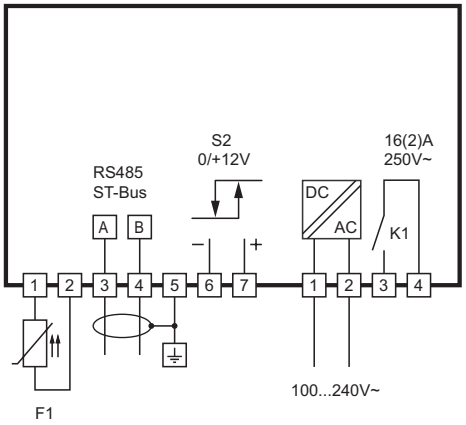
PID controller

Order number: 900410.026

As of: 18.01.2022 V1.33

Wiring diagram



Product description

The controller ST24-FV1TUR.102 was developed for simple thermostatic applications. The unit disposes of a connection for resistance sensor PTC or Pt100. It is supplied with a voltage of 100...240V AC. The controller has a voltage output to control an external SSR relay and a relay with a maximum electric Ohm load of 16A. Inductive loads can be connected with up to max. 2.2A permanent current. PID control and/or thermostat control can be activated via the parametrisation. Networking of the controller takes place via the ST-Bus interface.

Sensor:	Multi resistance input
Measuring range:	dependent on type of sensor
Front size:	107mm x 24mm
Panel cut-out:	73mm x 22,4mm
Tightness:	Front IP65
Connector:	screw terminal

Operating keys

Key UP

By pressing this key, you can increase the parameter or parameter value or scroll the parameter list.

Key DOWN

By pressing this key, you can decrease the parameter or parameter value or scroll the parameter list. At alarm the buzzer function can be switched off with this key.

Key SET

Holding this key, the setpoint is indicated.
Additionally, this key is used for setting parameters.

Another function can be assigned to the buttons with H31...H33, which is executed when pressed for a longer time (>3 sec.).

Control levels:

Parametrisation of the setpoint

The control setpoint C1 is accessible directly with SET key.
Pressing also the UP or DOWN key it can be adjusted.

The activation of the second setpoint of circuit 1 C2 is indicated on the display with a flashing point to the right. It can either be activated via switching entrance or with a function key (depending on parameter).

Adjustment of control parameters

To activate parametrisation mode, press buttons UP and DOWN at the same time. After approx. 3 seconds, the code word Adr will be displayed. Press UP or DOWN to switch between code words Adr and PA.
Under code word Adr you can set a network address. This is required for commissioning networked systems.

By selecting code word PA, you can enter a password required for parametrisation. Once the password -19 has been entered, the name of the first group of parameters is displayed C-- (controller level).

Now, using the buttons UP and DOWN you can select any of the parameter groups. After pressing the SET key you have to enter the password for the respective parameter level together with the UP and DOWN key. (Default value: 0)

The sub-menus are marked by the respective initial letter followed by 2 dashes (e.g. C-- for the C-level).

	Menu	Function
C--	Controller level	Application parameters
b--	Between level	Linking parameters
H--	Hardware level	Hardware parameters
d--	Defrost level	Defrosting parameters
A--	Analogue level	Parameter for analogue in- and outputs

The last parameter of the respective sub-menu (e.g. C99, b99...) corresponds to the current password of this level and can be changed there.

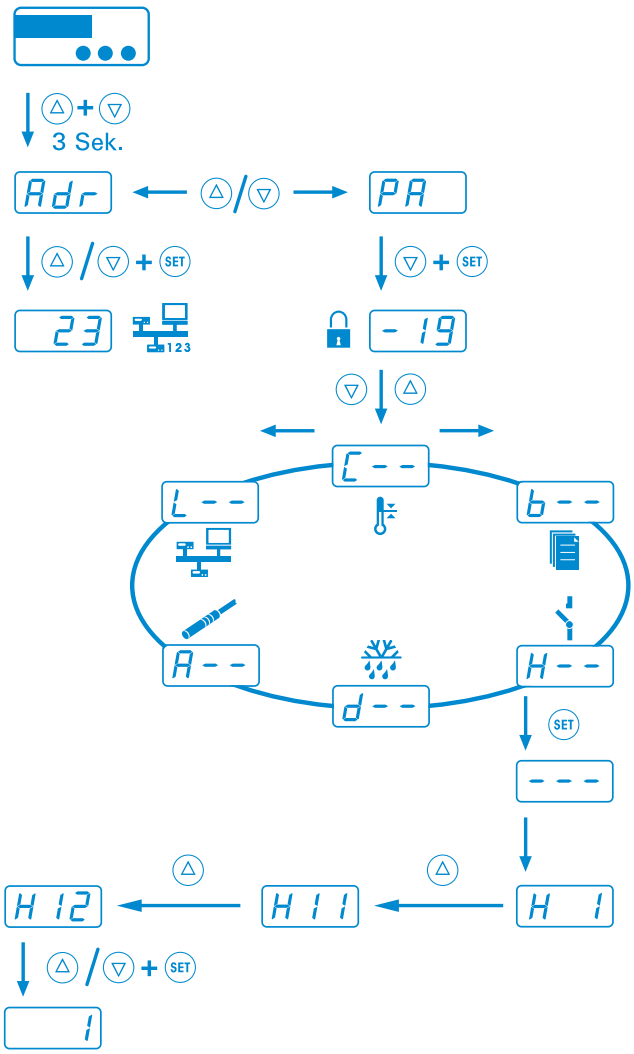
NOTE: Forgetting the password requires sending the controller to Störk-Tronic.

After releasing the SET key, if the password is entered correctly, the display jumps to the sub-menu and shows the first parameter in the list. If you press the SET key, the value of the selected parameter is displayed. It can be adjusted by additionally pressing the UP or DOWN key. After releasing all keys, the new value is permanently stored.

If the UP and DOWN keys are pressed again simultaneously for at least 4 seconds, the display changes back to the menu level. Pressing again for 4 seconds or if no key is pressed for longer than 60 seconds, the display returns to the default state.

Software version

The version number of the software will show when pressing SET + UP + DOWN at the same time



The C-level (controller)

This level contains the application parameters.

Thermostat 1

Parameter	Function	Adjustment range	Standard value	Custom value
C 1	Setpoint control circuit 1	C 10...C 11	0.0 °C	
C2	Setpoint control circuit 1 (*)	C 10...C 11	0.0 °C	
C3	Offset for C1/C2	-99.0 ... 99.0°K	0.0 K	
C4	Switching sense control circuit 1	0: heating function 1: cooling function	1	
C5	Hysteresis control circuit 1	0.1 ... 99.9°K	1.0 K	
C6	Hysteresis mode control circuit 1	0: symmetrical 1: one-sided	0	
C7	Minimum action time control circuit 1 "ON"	0 ... 400 sec.	0 sec.	
C8	Minimum action time control circuit 1 "OFF"	0 ... 400 sec.	0 sec.	
C9	Function control circuit 1 at sensor error	0: relay off 1: relay on	0	
C 10	Control range limitation, minimum Setpoint 1, 2, 3	-99.0°C ... C 11	-99.0 °C	
C 11	Control range limitation, maximum Setpoint 1, 2, 3	C 10 ... 999.0°C	999 °C	

* The activation of the second desired value C2 is indicated on the display with a flashing point to the right. It can either be activated via switching entrance or with function key 1 (depending on parameter).

Thermostat 2

Parameter	Function	Adjustment range	Standard value	Custom value
C21	Setpoint control circuit 2 (b 1=0)	C 10...C 11	0.0 °C	
C23	Offset for C1/C21 (b 1=1)	-99.0 ... 99.0°K	0.0 K	
C24	Switching sense control circuit 2	0: heating function 1: cooling function	1	
C25	Hysteresis control circuit 2	0.1 ... 99.9°K	1.0 K	
C26	Hysteresis mode control circuit 2	0: symmetrical 1: one-sided	0	
C27	Minimum action time control circuit 2 "ON"	0 ... 400 sec.	0 sec.	
C28	Minimum action time control circuit 2 "OFF"	0 ... 400 sec.	0 sec.	
C29	Function control circuit 2 at sensor error	0: relay off 1: relay on	0	
Thermostat 3				
C41	Setpoint control circuit 3 (b2=0)	C 10...C 11	0.0 °C	
C43	Offset for C1/C41 (b2=1)	-99.0 ... 99.0°K	0.0 K	
C44	Switching sense control circuit 3	0: heating function 1: cooling function	1	
C45	Hysteresis control circuit 3	0.1 ... 99.9°K	1.0 K	
C46	Hysteresis mode control circuit 3	0: symmetrical 1: one-sided	0	
C47	Minimum action time control circuit 3 "ON"	0 ... 400 sec.	0 sec.	
C48	Minimum action time control circuit 3 "OFF"	0 ... 400 sec.	0 sec.	
C49	Function control circuit 3 at sensor error	0: relay off 1: relay on	0	
Boundary or range alarm				
C61	Lower alarm value	-99.0 ... C62 °C	-10.0 °C	
C62	Upper alarm value	C61 ... 999.0 °C	10.0 °C	

Parameter	Function	Adjustment range	Standard value	Custom value
C63	Alarm functions	0: Boundary alarm, relative boundaries 1: Boundary alarm, absolute boundaries 2: Range alarm, relative boundaries 3: Range alarm, absolute boundaries 4: Boundary alarm, relative boundaries, alarm inverse 5: Boundary alarm, absolute boundaries, alarm inverse 6: Range alarm, relative boundaries, alarm inverse 7: Range alarm, absolute boundaries, alarm inverse	0	
C64	Special function at boundary alarm	0: not active 1: flashing display 2: buzzer 3: buzzer + flashing display 4: like 3, buzzer can be cancelled 5: like 4, restarts after 10 min. 6: like 4, restarts after 30 min	0	
C65	Hysteresis alarm circuit	0.1 ... 99.9 K	1 K	
PID controller				
C81	PID function	0: inactive 1: cooling 2: heating	2	
C82	Proportional area at PID control	0.1 ... 999.0°K	10 K	
C83	Reset time at PID control (I-portion)	0...999 sec., 0: inactive	500 s	
C84	Lead time at PID control (D-portion)	0...999 sec., 0: inactive	50 s	
C85	Cycle time at PID control	2...100 sec.	8 s	
C86	Control variable dead volume	0.0 ... 100.0%	0,0 %	
C87	Function PID control circuit at sensor error	-100.0% ... 0 ... 100.0%	0,0 %	
C88	PID-mode	0: PID 1: DiffPID (2 relays – heating, cooling) 2: PID with dead volume at analogue exit	0	
C89	Cycle time motor valve (Differential PID)	2...100 sec.	8 s	
Password				
C99	Password C level	-99...999	0	

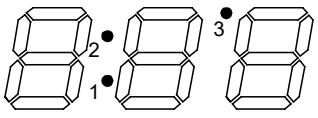
b-level (between)

This level contains the parameters for different combinations.

Parameter	Function	Adjustment range	Standard value	Custom value
b1	Activation setpoint combination for thermostat 1 and 2 (C23 = deltaW2)	0: no combination 1: Setpoint thermostat 2 = C1/C2 + C23	0	
b2	Activation setpoint combination for thermostat 1 and 3 (C43 = deltaW3)	0: no combination 1: setpoint thermostat 3 = C1/C2 + C33	0	
b11	Delay control circuit 1, 2, 3 after “Power-On”	0...400 sec.	0 sec.	
b12	Mutual delay control circuit 1, 2, 3	0...400 sec.	0 sec.	
b13	Alarm suppression after “Power-On”, “setpoint”	0...60 min.	20 min.	
b21	Linking analogue exit	0: actuating variable 1: actual value 2: setpoint	0	
b99	Password b-level	-99 ... 999	0	

H level (Hardware)

This level contains the hardware parameters.

Parameter	Function	Adjustment range	Standard value	Custom value
H 1	Key-lock	0: no key-lock 1: key-lock	0	
H 11	Indication mode display 1	0: integrals 1: decimals in 0.5°K 2: decimals in 0.1°K	1	
H 12	Display 1 mode	1: actual value 2: setpoint	1	
H 15	Temperature scale	0: Celsius 1: Fahrenheit	0	
H 16	Indication standby	0: no display (point to the right) 1: AUS 2: OFF 3: display off, right point flashing	1	
H 17	Mode following "Power-On" “	0: Off 1: On 2: Auto	1	
H31	Assigning function key 1	0: no function 1: standby key 2: defrosting 3: acknowledge alarm 4: Sepoint 1 / setpoint 2 5: show sensor F1	1	
H32	Assigning function key 2 (if available)	see H31	2	
H33	Assigning function key 3 (if available)	see H31	0	
H35	Activation of key acknowledgement	0: no key acknowledgement 1: key acknowledgement with buzzer	0	
H41	Function output K1	0: no connection 1: thermostat 1 2: thermostat 2 3: thermostat 3 4: alarm function 5: PID (function see CB1)	1	
H42	Function output K2/S2	see H41	0	
H43	Function output K3	see H41	0	
H44	Function hybrid output K1	see H41	0	
H51	Mains frequency	0: 50Hz 1: 60Hz	0	
H61	Function LED 1 	0: inactive 1: output K1 2: defrost 3: flash during defrost 4: output S2	0	
H62	Function LED 2	see H61	4	
H63	Function LED 3	see H61	0	
H99	Password H level	-99..999	0	

d-level (defrosting functions)

This level contains the parameters for defrosting.

NOTE: Defrosting parameter only affects control circuit 1

Parameter	Function	Adjustment range	Standard value	Custom value
d0	Defrosting interval TH1	1 ... 99h 0: no defrosting	0	
d2	Defrosting temperature TH1	-99.0 ... 999.0°C	10,0 °C	
d3	Defrosting time limit TH1	1 ... 99 min. 0: no time limit	30 min	
d9	Manual defrosting TH1	0...1	0	
d99	Password d-level	-99...999	0	

Die A-level (analogue values)

This level contains the parameters for analogue inputs and outputs

Parameter	Function	Adjustment range	Standard value	Custom value
A 1	Actual value sensor F1	-		
A2	Actual value correction F1	-99.0 ... 99.9 °K	0 K	
A3	Weighing factor F1	0.50 ... 1.50	1,00	
A4	Sensor type F1	0: non existent 1: PTC 2: Pt100 2-wire	1	
A 17	Reset min/max memory	0: - 1: reset MAX memory 2: reset MIN memory 3: reset MAX+MIN memory	0	
A 18	Show actual MAX value	—		
A 19	Show actual MIN value	—		
A40	Software filter	1...32 measuring values	4	
A50	Show PID signal	—		
A99	Password A-level	-99 ... 999	0	

Z-level (additional level)

Parameters are only accessible via ST-Bus.

Parameter	Function	Adjustment range	Standard value	Custom value
J1	Parameter set	0...1	0	
J3	Parameter reset	0: – 1: all control parameters, except H 15, H 16, H5 1 2: like 1, with H 15, H 16, H5 1 3: all parameters (incl. passwords)	0	
L0	Own ST-Bus address	0: deactivated 1...250	5	
Pro	Show program version	—		
L40	Release mask for ST-Bus (functions)	0...255	0	
L42	10 minutes release to reset counters and operating times	0: locked 1: Enable Reset for 10 minutes (see N98 and T98)	0	
Z98	Password for level selection (if PA is displayed)	-99 ... 999	-19	
Z99	Password for Z-level	-99 ... 999	0	

N-level (counters)

Parameters are only accessible via ST-Bus.

Parameter	Function	Adjustment range	Standard value
N0	Switching cycles of K1 (lower 16 bit)	—	
N1	Switching cycles of K1 (upper 16 bit)	—	
N2	Switching cycles of S2 (lower 16 bit)	—	
N3	Switching cycles of S2 (upper 16 bit)	—	
N98	Delete relay switching cycles	0: — 1: delete	0
N99	Password for Z-level	-99 ... 999	0

The number of switching cycles is calculated as follows: Number = 65536 * N1 + N0. Parameter N98 resets all relay switching cycle counters. It depends on the setting in parameter L42. The return value is automatically set back to 0.

T-level (operating times)

Parameters are only accessible via ST-Bus.

Parameter	Function	Adjustment range	Standard value
T0	Overall operating time (lower 16bit)	—	
T1	Overall operating time (upper 16bit)	—	
T2	Operating time since last reset (lower 16bit)		
T3	Operating time since last reset (upper 16bit)		
T4	Operating time relay K1 (lower 16bit)		
T5	Operating time relay K1 (upper 16bit)		
T6	Operating time relay S2 (lower 16bit)		
T7	Operating time relay S2 (upper 16bit)		
T98	Reset operating hours	0: — 1: Reset	0
T99	Password for T-level	-99 ... 999	0

The operating time is calculated as follows, for example: Operating time (in min.) = 65536 * T1 + T0. Parameter T98 resets all operating and running times (except T0 and T1). It depends on the setting in parameter L42. The return value is automatically set back to 0.

EC - level (only for internal use)

Parameters are only accessible via ST-Bus.

C-level:

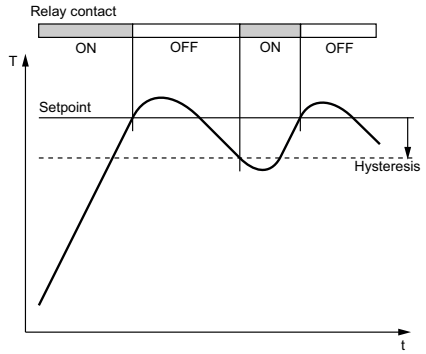
C 1: Setpoint control circuit 1
This value corresponds with the setpoint set at the first control level.

C2: Setpoint control circuit 1 (thermostat) at closed switching input
By closing switching input E1, setpoint C 1 can be switched to a setpoint C2.
The setpoint C2 can only be accessed if entrance E1 is closed. It can only be activated, if the external input is configured for setpoint change-over.

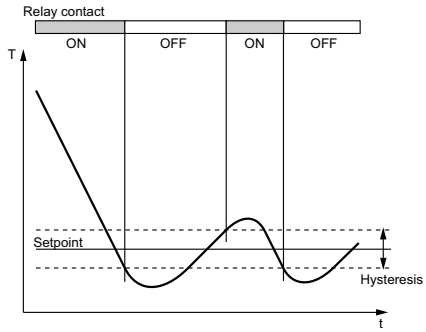
C3: Offset for C 1/C2
This adjusted value will build the difference to the setpoint for control circuit 1, i.e. there is no regulation according to the pre-set value, but according to the sum of desired value and the value of C3.

C4: Switching sense control circuit 1
The switching sense for the relays, i.e. cooling or heating function, can be programmed independently. Heating function means that the contact falls as soon as the pre-set setpoint is reached, thus power interruption. At cooling function, the contact only tightens, if the actual value is above the required setpoint.

C5: Hysteresis control circuit 1
The hysteresis can be set symmetrically or one-sided at the desired value (see C6). At one-sided setting, the hysteresis works downward with heating contact and upward with cooling contact. At symmetrical hysteresis, half of the hysteresis' value is effective below and half of the value above the switching point.



Heating controller, one-sided hysteresis



Cooling controller, one-sided hysteresis

C6: Hysteresis mode control circuit 1
These parameters allow selection as to whether the hysteresis values which are adjustable with C5, are set symmetrically or one-sided at the respective switching point. At symmetrical hysteresis, half of the hysteresis' value is effective below and half of the value above the switching point. The one-sided hysteresis works downward with heating contact and upward with cooling contact.

C7/C8: Minimum action time control circuit 1 "On"/"Off"
These parameters permit a delay in switching on/off the relay in order to reduce the switching frequency. The adjusted time sets the entire minimum time period for a switching-on or switching-off phase

C9: Function circuit 1 at sensor error
At sensor error the selected relay (see H41, H42) falls back into the condition pre-set here.

C 10: Setpoint limit (min) setpoint 1
C 11: Setpoint limit (max) setpoint 1
The adjustment range of the setpoint can be limited in both directions. This is to prevent the end user of a unit from setting inadmissible or dangerous setpoints.

C21: Setpoint control circuit 2 (thermostat) (b1=0)
If b1=1, this value is ineffective.

C23: Value deltaW2 (b1=1)
If b1=1, the setpoints for control circuit 1 and 2 are linked with one another via switching difference deltaW2 (operation with deltaW).
The following applies: Setpoint thermostat 2 = setpoint control circuit 1 (C 1/C2) + deltaW2.
This difference can take positive or negative values. Thus, a leading or following contact can be realised.

C24: Switching sense control circuit 2
The switching sense for the relays, i.e. cooling or heating function, can be programmed independently at works. Heating function means that the contact falls as soon as the pre-set setpoint is reached, thus power interruption. At cooling function, the contact only tightens, when the actual value is above the required setpoint.

C25: Hysteresis control circuit 2
The hysteresis can be set symmetrically or one-sided at the setpoint (see C26). At one-sided setting, the hysteresis works downward with heating contact and upward with cooling contact. At symmetrical hysteresis, half of the hysteresis' value is effective below and half of the value above the switching point.

C26: Hysteresis mode control circuit 2
These parameters allow selection as to whether the hysteresis values which are adjustable with C25, are set symmetrically or one-sided at the respective switching point.
At symmetrical hysteresis, half of the hysteresis' value is effective below and half of the value above the switching point. The one-sided hysteresis works downward with heating contact and upward with cooling contact.

C27: Minimum action time control circuit 2 "On"
C28: Minimum action time control circuit 2 "Off"
These parameters permit a delay in switching on/off the relay, in order to reduce the switching frequency. The adjusted time sets the entire minimum time period for a switching-on or switching-off phase.

C29: Function control circuit 2 at sensor error
At sensor error the selected relay (see H41, H42) falls back into the condition pre-set here.

C41: Setpoint thermostat 3 (b2=0)
If b2=1, this value is ineffective.

C43: Value deltaW3 (b2=1)
If b2=1, the setpoints for control circuit 1 and 2 are linked with one another via switching difference deltaW3 (operation with deltaW).
The following applies: Setpoint thermostat 3 = setpoint control circuit 1 (C 1/C2) + deltaW3.
This difference can take positive or negative values. Thus, a leading or following contact can be realised.

C44: Switching sense control circuit 2
The switching sense for the relays, i.e. cooling or heating function, can be programmed independently at works. Heating function means that the contact falls as soon as the pre-set setpoint is reached, thus power interruption. At cooling function, the contact only tightens, when the actual value is above the required setpoint.

C45: Hysteresis control circuit 2
The hysteresis can be set symmetrically or one-sided at the setpoint (see C46). At one-sided setting, the hysteresis works downward with heating contact and upward with cooling contact. At symmetrical hysteresis, half of the hysteresis' value is effective below and half of the value above the switching point.

C46: Hysteresis mode control circuit 3
These parameters allow selection as to whether the hysteresis values which are adjustable with C45, are set symmetrically or one-sided at the respective switching point.

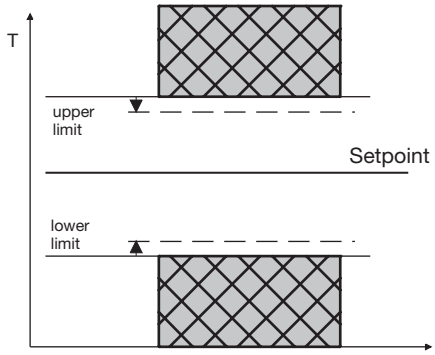
At symmetrical hysteresis, half of the hysteresis' value is effective below and half of the value above the switching point. The one-sided hysteresis works downward with heating contact and upward with cooling contact.

C47: Minimum action time control circuit 2 "On"
C48: Minimum action time control circuit 2 "Off"
These parameters permit a delay in switching on/off the relay, in order to reduce the switching frequency. The adjusted time sets the entire minimum time period for a switching-on or switching-off phase.

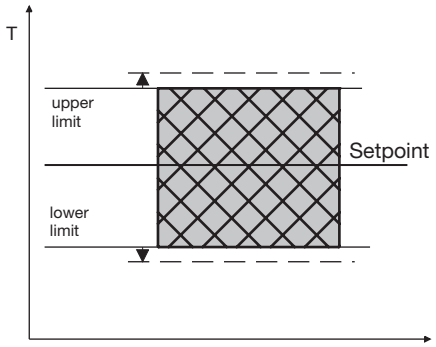
C49: Function control circuit 3 at sensor error
At sensor error the selected relay (see H41, H42) falls back into the condition pre-set here.

C61: Lower alarm value
C62: Upper alarm value
The exit alarm is a boundary alarm or a range alarm with one-sided hysteresis (see parameter C65). Both at the boundary alarm and the range alarm, limit values can be relative, i.e. going along with the setpoint C1/C2, or absolute, i.e. independent of the setpoint C1/C2. At boundary alarm the hysteresis works one-sided inwardly, and at range alarm outwardly (see pictures).

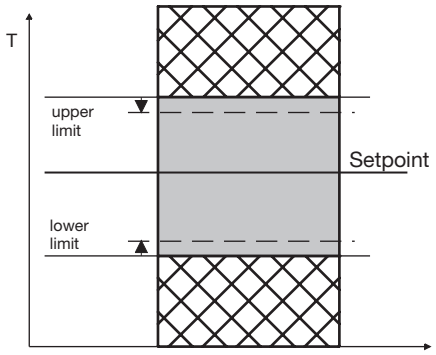
C63: Function exit alarm
The exit alarm evaluates an upper and a lower limit value (see parameters C61 and C62), whereas a selection is possible as to whether the alarm is active if the temperature lies within these two limits, or whether the alarm is released if the temperature lies beyond them. In the case of sensor error, the alarm is activated independently of this adjustment. The exit can also be inverted, so that it functions like a release (see pictures).



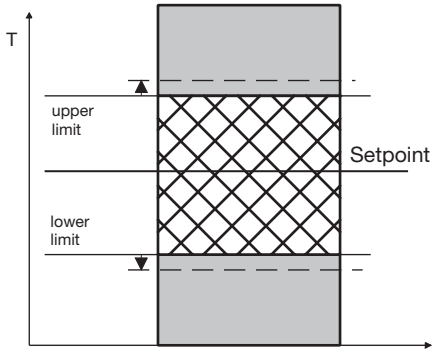
Boundary alarm, alarm contact normal:
C63=0 limits relative, C63=1 limits absolute



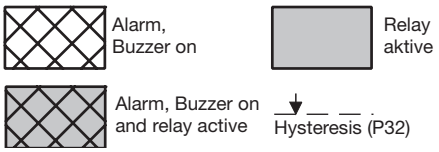
Range alarm, alarm contact normal:
C63=2 limits relative, C63=3 limits absolute



Boundary alarm, alarm contact inverse:
C63=4 limits relative, C63=5 limits absolute



Range alarm, alarm contact inverse:
C63=6 limits relative, C63=7 limits absolute



C64: Special function at alarm
Here can be selected whether, in the case of emergency, the indication to flash and/or the buzzer is to start. Sensor alarm (display F1L or F1H) is indicated independently thereof by flashing display and the buzzer runs off.

C65: Hysteresis alarm circuit
Hysteresis is set one-sided at the adjusted limit value. It becomes effective depending on alarm definition.

PID - control

C82: Proportional band at PID regulation
The proportional band works in such a way that with approximation of the actual value to the setpoint the variable is reduced linearly from +-100% to 0%.

C83: Reset time at PID regulation (I-portion)
C84: Lead time at PID regulation (D-portion)
The proportional controller as such has a remaining deviation of the actual value from the setpoint. The integral portion provides for a complete compensation of this offset.
The reset time is a measure for the period of time needed to adjust a remaining temperature deviation of the size of the proportional range.
If a small reset time is set, a fast post-adjustment will take place. At a too small reset time, however, the system may tend to vibrate.
The differential portion dampens temperature changes.
If lead time is set for long, damping is strong. At too long lead time, however, the system may tend to vibrate. At setting 0 the values are ineffective. It is therefore possible to realise a pure PI or PD regulation.

C85: Cycle time at PID regulation
During the cycle time the control exit runs through one switching period, i.e. once switched out and once switched on. The smaller the cycle time, the faster the regulation. By consequence, however, there is also an increased switching frequency of the output, which can lead to rapid wear of relay contacts. For very fast control ways with the respective high switching frequency a voltage output is therefore of advantage.

C86: Control variable dead volume
With parameter C86, the size of the dead volume can be set in % of the PID control value. This function is usually used with clocked PID controllers (relays) to achieve a minimum switch-on time. With C88 = 1 (differential PID), a pseudo hysteresis can be realised. This leads to a reduction in the switching frequency, provided the actual value is approximately equal to the setpoint. For C88 = 2, the dead volume is also made available at the analogue output.

C87: Function PID control circuit at sensor error
In the case a sensor error, the PID variable automatically goes to the condition set here.

C88: PID-Mode
[C88 = 0] PID standard
[C88 = 1] PID differential (see below)
[C88 = 2] PID standard with dead volume at analogue exit

PID differential: The differential mode is particularly suitable for the use of control valves (e.g. K1=OPEN, K2=CLOSED). As long as the value computed by the PID circuit remains constant, both exits remain inactive, i.e. the valve stops at the current position.

	PID Standard (C88 = 0/2)		
	PID	K1: Heating	K2: Cooling
1	20 %	20 %	0 %
2	25 %	25 %	0 %
3	25 %	25 %	0 %
4	10 %	10 %	0 %
5	-20 %	0 %	20 %

	PID Differential (C88 = 1)		
	PID	K1: Heating	K2: Cooling
1	+20 %	20 %	0 %
2	+5 %	5 %	0 %
3	±0 %	0 %	0 %
4	-15 %	0 %	15 %
5	-30 %	0 %	30 %

Thus, control valves almost show the same controlling results as analogue valves. The table shows the different behaviour of both modes within the same control system.

C89: Cycle time control valve (DiffPID)
This parameter sets the time the control valve needs to go from 0% to 100%.
If C88=1, the PID variable is converted to this interval. The PID cycle time (C85) remains unaffected by this. When this time is defined, indication with a rounded up value in seconds is recommended.
Furthermore C85 should be > = C89.
At ± 100% the respective exit remains durably active (synchronisation).

C99: Password
This parameter is to set the password for the C-- level.

b-level

b 1: Activation setpoint combination for thermostat 1 and thermostat 2 (deltaW2)
This parameter determines whether the setpoints for thermostat 1 and 2 independently adjustable (parameter C2 1) or whether they are tied with one another via a switching offset deltaW2 (parameter C23).

b2: Activation setpoint combination for thermostat 1 and thermostat 3 (deltaW3)
This parameter determines whether the setpoints for thermostat 1 and 3 independently adjustable (parameter C4 1) or whether they are tied with one another via a switching offset deltaW2 (parameter C43).

b 11: Delay control circuit 1, 2, 3 after "Power-On"
This parameter allows a switching-on delay of relays after switching-on the mains voltage. This delay corresponds with the time set here.

b 12: Mutual delay control circuit 1, 2, 3
This parameter makes a mutual switching-on delay of relays possible, depending on whichever contact is switched first.

b 13: Alarm suppression after "Power-On", "setpoint"
This parameter allows a switching-on delay of the alarm contact after switching on the mains voltage. This delay corresponds with the time set here.

b99: Password
This parameter is to set the password for the b—level.

H-level

H 1: Key-lock
The key-lock allows blocking of the control keys. In locked condition parameter adjustments with keys is not possible. At the attempt to adjust the parameters despite key-lock the message "---" appears in the display.

H 11: Indication mode display 1
The value can be indicated in integrals or with decimals in 0.5°K or 0.1°K. At indication in 0.5°K the value is rounded up or down. In general, all parameter indications are presented in 0.1°K.

H 12: Display 1 mode
H 12=1 indicates the actual value and H 12=2 indicates the setpoint C 1 or C2 in the display. Therefore, the current actual value can only be indicated with parameter A 1.

H 15: Temperature scale
Indication can be switched between Fahrenheit and Celsius. At conversion, the parameters and setpoints maintain their numerical value and adjustment range. (Example: A controller with the setpoint of 0°C is switched to Fahrenheit. The new setpoint is then interpreted as 0°F, which corresponds to a temperature of -18°C).
NOTE: Indication limits with °F can be smaller than the actual measuring range!

H 16: Indication standby
In standby mode the here set value appears in the display.

H 17: Mode following "Power-On"
After switching on the mains voltage, the controller automatically goes to the condition set here. H 17=2 applies to the condition prior to the separation from the net.

H31...H33: Assigning function key 1...3
The standard function of the keys (imprint on the front panel) remains always active. With these parameters, a function can be programmed to be active only when the button is pressed sole. Eventually, the button must be pressed longer.

0	no additional function defined
1	for more than 3 sec., Standby
2	Defrosting, only effective with cooling controller
3	Acknowledge alarms, switches off the buzzer (if available)
4	for more than 3 sec, change-over setpoint C1 / C2
5	indicate value of sensor F1, as long as the key is pressed

H35: Key acknowledgement
This parameter permits to switch the internal buzzer on/off by key confirmation.

H41: Function output K1
H42: Function output S2
Generally, the exits are exchangeable with parameter adjustments, in order to achieve an optimal relation of the existing hardware with regard to contact rating, kind of contact and cycle number. Therefore, these parameters first assign the exits to the controller function.

H51: Mains frequency
This parameter is to select the mains frequency.

H61...H63: Function LED1-LED3
Assignment of the status LEDs.

H99: Password
This parameter is to adjust the password for the H—level

d-level:

d0: Defrosting interval
The "defrosting interval" defines the time, after which a defrosting process is started. After each defrosting start, this time is reset and runs the next interval.

Manual defrosting:
Pressing the key UP for at least 3 sec. the defrosting interval is activated earlier. Alternatively, parameter d9 can be applied for this function, too. The next automatic defrosting process takes place again after the time d0 (defrosting synchronisation).

d2: Defrosting temperature
This permits to terminate defrosting when the adjusted desired temperature value is reached. The defrosting time set with "d3" nevertheless runs at the same time, i.e. it

functions as safety net to terminate the defrosting process in case the defrosting temperature is not reached.

d3: Defrosting time limit
After the here set time the defrosting process is terminated.

d9: Manual defrosting
At change of 0 - > 1 the defrosting process is started and the defrosting interval is re-set (defrosting synchronisation).

d99: Password
This parameter is to set the password for the d-level.

A-level:

A 1: Indication of actual value sensor F1
The here indicted temperature value is the sum of the actual measured value of sensor F1 and the actual value correction according to parameter A2.

A2: Actual value correction sensor F1
With this parameter it is possible to correct actual value deviations caused by sensor tolerances or extremely long sensor lines for example. The control measuring value is increased or decreased by the here set value.

A3: Weighing factor sensor F1
With this parameter the actual value can be submitted to weighing. The measured value is multiplied by it and both indicated in the display and applied for regulation.

A4: Sensor type F1
This parameter allows the selection of the sensor type or the type of analogue input as long as the hardware requirements are met.

A 17: Reset MIN/MAX memory
The MIN and/or MAX value can be reset.

A 18: Show actual MAX value
The current MAX value can be viewed here.

A 19: Show actual MIN value
The current MIN value can be viewed here.

A40: Software filter
This parameter determines over how many measured values an average value is to be formed. An average value is formed from the last measured values, whereby the oldest measured value is deleted (so-called “moving average filter”).

A99 Password
This parameter is to set the password for the A-level.

Z level:

J1: Internal: active data set
With this parameter, you can set up pre-defined data sets. The data sets are provided by Störk-Tronic. If a new data set is loaded, all previously set parameters will be overwritten. After that, they can be edited as required.

J3: Parameter reset
With this parameter some parameters can be reset to factory defaults.
1: all control parameters
2: like 1, with counters and operating times
3: factory preset

L0: ST-bus own address
With the address set here, the controller can be addressed via the bus. Each bus client must have its own address. Addresses must be unique, i.e. must not be assigned several times.

L40: Mask on enabled functions
Here, you can specify the functions enabled via the bus using a binary mask. The bits have the following meaning

Bit	Valency	Function
0	1	All On
1	2	Defrost
2	4	Acknowledge
3	8	Set2 absolute
4	16	Set3 relative
5	32	Min Reset
6	64	Max Reset
7	128	—

To determine the value to be parametrised, all valencies must be added up

L42: 10 minutes release to reset counters and operating times
As soon as the parameter is set to 1, counters and operating times can be reset by means of parameters N98 and T98 during the following 10 minutes.

Z98: Password for level selection (if PA is displayed)
With this parameter, you can set the level selection password, i.e. in display PA. In the standard design, access to level selection is blocked by password - 19. This parameter cannot be set on the controller itself but only via the ST-bus

Z99: Password for Z-level
With this parameter, you can set the password for parameter level Z–.

Message	Cause	Error elimination
Temperature and right decimal point	Setpoint C2 is active	
F 1H F 1L	Sensor error (H: open-circuit or L: short-circuit at sensor F1)	Check sensor
EP0 EP 1	0: Error program memory 1: Error parameter memory **=> ALL EXITS WILL BE SWITCHED OFF**	Repair controller
---	Display overrun or key-lock	
Flashing display	Temperature alarm at too high or too low temperature (if activated)	

If an error is detected in the parameter memory (display EP) and therefore the stored settings cannot be used, the control contacts are switched to the de-energised state.

Measuring input	**F1:**	Resistance sensor PTC, Pt100, 2-wire connection Measuring range: Pt100 -80°C...+400 °C PTC -50°C...+150 °C Measuring accuracy of the controller at 25°C: +/-0.5K and +/-0.5% of measuring range
Outputs	**K1:** **S2:**	Relay, 16(2)A 250V, normally-open contact Voltage output for SSR relay, output voltage 0/12V= Additional buzzer, 85dB
Display	One 3-digit LED-Display, height 7 mm, colour red	
Power supply	100...240V AC, (50/60Hz)	
Connectors	Screw terminal	
Ambient conditions	Storage temperature: 20...+70°C Operating temperature: 0...+55°C Relative humidity: max. 75% without dew	
Enclosure	Front IP65, IP00 from back	
Interface	ST-Bus communication interface Interface driver: RS485, galvanically not separated The network has to be installed in lines topology and terminated with a 120 Ohm resistance on each side. In case of networking always connect port “A” with port “A” and port “B” with port “B”. Crossing over is not permissible!	
Installation data	The controller is designed for installation in a control panel. Front size: 107 x 24 mm Panel cut-out: 73 x 22.4 mm Installation depth max. 65mm