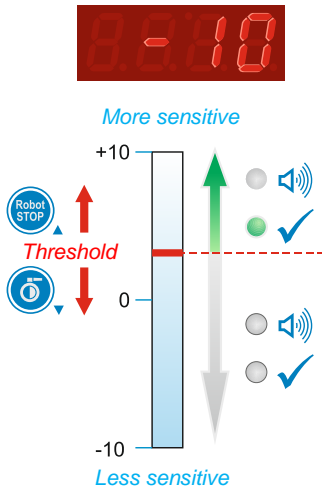
Fine adjustment during cleaning (only for the service technician)

This method works only when sensitivity has been set too low!

If at the start of the first washing stage (water intake until level is reached) no water is detected despite the level electrode having been reached, water continues to enter. The service technician can now adjust the sensitivity setting:

- Hold down the SET button for 4 seconds: The water valve is switched off.
  The value indicated changes from the programme stage display to level sensitivity display. The value last set appears.
- Use the DOWN ARROW to adjust the value shown to "-10".
- Use the UP ARROW button to increase the value slowly until the green LED lit up. (And then increase by 1).
- Pressing CLEANING button. The value set is stored, and washing continues from the appropriate stage.

Fine adjustment in the extended washing parameters
(Only for the service technician)

The level input sensitivity can be further adjusted manually using parameters [r30] for level 1 and [r31] for level 2.

11.7 Relay function 'set level 2 to relay'

If this function '23' is assigned to a relay [A1..A20], the relay is always energized when water is detected at the level 2 input.

11.8 Function of pressure switch – Effect on pump and heater

A pressure switch fitted to the washing circuit can protect the pump and heater from damage.

Protection of the cleaning pump

Parameter [r11] can be used to set the length of time during which there may be no pressure in the washing line before washing is stopped. This prevents the washing pump being damaged by running dry.

Protection of heater

Parameter [r38] can be used to set the length of time during which there may be no pressure in the washing line before the heater is switched off. Washing continues nevertheless. This prevents heater burn-out.

11.9 Air in the cleaning pump -> automatic venting

If there is air in the washing line when the washing pump starts, it is impossible for the pump to circulate the washing water. The remedy: short switch-on and switch-off impulses when the pump starts can remove air bubbles.

The number of impulses and the time interval between them must be set.
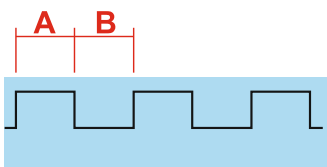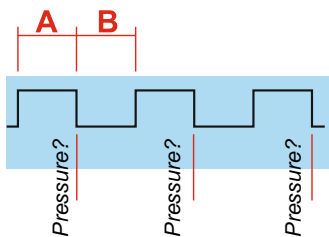
Parameter [r80] - Setting 1 =
On/off impulse with fixed quantity for all cleaning stages.

r81   - Number of switch-on and switch-off impulses
r82   - Duration of switch-on impulses **A**
r83   - Duration of switch-on impulses **B**

Parameter [r80] - Setting 2 =
as 1 - however, premature termination when pressure via pressure switch

After each switch-on impulse, the pressure switch is contacted. If no pressure has been built up, a further impulse interval follows. If there is pressure in the line the washing pump switches on and runs continuously. Parameter [r81] is used to limit the maximum number of impulses.

r81   - Max. number of switch-on and switch-off impulses
r82   - Duration of switch-on impulses **A**
 r83   - Duration of switch-on impulses **B**

Parameter [r80] - Setting 3 or 4

If permanent impulses of the cleaning pump are requested (improved rinsing effect) in the rinsing steps (rinsing cycles 0 and 9) select settings 3 and 4.
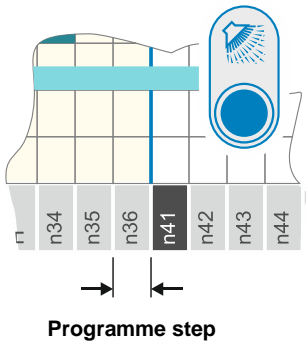
NB:

During automatic venting with pressure switch evaluation, parameters [r11] and [r38] do not come into play.

NOTICE

The digital input in parameter [A25] (5=Pressure switch water "Default setting") is used directly for evaluation.

11.10 Service functions for testing the cleaning cycle

Programme step

11.10.1 Start cleaning with the desired cleaning stage (0 to 8)

- Set the desired cleaning stage (0 to 8) in parameter [r92].
- Press CLEANING button: A cleaning cycle starts with the selected cleaning stage and then runs through to the end.

  The next cleaning cycle starts again with the first cleaning stage.

11.10.2 Single step function during cleaning

Advancing the cleaning cycle by individual steps

For a faster testing of the cleaning cycle, it is possible to manually switch the cycle from one programme step to the next one with the single-step function, you do not have to wait until it has been completely processed.

NOTE: Even a stopped cleaning cycle is considered completed!!

ATTENTION: The use of this single step function is at your own risk! Advancing important processes poses a danger to both the tank and the milk!

WARNING

Proceed as follows:

either

- Set in parameter [r93] how many cleaning cycles (1..3) should be carried out one after another with the single step function.

  NOTE: The single step function is immediately active when cleaning is started!

or permanently

- Set selection '4' in parameter.

  If '4' is selected, the single step function is started by pressing the CLEANING button for 4 seconds while cleaning is in progress. StP' appears in the display.
- By a repeated pressing the button CLEANING, the cycle can now be advanced step by step.

NOTE:

The last rinsing step (n86) 'draining phase' cannot be skipped.

If cleaning has been continued via the single step function, the green LED 'CLEANING END' does not flash.

Cleaning can be stopped at any time by pressing the OFF button. A drain phase is automatically carried out - this cannot be stopped. In the display, "ABL" appears alternating with the temperature.

12. Other information - Tank monitor

12.1 Activation delay tank monitor [H90]

The activation delay of the tank monitor is required to test the operation modes during the commissioning without activating false alarms.

The delay is activated when the WTS-300 is switched on.
- All time-dependent alarms are temporarily deactivated
- Only after the set time [H90] has elapsed the tank monitor is set to the basic condition and activated.
- After one day, parameter [H90] is also reset to 0 to prevent a repeated delay.

12.2 EMAIL-, alarm + remote maintenance module ESIPM

The email alarm and remote maintenance modem ESIPM-001 is used
- to send fault messages by email
- for remote configuration
- for remote diagnosis
- for configuration and diagnosis via the own LAN / WLAN network

of the connected controllers.

For proper installation, please pay attention to the documentation supplied.

Configuration:
- Activation of alarm module monitoring => Parameter [A73]

12.3 SMS, alarm + remote maintenance module ESGSM

The SMS alarm and remote maintenance modem ESGSM-001 is used
- to send fault messages by SMS
- for remote configuration
- for remote diagnosis

of the connected controllers.

For proper installation, please pay attention to the documentation supplied.

Configuration:
- Activation of alarm module monitoring => Parameter [A73]