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All from the same source

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Tank monitor

# TW-31

Quick start for the farmer



Programmable via  
configuration software  
WELBA „KONSOFT“

# 1. Introduction

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# 1. Introduction

## 1.1 Information about this operating instructions

This quick start is for the operator of the tank monitor. The document comprises all instructions and information for the operation of the tank monitor.

Read this document carefully and follow the instructions provided to ensure a smooth operation of the. In addition, the local accident prevention regulations and general safety regulations for the application area of the tank monitor must be observed.

## 1.2 Device description



The tank monitor TW-31 fully automatically monitors all processes (cooling, storage and cleaning processes) in milk cooling tanks. The objective here is to be able to remedy problems with the milk storage early enough by early alerting in order to prevent economic damage.

### Automatic detection of the operating mode

The TW-31 detects independently the mode (cooling, cleaning or empty) of the connected milk cooling tank. Depending on the mode it stores the temperature of the tank at different intervals. If the temperatures are beyond the set limits, the farmer or the tank driver is alerted visually as well as acoustically. The exact error cause can be determined via the alarm code shown on the display.

### Alarms

The TW-31 distinguishes between informative and critical alarms.

- The informative alarm (blinking green LED) signals to the farmer an improper operation -> action required
- The critical alarm "DO NOT LOAD" (blinking red LED) addresses the driver of the milk-collecting-truck. Together with the farmer the driver decides what to do next.

In addition to the two warning LEDs, an external warning light, an audible signal device or dialer can be connected.

You will find the description of the operation method in section 3.1.

### Function monitoring

In addition to the temperatures the proper functioning of all agitators and the proper cleaning process of the milk tank are monitored. In case of errors the corresponding alarms are also generated.

### Power failure

With the integrated power pack the temperatures are monitored and stored even in the case of a power failure. Thus the TW-31 can continue its work during a power failure and activate an alarm.

# 1. Introduction

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to section 1.2: Device description

## Data storage/-evaluation

The determined data of the last 300 days (max.) temperatures, alarms, operating mode changes, etc.) are stored in the CSV-format and can thus be opened in other programs.

The data can be read out by simply inserting a standard USB-stick into the USB socket - without further operation of the tank monitor.

## EMAIL or SMS remote maintenance modems

By an optional Email or SMS remote maintenance modem error messages can be sent via Email or SMS to inform the farmer at an early stage.

## 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!



### ***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.



### ***Nature and source of danger***

This warning signs warns of possible property damage.

Failure to observe this warning signs can lead to further damage to the system, loss of data or damage to the milk.



### ***Nature and source of danger***

This warning signs warns of possible operating faults. Failure to observe these warning signs can lead to loss of data or damage to the milk.



### ***Note***

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

## 1.4 Limitation of liability



***The proper function of the TW-31 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 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.**

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

**The tank monitor may only be opened by an authorized electrician!**

**The setting or changing of parameters may only be carried out by the system manufacturer or the service technician!**



#### **Important information on operation**

**The tank monitor must not be operated, when**

- **the housing is open or damaged**
- **the front foil is damaged (leaking)**
- **the time and date are not set correctly**

**If four bars appear in the display after a longer power failure, the time setting is lost and must be set again! See section 2.1**

**No liquid may get inside the housing!**

## 1.5 Function power pack + regular exchange

**Charged (!) Batteries must be used at all times for the tank guard to function properly!**

The batteries are used to maintain the tank guard function in the event of a power failure. During the power failure, the error code (F30) flashes in the display.

#### **Fault message (F39)**

If the fault message (F39) appears, the battery voltage is too low. The batteries can be removed and recharged by a qualified electrician. Are the batteries older than two years => replace!

#### **IMPORTANT NOTICE ABOUT THE ACCUMULATORS**

**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)**

**Since the tank guard may not be opened by laypeople, the replacement of the batteries may only be carried out by a qualified electrician**

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



## 2. Operation

### 2.1 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.

##### 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.

#### Setting the time during normal operation

- Press the SET button: a time is displayed.  
If the correct time is displayed, no further steps are necessary.

If the wrong 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.

The setting is finished. Depending on the operation mode of the cooling tank the display shows the current temperature in the tank or the time.



### NOTICE

*INFORMATION: Switching to summer- / winter time*

*The tank monitor can be configured for "automatic summer / winter time change-over". Talk to your service technician.*

## 2.2 Operating and display elements



### 2.2.1 Button functions

In case of a trouble-free working process the TW-31 does not require any handling with the following exception:

- in case of setting the clock (see section 2.1)
- in case of reading and confirming error codes (see section 3.5).



#### „SET“ button

- in case of normal operation = brief pressing: Displays the current time, hold 3 seconds: Set date and time
- If the red LED is flashing = display of the current error codes  
See section 3.5



#### „ARROW BUTTONS“

for setting the time or adjusting parameters

### *Operation by the driver of the milk-truck*



#### „RESET“ button

- Confirmation of the message “Do not load”. See section 3.3
- Function test "Do-Not-Load LED" and "external alarm light":  
Press reset button for 5 seconds: the alarm will go off for 10 seconds.

## 2. Operation

### 2.2.2 Description of the LEDs

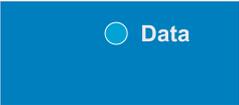
#### Display of the modes

	<b>“TANK EMPTY” detected</b> After a successful cleaning the tank can be filled with milk.
	<b>Operating mode “COOLING” detected</b> Cooling operation is active
	<b>Operating mode “CLEANING” detected</b> The cleaning operation is active
	<b>All LEDs off</b> Check the tank content

#### Tank monitor

	<b>LED (green) “MILK COLLECTION OK”</b>	permanent	everything is ok – milk can be loaded
		blinking	informative alarm
		off	a) if red LED is flashing or blinking b) after the confirmation of an informative alarm
	<b>LED (red) “DO NOT LOAD!”</b>	blinking	critical alarm
		permanent	critical alarm – has already been confirmed

#### Data transfer

	<b>LED (blue) “Data”</b>	blinking	USB-stick inserted: Data are transferred
		permanent flashing and goes off after 5 sec.	USB-stick inserted: Data transfer successfully completed
		off	No USB-stick inserted

For the procedure for reading out the LOG files, see next page.

## 2.3 Reading out the tank guard LOG file



Proceed as follows:

- Insert a standard USB stick (FAT-32) into the USB socket of the tank monitor:
  - The blue "DATA" LED begins to look slowly after a short time => The tank monitor LOG file is transferred to the USB stick! Depending on the evaluation period [parameter h90], this transfer can take several minutes.
  - Has the data transfer been completed without faults: The blue "DATA" LED lights up permanently for approx. 5 seconds and then goes out.
  - If the data transfer is faulty: The blue "DATA" LED flashes quickly for approx. 5 seconds and then goes out.  
*Try again or use a different USB stick.*
- If the LED has gone out: remove the USB stick and close the cover cap tightly.

### File names of the tank monitor LOG files:

When reading out the tank monitor data on a USB stick, the tank monitor automatically defines the file name of the data file:

**DATA-000.CSV**

If this file name is already on the stick, the next higher number is used:

**DATA-001.CSV**

**NOTICE**

The files on the USB stick can be displayed with the Welba KONSOFIT.

### 3. Operation and fault handling

#### 3.1 Description of tank monitor operation

During the entire cooling and cleaning process the tank monitor checks the operation of all processes to guarantee the perfect condition of the milk. Errors are displayed flashing on the display via corresponding error codes. Depending on the type of alarm two LEDs (red and green) flash or blink additionally.

In case of errors which may jeopardise the milk quality, the problem is indicated by the red LED as a “critical alarm”. In this case milk must not be filled into the tank unless a careful check has been carried out!

The tank monitor “knows” the following alarm types:



#### **Critical tank monitor alarms** (red LED + error code in the display)

- During cooling mode:
- minimum and maximum milk temperature
  - agitator function and stirring intervals
  - duration of power failure
  - milk temperature too high for a long period of time
- During cleaning:
- cleaning temperatures
  - cleaning time



#### **Informative tank monitor alarms** (green LED + error code in the display)

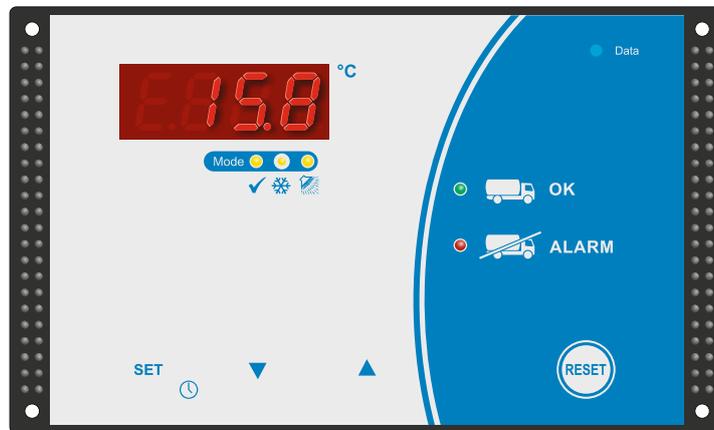
- During cooling mode:
- milk temperature too high for a long period of time
  - milk temperature too low
  - malfunction agitator and agitator times
  - maximum time until next cleaning
  - duration of the power failure
- During cleaning:
- cleaning temperatures
  - detergent dosage and exposure time

#### **Additional system-alarms** (only error code on display)

*(Depending on parameterization they can be both, critical or informative).*

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

### 3.2 Optical presentation of alarms



  No Alarm

**F34**

Each alarm has its own display code (see section 6.5). Informative and critical alarms are additionally displayed by LED as follows:

Informative alarm



active informative alarm  
(After RESET permanently green again)

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 – 1 x RESET  
critical + informative alarm – multiple RESET  
*In case of several alarms, the RESET button has to be pressed several times. See section 3.4)*  
(Turns off when cleaning cycle runs for at least 10 minutes)

System alarms

**F34**

is displayed only as a blinking display code

### 3. Operation and fault handling

#### 3.3 Milk removal YES or NO

Examples for the use of the tank monitor.



#### **ATTENTION:**

**Do not simply confirm the alarms of the tank monitor.**

**It is essential to investigate and remedy the cause of the alarm in order to avoid harmful effects on the milk!!!!**

**Even without an alarm message, the operator of the equipment has to ensure the transportability of the milk!!!!**

#### No alarm – Milk may be drawn off.

	Green = on Red = off	no alarm
		

- The driver goes to the TW-31 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)		
	after RESET Green = on Red = off	Informative alarm		
				

- The driver checks the LEDs at the tank monitor. The green LED is blinking – alarm horn sounds - error code on display. Milk can be removed -> farmer has to be informed.
- The farmer investigates ((and remedies) the cause of the error and presses the button “RESET” -> the alarm horn stops.
- The farmer presses button “RESET” once again -> the green LED flashes permanently. (The informative alarm is confirmed and deleted by the push button).
- Once the milk has been removed, the driver starts the cleaning process.

*Remark:*  
If the informative alarm is not reset, the green LED and the error code will continue to blink on the display -> even after the next cleaning cycle.

\* if parametrized

to section 3.3: Milk removal YES or NO

#### Critical alarm - Milk must not be taken out.

 OK  ALARM	Green = an Red = flashing	critical alarm (press RESET button)	
after RESET			
 OK  ALARM	Green = off Red = on	critical alarm	

- The driver checks the LEDs at the tank monitor.  
The red LED is blinking or flashing, an error code is displayed and an alarm horn sounds.
- The driver informs the farmer -> together they investigate the cause of the critical alarm. (The critical alarm codes are retrieved from the display and identified by means of the error table. See section 3.6).
- Farmer and driver determine together whether the milk can be fed into the tank, despite the alarm.
- With the RESET-button the farmer confirms the alarm -> the alarm horn stops – the red LED continuous to flash.
- The farmer presses the RESET-button again -> the red LED flashes permanently.
- After emptying the tank the cleaning process has to be started.

*Only when the cleaning cycle has been active for at least 10 minutes, the tank monitor automatically resets all critical alarms.*

### 3. Operation and fault handling

to section 3.3: Milk removal YES or NO

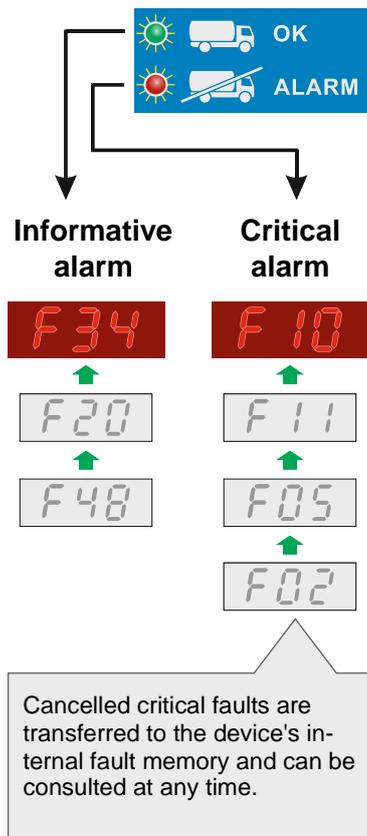
#### Critical + informative alarm - **Milk must not be taken out.**

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

- Der The driver checks the LEDs at the tank monitor. Green and red LEDs are blinking, an error is displayed and an alarm horn sounds.
- The driver informs the farmer -> together they investigate the cause of the critical and informative alarms. (The alarm codes are retrieved from the display and identified by means of the error table. See section 3.6).
- Farmer and driver determine together whether the milk can be fed into the tank, despite the alarm.
- With the RESET-button the farmer confirms the critical alarm at first -> the alarm horn stops.
- The farmer presses the RESET-button again -> the red LED flashes permanently.
- Afterwards the farmer confirms the informative alarm -> the green LED turns off.
- After emptying the tank the cleaning process has to be started.

*Only when the cleaning cycle has been active for at least 10 minutes, the tank monitor resets automatically all critical alarms.*

### 3.4 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.

**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)

- 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.*

### 3.5 Display fault memory



**NOTICE**

If the red LED of the tank monitor flashes permanently it means that critical errors have already been confirmed, but still exist. These error codes are registered in the internal error memory of the unit. They can be read out as follows:

**Display of the last 5 critical errors from the fault memory**

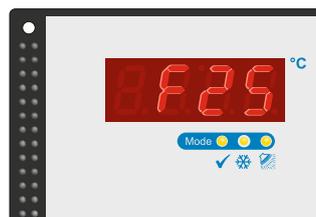
- Press SET-button: The display indicates the code of the first critical error (in the example above F02).
- Press SET-button again: the next error code (in example F05) is indicated..

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

*Only when the cleaning cycle has been active for at least 10 minutes, the tank monitor resets automatically all critical alarms.*

### 3.6 Listing fault memory and description

The display blinks to indicate faults.



#### 3.6.1 Critical tank monitor alarms (red)

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

The milk temperature is monitored throughout the complete cooling cycle. A stopwatch runs whenever the milk temperature is above the pre-set limit temperature "1". If the total time the temperature was exceeded reaches the maximum permitted duration, the alarm F1 is displayed. There is an acute risk that the milk will be sour.

EXAMPLE: Milk temperature was above 13°C for a total of more than 10 hours.

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

as F1, but based on limit temperature "2"

EXAMPLE:

Milk temperature was above 16°C for a total of more than 6 hours.

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

as F1, but based on limit temperature "3"

EXAMPLE:

Milk temperature was above 28°C for a total of more than 5 hours.

##### F6 Power failure alarm

Alarm is only possible, if all power packs are charged!

The alarm is activated if a power failure lasts longer than the time set by the fitter and at the same time the milk temperature is higher than the set temperature limit.

EXAMPLE: A power failure lasted longer than 5 hours and the milk temperature is above 7°C.

#### NOTICE

*NOTE: The alarms F11 to F16 can also be configured as "INFORMATIVE ALARMS" depending on the pre-setting!*

##### F11 Minimum washing temperature not reached

Alarm is triggered if the minimum water temperature (e.g. 40°) has not been reached during the main wash cycles.

##### F12 Minimum acting time not reached

Alarm is triggered if the minimum water temperature (e.g. 40°) has not been effective long enough (e.g. 2 minutes) within the main wash cycles.

##### F13 Cleaning time too short

Alarm is activated if the cleaning stops before the set minimum cleaning time (e.g. 35 min.)

### F15 Agitator fault in cooling mode (no milk agitating)

Alarm is triggered after starting the cooling mode if no counter pressure from the milk has been detected on the agitator after a certain period of time.

### F16 "No stirring" time exceeded

Alarm is triggered when a certain time has passed after the last agitator operation without the agitator restarting - or the minimum running time has not been reached.



### 3.6.2 Informative tank monitor alarms (green)

#### F17 Cooling not activated after "first milk comes into the tank" time 1

When the cleaning is finished, the tank monitor can detect that warm milk is entering. If incoming milk is detected, the cooling must switch on within the pre-set time "1". If this is not the case, alarm F17 is output.

#### F18 Cooling not activated after "first milk comes into the tank" time 2

like F17, but after the pre-set time "2" has elapsed.

#### F19 Cooling not activated after "first milk comes into the tank" time 3

like F17, but after the pre-set time "3" has elapsed

#### F20 Cooling time exceeded for first milking

Alarm is triggered if the pre-set milk temperature (e.g. 6°C) has not been reached within the pre-set time (e.g. 3 hours).

The time starts when cooling of the first milking starts.

#### F21 Cooling time exceeded

Alarm is triggered if, after the detection of "first milk comes into the tank", the pre-set milk temperature (e.g. 8°C) has not been reached within the pre-set time (e.g. 3.5 hours).

#### F22 Forgotten to switch on the cooling

Alarm is triggered if the cooling was not switched on at the pre-set milking times.

#### F23 Milk temperature too high for too long

Same functionality as error F1 - F3.

Here a shorter time interval can be entered to warn the farmer ahead of time.

This alarm serves as a pre-alarm to avoid "red alarms".

#### F25 Excess temperature directly

Alarm is triggered if the temperature rises above a second limit value (e.g. 25°C) again after the target temperature has fallen below the target temperature (e.g. 6°C) for the first time.

#### F27 Milk temperature too low for too long

Alarm is triggered if the milk temperature is too long (e.g. 2 hours) too low (e.g. 2°C). 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 pre-set temperature. (Ice protection)

#### F30 Power cut directly

An alarm is activated in the event of a power failure.

The alarm can only occur when the accumulators are charged.

### 3. Operation and fault handling

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to section 3.6: Listing fault memory and description

**F31 Max. cooling interruption or cleaning not started**

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.)

Alarm is triggered if, after switching off the cooling, a new cooling or cleaning mode is not recognized within a pre-set time.

**F32 Max. time without**

(Timer starts after cleaning is finished or after power ON)

Safety function! (This is to prevent people from forgetting to start cooling mode after cleaning has finished.)

The timer starts as soon as the cleaning mode is ended. Alarm is triggered if a new cooling or cleaning mode is not started within a preset time

**F33 Min. cleaning interval**

Timer starts after detection of "cleaning finished". Alarm is activated if within a pre-set time a new cleaning start is not detected.

**F34 Time / date not set**

The alarm is triggered if the date and time are lost.

**F35 Detergent "empty" alkaline**

Alarm is activated only during the cleaning if the float switch detects "detergent alkaline empty".

**F36 Detergent "empty" acidic**

Alarm is activated only during the cleaning if the float switch detects "detergent acidic empty".

**F38 Exceeding of temperature difference, monitoring sensor**

The alarm can function only if the optional monitoring sensor is installed and parameters set.

As soon as the temperatures differ by the set value, the alarm is triggered.

**F39 Battery voltage too low**

The alarm is triggered if the battery charge is no longer sufficient.

See section 1.5

to section 3.6: Listing fault memory and description

### 3.6.3 System alarms

**F45 Water in the tank after cleaning end**

- washing completed
- level electrode reports water in the cleaning line
- 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

**F53 Thermal protection compressor**

The motor protection switch for the compressor contactor of the tank and the ice water preparer is activated.

**F56\* Broken sensor**

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

*Possible cause of fault:*

- Temperature sensor faulty
- Sensor cable damaged

**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.

**F59\* Signal error mode detection**

If the tank monitor receives different signals for the mode detection (trigger signal for cooling and cleaning at the same time), error F59 is displayed.

### 3.6.4 System alarms external sensors

**F60\* Erroneous communication with agitator monitoring module**

and phase error (only for ESVAW-003).

**F61\* Erroneous communication with GSM-module**

**F85\* Phase error**

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

\* Call a service technician.

### 4. Cleaning instructions

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



**WARNING**

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

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