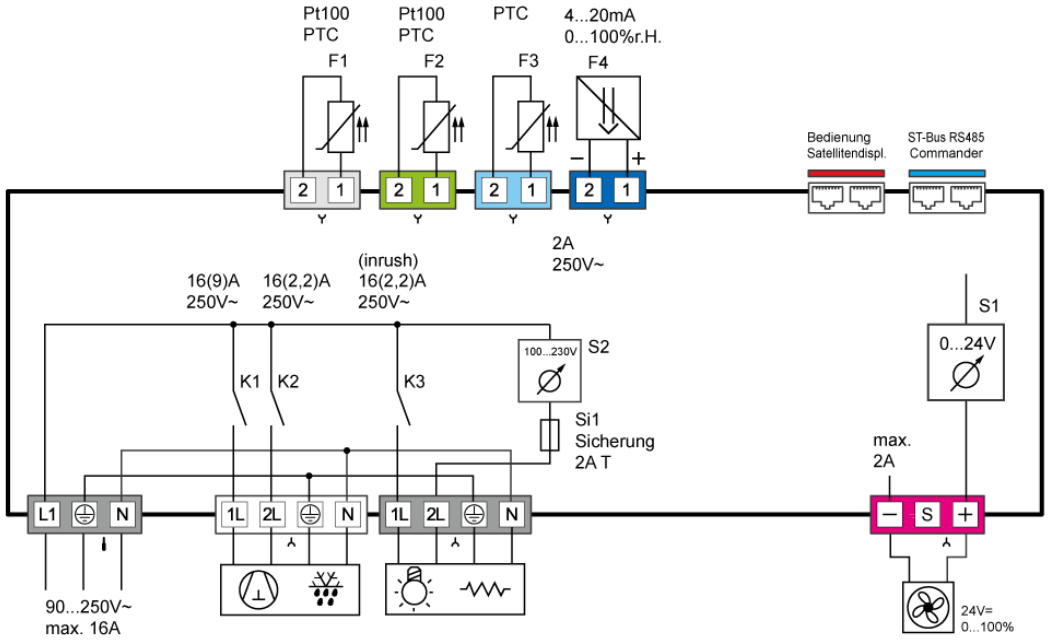
Controller for cooling applications

Order number 900235.006

As of: 25.01.2017, V1.35

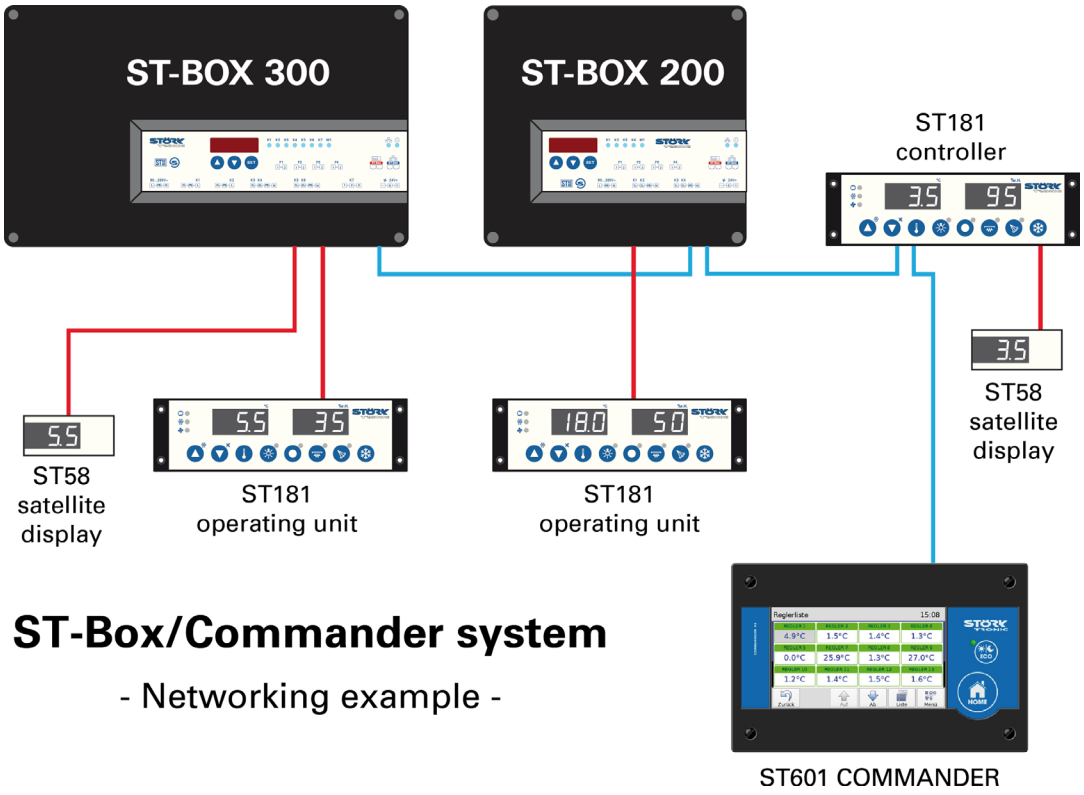
Wiring diagram



Product description

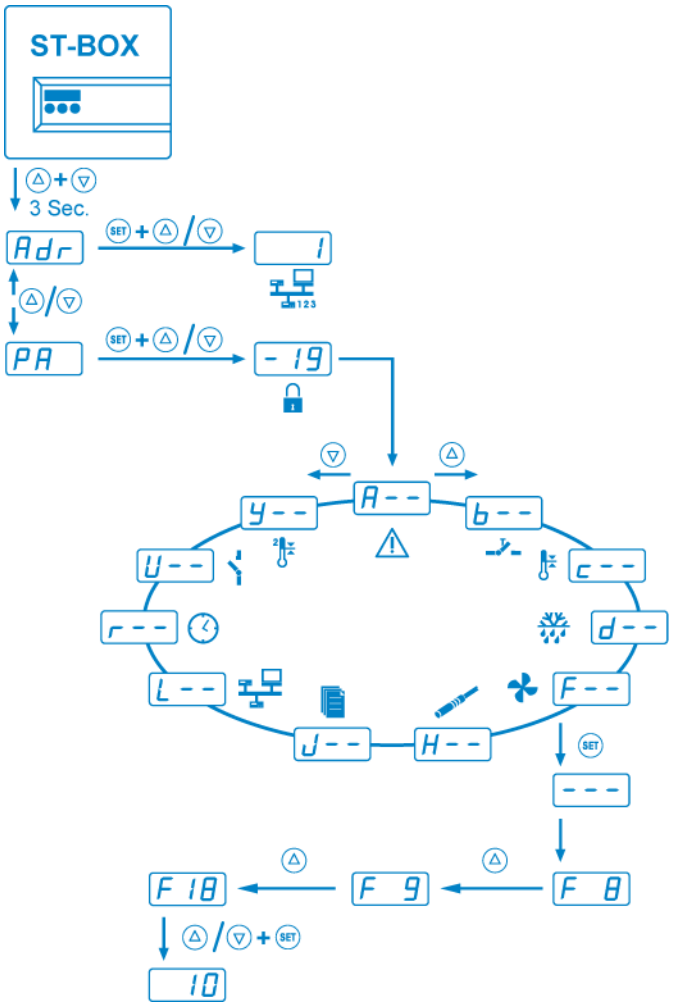
The cooling controller ST-BOX 200 is used for thermostatic temperature regulation in refrigerating plants. The controller is supplied with 90...250V AC and has three relay outputs. The outputs can be used for different functions, e.g. for a compressor, a defroster, lights, an alarm relay, etc. Furthermore a TRIAC output and an output for a DC fan are available.
The operation is done directly on the box or on a separate connectable display. The ST-BOX is provided with a 3-digit display, 3 control keys and 7 LEDs for status display of the relay exits. Parametrisation takes place in several operating levels with increasing security level.
The controller is networked via the ST-Bus interface.

Sensor: Pt100, PTC, 4...20mA
Dimensions ST-Box: 185mm x 170mm x 76mm
Tightness: Front IP20
Connection: WAGO-plug



ST-Box/Commander system

- Networking example -



General informations

The ST-BOX controllers are designed for general use in refrigerating plants.

Depending on the existing hardware, up to four temperature sensors can be connected. These can either be used for capturing the cold store temperature, evaporator temperature, super-frost core temperature, the temperature of a second control circuit or the temperature of the condenser. The type, function, offset and weighting of each sensor can be configured separately via parameters. Additionally, an analogue input (4..20mA) can be made available for capturing pressure levels, e.g. for condenser/fan control, provided that the required hardware is available.

Depending on the hardware, up to seven relay outputs are possible the functions of which can be configured as required via parameters. Please refer to the specifications of the hardware installed to ensure that the relays are not overloaded. Also refer to the circuit diagram in the corresponding device manual.

HUMIDITY CONTROL

Dehumidification by cooling and then reheating

The relative humidity of the air is strongly temperature-dependent. Heated air can hold more moisture. In contact with the environment the evaporation rate increases upon heating and the environment dries out.
Conversely, cooling air at cold surfaces leads to an increase in the rate of condensation and the condensate evaporates.
Circulating air therefore always transports the moisture from warm to cold regions..

In refrigerated counters one uses the effect of removing moisture from.
At too high humidity in the refrigerator dehumidification is done by starting the cooling.

The air coming from the cooling looses a part of the moisture by condensation on the cold evaporator (outside of the refrigerator). Before re-entering the cooling chamber, the now drier, but also cooled air reaches it correct temperature by reheating (without contact with humid environment) and then gathers moisture in the cooling chamber

Control keys

Key T1: UP (up-arrow)
By pressing this key the parameter or parameter value is increased.

Key T2: DOWN (down-arrow)
By pressing this key the parameter or parameter value is decreased.

Key T3: SET
While SET key is pressed, the setpoint S1 is indicated.

The cooling controller is generally controlled using the buttons UP, DOWN and SET. The standard display indicates the temperature of the cold store (actual temperature value). Press SET button to switch over the display to the required cold store temperature (setpoint temperature).

The setpoint temperature can only be changed by pressing buttons SET and UP or SET and DOWN at the same time. While pressing the buttons, the changing setpoint temperature is displayed. After changing the setpoint temperature and releasing the buttons, the actual temperature is displayed again. This is the standard setting method.

Parameterisation

Parameterisation of the cooling controller is done in the factory or during commissioning of a cold store by qualified staff. Wrong or inappropriate parameterisation can result in malfunction and damage of the refrigerated goods. Parameter setting is possible only after entering one or more passwords. In the following list of parameters, all parameters of a complex cooling controller are listed. Please note, however, that the parameters listed are only available in controller designs where the relevant hardware (outputs, inputs, sensors and internal clock) is available.

Parameterisation is possible at any time. The control operation is not interrupted during parameterisation, but can have a direct influence on it. If no button is pressed for 2 minutes, the operation is stopped and the actual value is displayed again.

To activate parameterisation 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. All other settings / value specifications in parameter setting mode are performed using the default value setting method, i.e. pressing buttons SET and UP / DOWN at the same time.

Usually after selecting a parameter group it is sufficient to just press the SET key (--- shows up in the display) and release it again. The first parameter of the parameter group is indicated (i.e. parameter A0 in the parameter group A--).

Parameter groups ST-BOX:

A-- Alarms

* b-- Buttons and switching inputs

c-- Control circuit 1

d-- Defrosting control circuit 1

F-- Fan control circuit 1

H-- Temperature sensors

* J-- Pre-defined sets of parameters

* L-- Networking and display

* r-- Week timer

* U-- Relay contacts and lamps

* Y-- Control circuit 2

* These levels by default are protected by the password - 19.

A-- Alarms

Para-meter	Description of function	Setting range	Default valuse	
A0	Assignment of alarm sensors, detailed description of sensors in parameters H11 through H53	0: none 1: Sensor F1 2: Sensor F2 3: Sensor F3 4: Sensor F4 5: weighted mean value from F1 and F2	1	
A1	Upper limit value	0.0: inactive +0.1...+99.0°C	10,0	
A2	Lower limit value	-99.0...-0.1°C 0.0: inactive	-10	
A3	Switching mode of alarm relay	0: on if alarm present (normal) 1: off if alarm present (inverse)	1	
A4	Switching hysteresis for alarm	0.1...15.0°C	2,0	
A6	Absolute upper limit value	A7 ... 999 °C	150	
A7	Absolute lower limit value	-99 ... A6 °C	-99	
A10	Alarm suppression time after temperature alarm	0...240 min.	10	
A11	Alarm suppression time after defrosting	0...240 Min	15	
A12	Alarm suppression time after control ON or change of setpoint and/or alarm limits	0...300 Min.	180	
A13	Alarm suppression time, door open	0: no alarm 1 ... 600 sec.	180	
A14	Behavior if temperature alarm disappears again	0: without buzzer, delete automatically 1: with buzzer, delete automatically 2: without buzzer, with acknowledgement 3: with buzzer, with acknowledgement	1	
A15	Function buzzer and/or display in the case of alarm (temp. alarm see A14)	0: no display, no buzzer 1: display flashing only 2: buzzer active only 3: display flashing, buzzer active 4: like 2., can be acknowledged 5: like 3., buzzer can be acknowledged 6: like 5., recurring after A16	5	
A16	Buzzer recurring after acknowledgement	1 ... 120 min.	30	
A17	Reset MIN / MAX memory	0: - 1: reset MAX memory 2: reset MIN memory 3: Reset MAX and MIN memory	0	
A18	Display of current MAX memory	Measured value, not adjustable		
A19	Display of current MIN memory	Measured value, not adjustable		
A20	Function of high-pressure switch Releases until permanent alarm	0: no permanent alarm 1..10 : releases per 15 min.	0	
A25	Function of low-pressure switch Releases until permanent alarm	0: no permanent alarm 1...300 sec.	0	
A65	Alarm messages via ST-Bus during Standby	see table at parameter description	18	
A99	Password of parameter level A--	-99 ... 999	0	

b-- Buttons and switching inputs (password-protected)

Parameter	Description of function	Setting range	Values default	
b11	Function of external switching input E1	0: without function 1: controller on/standby 2: high-pressure alarm (see A20) 3: low-pressure alarm (see A25) 4: door contact (light on, fan off, see A13) 5: relay function A (light 1), not active in standby 6: relay function A (light 1), regardless of standby 7: relay function B (light 2), not active in standby 8: relay function B (light 2), regardless of standby 9: relay function C (window heating), not active in standby 10: relay function C (window heating), regardless of standby 11: relay function D (door frame heating), not active in standby 12: relay function D (door frame heating), regardless of standby 13: relay function E (blade scraper), not active in standby 14: relay function E (blade scraper), regardless of standby 15: relay function F, not active in standby 16: relay function F, regardless of standby 17: Set1 / Set2 change-over 18: day / night change-over 19: "super-frost" on/off (see c21...c23) 20: evaporator fan on permanently 21: defrosting request circuit 1 22: defrosting request circuit 2 23: control circuit 1 on/off 24: control circuit 2 on/off 25: as 17, same condition after power failure 26: as 6 same condition after power failure 27: as 8, same condition after power failure 28: external alarm, MESSAGE FULL 29: Pumpdown (low pressure switch) 30: Extended door contact (see c17 and c18)	0	
b12	Switching input E1 inverse / not inverse	0: normal 1: inverse	0	
b13	Function of external switching input E2	see b11	0	
b14	Switching input E2 inverse / not inverse	see b12	0	
b15	Function of external switching input E3	see b11	0	
b16	Switching input E3 inverse / not inverse	see b12	0	
b17	Function of external switching input E4	see b11	0	
b18	Switching input E4 inverse / not inverse	see b12	0	
b99	Password of parameter level b--	-99 ... 999	-19	

c-- Control circuit 1

Parameter	Description of function	Setting range	Values default	
c0	Assignment of cold store sensors, detailed description of sensors in parameters H11 through H53	0: none 1: Sensor F1 2: Sensor F2 3: Sensor F3 4: Sensor F4 5: weighted mean value from F1 and F2	1	
c1	Setpoint for Set1	c8...c7	0,0	
c2	Night setpoint (relative to current setpoint c1 / c3)	-20 ... +20.0°C	5,0	
c3	Setpoint for Set2	c8...c7	2,0	
c4	Switching mode	0: heating 1: refrigerating	1	
c5	Hysteresis	0.1...15.0°C	2,0	
c6	Hysteresis mode	0: symmetrical 1: one-sided	1	
c7	Upper setpoint limit	c8...+99°C	50,0	
c8	Lower setpoint limit	-99°C...c7	-50	
c10	Start protection after compressor start	0 ... 900 sec.	300	
c11	Start protection after compressor stop	0 ... 900 sec.	180	
c12	Start protection compressor after mains on	0 ... 60 min.	0	
c15	On-time in emergency operation	0 ... 100%	50	
c16	Cycle time in emergency operation	5 ... 60 min.	10	
c17	Compressor release after “door open”	0 ... 900 sec.	300	
c18	Compressor start protection after “door closed”	0 ... 900 sec.	120	
c20	Assignment of sensor for "super-frost" (also core or product temperature) detailed description of sensors in parameters H11 through H53	0: none 1: Sensor F1 2: Sensor F2 3: Sensor F3 4: Sensor F4 5: weighted mean value from F1 and F2	1	
c21	"super-frost“: time limit ("shock-frost", "max. cooling power")	1 ... 36 hrs.	10	
c22	"super-frost“: temperature limit ("shock-frost", "max. cooling power")	-40 ... 0°C	0,0	
c23	"super-frost“: automatic off ("shock-frost", "max. cooling power")	0: none, manual only 1: controlled by time 2: controlled by time or temperature	2	
c30	Assignment of humidity sensor, detailed description of sensors in parameters H11 through H53	0: none 1: Sensor F1 2: Sensor F2 3: Sensor F3 4: Sensor F4 5: weighted mean value from F1 and F2	0	
c31	Humidity setpoint for Set1	0 ... 100 % rH	50%	
c32	Night setpoint, humidity (relative to c31)	-20 ... +20 %	0	
c33	Humidity setpoint for Set2	0 ... 100 % rH	50%	
c34	Humidity mode	0: off 1: evaporator fan on (cont. operation) 2: Moisturize 3: Dehumidification with counter-heating	1	
c35	Hysteresis humidity	0.1% ... 15.0 %	5,0%	

Parameter	Description of function	Setting range	Values default	
c36	Hysteresis mode humidity	0: symmetrical 1: one-sided	1	
c37	Setpoint offset counter-heating for dehumidification (relative to cold store setpoint c 1/c2/c3)	-15.0 ... 0.0 K	-0,5	
c38	Hysteresis for c37 (one-sided above)	0.1 ... 10.0 K	1,0 K	
c39	Upper setpoint limit c3 1/c33	c40 ... 100%	100%	
c40	Lower setpoint limit c3 1/c33	0,0% ... c39	0,0%	
c90	Pumpdown during Standby	0: Pumpdown OFF during standby 1: Pumpdown always ON	1	
c91	Min. activation time of the switching input until the "Pumpdown" function is triggered	0 ... 60 sec.	2	
c92	Minimum compressor ON-time in Pumpdown mode	0 ... 900 sec.	30	
c93	Minimum compressor OFF-time in Pumpdown mode	0 ... 900 sec.	30	
c94	Min. time of the switching input for compressor OFF	0 ... 60 sec.	2	
c99	Password of the parameter level c--	-99 ... 999	0	

d-- Defrosting control circuit 1

Parameter	Description of function	Setting range	Values default	
d0	Assignment of evaporation sensors (defrosting sensors) detailed description of sensors in parameters H11 through H47	0: none 1: Sensor F1 2: Sensor F2 3: Sensor F3 4: Sensor F4 5: weighted mean value from F1 and F2	2	
d1	Defrosting interval	0: no automatic defrosting 1...99 hrs.	8	
d2	Type of defrosting	0: no defrosting 1: compressor off only (circulating air) 2: electrical 3: with hot gas	2	
d3	Stop at defrosting temperature	0 ... +30.0°C	10,0	
d4	Defrosting time limitation	1...99 min.	30	
d7	Temperature difference to cold store setpoint in previous cooling	-15°C ... 0.0°C	0,0	
d8	Time limitation in previous cooling	1 ... 180 min.	10	
d9	Delay of start of defrosting after compressor off d2=2	0 ... 900 sec.	60	
d10	Dripping time	0 ... 15 min.	1	
d11	Stop delay drip tray heating	0 ... 60 min.	10	
d20	Display, forced release after defrosting	0 ... 60 min. (0 = deactivated)	0	
d99	Password of parameter level	-99 ... 999	0	

F-- Fan control circuit 1

Parameter	Description of function	Setting range	Values default	
F8	Fan speed control mode, Set1	0 ... 100%	80,0	
F9	Fan speed defrosting, Set1	0 ... 100%	100	
F10	Fan speed control mode, Set2	0 ... 100%	80,0	

Parameter	Description of function	Setting range	Values default	
F11	Fan speed defrosting, Set2	0 ... 100%	100	
F12	Start-up time	0 ... 60 sec.	5	
F13	Minimum speed (output variable if result=0)	0 ... 100%	10,0	
F14	Fan behavior in case of door alarm	0: directly 1: directly, special function if switching input as extended door contact 2: fan independent of door alarm		
F15	Evaporator fan Fan mode normal operation Remark: Control setpoint if F15>4 is c1 or c3	0: off 1: continuous operation 2: like 1, with drip interruption 3: with compressor on 4: temperature-controlled, evaporator sensor only 5: temperature-controlled, difference between cold store and evaporator sensor	3	
F16	Evaporator fan, Fan mode defrosting	0: off 1: on	0	
F17	Evaporator fan, Delay after compressor start	0 ... 600 sec.	0	
F18	Evaporator fan, Delay after defrosting	0 ... 600 sec.	120	
F19	Evaporator fan, Drip interruption time if F15=2	0 ... 600 sec.	180	
F20	Evaporator fan, Control offset if F15=4 or 5	-15.0 ... +15.0°C	0,0	
F21	Evaporator fan, Control hysteresis if F15=4 or 5	0.1 ... 15.0°C	2,0	
F50	Assignment of condenser sensor detailed description of sensors in parameters H11 through H53	0: none 1: Sensor F1 2: Sensor F2 3: Sensor F3 4: Sensor F4 5: weighted mean value from F1 and F2	0	
F51	condenser fan, Setpoint	-55...+150°C	60,0	
F54	condenser fan, switching hysteresis	0.1...15.0°C	10,0	
F58	condenser fan, Delay after compressor start	0...300 sec.	60	
F59	condenser fan, Delay after compressor stop (overrun)	0...600 sec.	300	
F65	condenser fan function	0: always off 1: always on 2: on, if compressor on 3: after setpoint F51 4: as 3, as the P controller	2	
F66	Proportional range P-controller for setting F65=4	0.1 ... 30.0 °C	10,0	
F67	Minimum speed (output PWM if result=0)	0 ... 100%	50,0	
F68	Condenser fan start-up time	0 ... 60 sec.	10	
F99	Password of the parameter level	-99 ... 999	0	

H-- Temperature sensors

Parameter	Description of function	Setting range	Values default	
H1	Mains frequency	0: 50Hz 1: 60Hz	0	
H11	Act. value sensor F1	Measured value, not adjustable		
H12	Calibration sensor F1 (act. value correction)	-20...+20.0°C	0,0	
H13	Weighting factor sensor F1	0.50...1.50	1,00	

Para-meter	Description of function	Setting range	Values default	
H 14	Selection sensor F1 Depending on hardware, not all types are available. Sensor will be deactivated in this case.	0: not existing 1: PTC (-50..+150°C) 2: Pt100 2-wire (-100...+600°C) 3: Pt100 3-wire (-100...+500°C) 4: NTC (-40...+40°C) 5: Pt1000 2-wire (-100...+330°C) 6: Pt1000 3-wire (-100...+300°C) 7: 0-20mA 8: 4-20mA	1	
H 15	Software filter sensor F1	1 ... 32	8	
H 16	Display at 0/4mA and sensor selection H 14=7/8	-99...+999	0,0	
H 17	Display at 20 mA and sensor selection H 14=7/8	-99...+999	100	
H21	Act. value sensor F2	Measured value, not adjustable		
H22	Calibration sensor F2 (act. value correction)	-20...+20.0°C	0,0	
H23	Weighting factor sensor F2	0.50...1.50	1,00	
H24	Selection sensor F2	see H 14	1	
H25	Software filter sensor F2	1 ... 32	8	
H26	Display at 0/4 mA and sensor selection H24=7/8	-99..+999	0,0	
H27	Display at 20 mA and sensor selection H24=7/8	-99..+999	100	
H31	Act. value sensor F3	Measured value, not adjustable		
H32	Calibration sensor F3 (act. value correction)	-20...+20.0°C	0,0	
H33	Weighting factor sensor F3	0.50...1.50	1,00	
H34	Selection sensor F3	see H 14	1	
H35	Software filter sensor F3	1 ... 32	8	
H36	Display at 0/4 mA and sensor selection H34=7/8	-99..+999	0,0	
H37	Display at 20 mA and sensor selection H34=7/8	-99...+999	100	
H41	Act. value sensor F4	Measured value, not adjustable		
H42	Calibration sensor F4 (act. value correction)	-20...+20.0°C	0,0	
H43	Weighting factor sensor F4	0.50...1.50	1,00	
H44	Selection sensor F4	see H 14	0	
H45	Software filter sensor F4	1 ... 32	8	
H46	Display at 0/4 mA and sensor selection H44=7/8	-99...+999	0,0	
H47	Display at 20 mA and sensor selection H44=7/8	-99...+999	100	
H51	Display of weighted mean value of F1+F2 H51 = (H53*H11 + (100-H53)*H21)/100			
H53	Weighting of sensor F1 for H51	0 ... 100%	100	
H99	Password of parameter level H--	-99 ... 999	0	

J-- Pre-defined parameter sets (password-protected)

Para-meter	Description of function	Setting range	Values default	
J1	Parameter set	0 ... 6	0	
J2	Parameter reset	0 ... 31 (see parameter description)	0	
J98	Password for entering level selection (in display PA)	-99 ... 999	-19	
J99	Password of parameter level J--	-99 ... 999	-19	

Parameter J98 can only be viewed and set via ST-bus.
Warning: Changes made in the parameter set will change **all** parameter settings.

L-- Networking and display (password-protected)

Parameter	Description of function	Setting range	Values default	
L0	Own address ST-bus Identical with the setting Adr	0: deactivated 1 ... 250	1	
L2	Temperature scale	0: °C 1: °F	0	
L3	Display mode	0: integral 1: rounded to 0.5 2: rounded to 0.1	2	
L4	Display value	see act. value table	0	
L6	Software version			
L7	Display by standby	0: OFF 1: OFF 2: right decimal point 3: right decimal point flashing	0	
L40	ST bus release mask for functions	0 .. 255	253	
L41	ST bus release mask for functions	0 .. 255	255	
L42	Release for a deletion of the counter/runtimes	0: no release 1: Delete is approved for 10 min. (see A17, N98 and T98)	0	
L99	Password of parameter level L--	-99 ... 999	-19	

U-- Relay contacts and lamps (password protected)

Parameter	Description of function	Setting range	Values default	
U1	Function relay K1	0: No function (off) 1: Compressor 2: Thawing circuit 1 3: Evaporator fan 4: Condenser fan 5: Alarm 6: Control contact circuit 2 7: Thawing circuit 2 8: Relay function A: light 1 9: Relay function B: light 2 10: Relay function C 11: Relay function D 12: Relay function E 13: Relay function F 14: Drip tray heating 15: Buzzer 16: on if controller active 17: on, if control circuit 1 active 18: on, if control circuit 2 active 19: on, if Set 1 active 20: on, if Set 2 active 21: on, if day mode active 22: on, if night setpoint active 23: on, if super-frost active 24: counter-heating in case of humidity 25: moistening in case of humidity 26: Pumpdown (compressor) 27: Oil sump pump (compressor)	1	
U2	Function relay K2	see U1	2	
U3	Function relay K3	see U1	12	
U4	Function relay K4	see U1	8	
U5	Function relay K5	see U1	6	

Parameter	Description of function	Setting range	Values default	
U6	Function relay K6	see U 1	10	
U7	Function relay K7	see U 1	5	
U8	Function relay K8	see U 1	0	
U9	Function Triac-output	see U 1	0	
U 10	Power limitation Triac-output	0 ... 100%	80,0	
U 11	Upper limit for U 10	U 12 ... 100%	100	
U 12	Lower limit for U 10	0% ... U 11	0,0	
U99	Password of parameter level U--	-99 ... 999	-19	

Y-- Control circuit 2 (password protected)

Parameter	Description of function	Setting range	Values default	
Y 0	Assignment of sensors to control circuit 2 detailed description of sensors in parameters H 11 through H53	0: none 1: Sensor F1 2: Sensor F2 3: Sensor F3 4: Sensor F4 5: weighted mean value from F1 and F2	0	
Y 1	2nd control circuit: setpoint	Y8 ... Y7	10,0	
Y 2	2nd control circuit: absolute setpoint or DeltaW	0: absolute 1: DeltaW	1	
Y 4	2nd control circuit: switching mode	0: heating 1: refrigerating	1	
Y 5	2nd control circuit: hysteresis	0.1...99.0°C	2,0	
Y 6	2nd control circuit: hysteresis mode	0: symmetrical 1: one-sided	1	
Y 7	Upper setpoint limit	Y8 ... +999°C	50,0	
Y 8	Lower setpoint limit	-99°C ... Y7	-50	
Y 9	Function in the case of sensor fault	0: contact off 1: contact on	1	
Y 10	Defrosting interval control circuit 2	0: no defrosting 1...99 hrs.	0	
Y 11	Defrosting time limitation thermostat 2	1...99 min.	30	
Y99	Password of parameter level Y--	-99 ... 999	-19	

N-level (counters)

Parameters are only accessible via ST-Bus.

Parameter	Description of function	Setting range	Values default	
N0	Switching cycles of K1 (lower 16bit)	—		
N1	Switching cycles of K1 (upper 16bit)	—		
N2	Switching cycles of K2(lower 16bit)	—		
N3	Switching cycles of K2 (upper 16bit)	—		
N4	Switching cycles of K3 (lower 16bit)	—		
N5	Switching cycles of K3 (upper 16bit)	—		
N6	Switching cycles of K4 (lower 16bit)	—		
N7	Switching cycles of K4 (upper 16bit)	—		
N8	Switching cycles of K5 (lower 16bit)	—		
N9	Switching cycles of K5 (upper 16bit)	—		
N10	Switching cycles of K6 (lower 16bit)	—		
N11	Switching cycles of K6 (upper 16bit)	—		
N12	Switching cycles of K7 (lower 16bit)	—		
N13	Switching cycles of K7 (upper 16bit)	—		
N14	Switching cycles of K8 (lower 16bit)	—		
N15	Switching cycles of K8 (upper 16bit)	—		
N98	Reset counter	0: — 1: Reset	0	
N99	Password for N-level	-99 ... 999	0	

The number of switching cycles is calculated as follows (i.e. for K1): **number = 65536 * N1 + N0**.
Parameter N98 resets the counters for all relays. It depends on the setting of parameter L42. The return value is set back to “0” automatically.

T-level (operating times)

Parameters are only accessible via ST-Bus.

Parameter	Function	Setting range	Values default	
T10	Total operating time (lower 16 bit)	—		
T11	Total operating time (upper 16 bit)	—		
T12	Operating time since last reset (lower 16 bit)	—		
T13	Operating time since last reset (upper 16 bit)	—		
T14	On-time relay "Compressor" (lower 16 bit)	—		
T15	On-time relay "Compressor" (upper 16 bit)	—		
T16	On-time relay "thawing 1" (lower 16 bit)	—		
T17	On-time relay "thawing 1" (upper 16 bit)	—		
T18	On-time relay "evaporator fan" (lower 16 bit)	—		
T19	On-time relay "evaporator fan" (upper 16 bit)	—		
T20	On-time relay "condenser fan" (lower 16 bit)	—		
T21	On-time relay "condenser fan" (upper 16 bit)	—		
T22	On-time relay "thermostat 2" (lower 16 bit)	—		
T23	On-time relay "thermostat 2" (upper 16 bit)	—		
T24	On-time relay "thawing 2" (lower 16 bit)	—		

T25	On-time relay "thawing 2" (upper 16 bit)	—		
T26	On-time relay "drip tray heating" (lower 16 bit)	—		
T27	On-time relay "drip tray heating" (upper 16 bit)	—		
T28	On-time relay function A: light 1 (lower 16 bit)	—		
T29	On-time relay function A: light 1 (upper 16 bit)	—		
T30	On-time relay function A: light 2 (lower 16 bit)	—		
T31	On-time relay function B: light 2 (upper 16 bit)	—		
T32	On-time relay function C (lower 16 bit)	—		
T33	On-time relay function C (upper 16 bit)	—		
T34	On-time relay function D (lower 16 bit)	—		
T35	On-time relay function D (upper 16 bit)	—		
T36	On-time relay function E (lower 16 bit)	—		
T37	On-time relay function E (upper 16 bit)	—		
T38	On-time relay function F (lower 16 bit)	—		
T39	On-time relay function F (upper 16 bit)	—		
T98	Reset operating hours	0: — 1: Reset	0	
T99	Password for T-level	-99 ... 999	0	

The operating time is calculated as follows: **Operating time (in minutes) = 65536 * T11 + T10**.
Parameter T98 resets the counters for all operating times (except for T10 und T11). It depends on the setting of parameter L42. The return value is set back to “0” automatically.

Master password

All passwords can be edited through parameterisation. If you don't remember a password, you can still parameterise the controller and look up and/or edit the password via a master password. To do that, follow these steps:

1. Switch off power supply (disconnect from mains or switch off power supply unit)
2. Press buttons UP, DOWN and SET **at the same time** and switch on power supply again.
3. Now, a ("Challenge") number will be displayed for approx. 5s.

In no case disconnect the controller from power supply now. Otherwise, the number will become invalid. Using this number, you can call our sales staff, phone +49 711 68661-0 to request the master password ("Response"). Enter this master password in the 1st control level in PA.

Important: Even if you remember the password, you **must** enter the master password here. If the password is accepted, you will enter the parameter selection levels and all passwords will be deactivated. By pressing the SET button (display ---) you can switch to the relevant parameter level.

Now, the master password is no longer required. The passwords will remain deactivated until the controller is disconnected from power supply again. In case you leave the parameter level now, simply press the SET button in PA in order to access the parameter selection levels again.

Message	Cause	Remedy
H 1	Overtemperature, temperature above alarm limit of parameter A1	
Lo	Undertemperature, temperature below alarm limit of parameter A2	
E1L	Error on sensor F1, short-circuit	check sensor F1
E1H	Error on sensor F1, wire broken	check sensor F1
E2L	Error on sensor F2, short-circuit	check sensor F2
E2H	Error on sensor F2, wire broken	check sensor F2
E3L	Error on sensor F3, short-circuit	check sensor F3
E3H	Error on sensor F3, wire broken	check sensor F3
E4L	Error on sensor F4, short-circuit	check sensor F4
E4H	Error on sensor F4, wire broken	check sensor F4
E5	Door open for too long	close door
E6	High-pressure fault	Check: Condenser fan and check for dirt accumulation
E7	Low-pressure fault	Plant leaking, to little coolant
E10	External Alarm	
EP0	Internal error in control unit	Repair control unit
EP1	Error in parameter memory	Check all parameters
EP2	Error in data memory	Repair control unit
Pr	Intern: test mode	Disconnect the controller briefly from the mains voltage.. If the message does not disappear -> Repair
rtc	Error of internal clock	Set clock again. If error occurs again, the controller must be repaired

Errors EP0 and EP1 will disable the controller. The controller will only be enabled again once the error has been repaired. Error EP0 (and EP2) can only be eliminated by repair.
The errors and the current temperature will be displayed alternately.

A-- Alarms

A0 Alarm sensor assignment
With this parameter, you can set which sensor input is to be used as the alarm sensor.

A 1 Upper limit value
A2 Lower limit value
The limit values are used for monitoring the cold store temperature. They are relative values, i.e. they always refer to the setpoint S1. If the temperature increases above or falls below the upper and lower limits, an alarm as specified in A 15 will be triggered. If [A 1 = 0] and/or [A2 = 0], the relevant limit alarm is deactivated.

A3 Switching mode of alarm relay
With this parameter you can define if the relay is to be closed or opened in the case of an alarm.

A4 Switching hysteresis for alarm
The alarm contact hysteresis is set asymmetrically, downward at the upper alarm value and upward at the lower alarm point.

A6 Absolute upper limit value
A7 Absolute lower limit value
The absolute limit values are used for monitoring the cold store temperature. They are absolute values. If the temperature increases above or falls below the upper and lower limits, an alarm as specified in A 15 will be triggered after the time set with A 10. To ignore these limits, the values must be set to a temperature outside the active cold room working range.

A 10 Alarm suppression time after temperature alarm
If the temperature of the cold store exceeds the limits set in A 1, A2, a temperature alarm should normally be triggered. Based on the suppression time set in [illegible] triggering of the alarm can be delayed.

A 11 Alarm suppression time after defrosting
Triggering of a temperature alarm is prevented for the set time after defrosting so that the plant can reach normal operating conditions again.

A 12 Alarm suppression time after Refrigeration On
Triggering of an alarm is suppressed for the set time after activation of refrigeration.
This is to allow the refrigerating plant to reach the working temperature range without triggering of an alarm.

A 13 Alarm suppr. time, door open
With this parameter you can define after which time an alarm is to be triggered when the door is opened. If the door is closed again within the specified time, no alarm will be triggered.

A 14 Behavior when temperature alarm disappears
Here, you can define if a temperature alarm can be deleted automatically as soon as the temperature is in the permissible range again or if it must be acknowledged. This is to ensure, for example, that a temperature alarm that occurred at night remains present until the error is acknowledged the next day. If the temperature alarm is still present when it is acknowledged, the buzzer will be switched off as set in A 15, the alarm message in the display, however, will remain present until the temperature is within the permissible range again. Then, the acknowledged alarm will be deleted automatically.

A 15 Buzzer function and/or display in the case of an alarm
Here, you can define if a temperature alarm is to be displayed or not and if the buzzer is to sound. Additionally, you can define if the buzzer is to sound again after acknowledgement. The corresponding time is indicated in A 16. The error message and the temperature will be displayed alternately as long as the alarm is present. If more than one alarm messages are present, they will be displayed alternately. The alarm relay will signal the alarm at all times.

A 16 Buzzer recurring after acknowledgement
Alarms which have not been eliminated will be switched on again by the buzzer after the set time. This only applies if [A 15=6].

A 17 Reset MIN / MAX memory
With this parameter, you can delete the MIN and/or MAX memory.

A 18 Display of current MAX memory
Here, you can view the current MAX memory.

A 19 Display of current MIN memory
Here, you can view the current MIN memory.

A20 High-pressure function: Releases until alarm
In the case of a high-pressure signal via a parameterised switching input, the compressor will be switched off immediately and a message will be displayed. If the high-pressure signal disappears within 15 minutes, the error message will be deleted and the compressor will be started again. However, an alarm via the alarm relay will only be triggered if the number of registered releases (within 15 min.) set in this parameter is exceeded or if the signal is present for more than 15 minutes. This fault will only be deleted after disconnection of the plant from mains supply (and repair!).

A25 Low-pressure function: Delay until alarm
If a low-pressure signal is present via a parameterised switching input and it does not disappear again within the time specified here, the compressor will be switched off and an error message will be displayed. This fault will only be deleted after disconnection of the plant from mains supply (and repair!).

A65 Alarm messages via ST-Bus during Standby
A binary mask selects the alarm messages, which are enabled for the ST-Bus during Standby.
The bits have the following meanings:

Bit	Value	Function
0	1	Temperature alarm (Hi, Lo)
1	2	Sensor error
2	4	High pressure alarm
3	8	Low pressure alarm
4	16	Door alarm
5		not used
6		not used
7		not used

To determine the value to be parameterized, all bti values must be added together. In the factory setting (A65 = 18) door alarm and sensor errors are allowed.

A99 Password for parameter level A--
With this parameter, you can set the password for parameter level A--.

b-- Buttons and switching inputs (password-protected)

b 11, b 13, b 15, b 17 Function E1 ... E4
Certain functions can be assigned to the switching inputs.

b 12, b 14, b 16, b 18 Switching mode E1 ... E4
Here, you can define if the switching input is used as a NO contact (normal) or NC contact (inverse).

b99 Password for level b--
With this parameter, you can set the password for parameter level b--.

c-- Control circuit 1

c0 Assignment of cold store sensors
With this parameter, you can set which sensor input is to be used as the cold room sensor. The selected sensor must be set up accordingly in the parameters.

c 1 Control circuit 1: Setpoint (Set1)
c2 Circuit 1: Night-time incr./decr.
c3 Control circuit 1: Setpoint (Set2)
With this parameter, you can set the setpoint. It will be displayed directly if you press the SET button and can be edited. The setting range is defined by the settings in parameters c7 and c8. Setpoint c3 becomes active if the Set2 function is switched on via a button, a digital switching input, the internal clock or the ST-bus. Setpoint c2 becomes active if the night-time increase/decrease function is switched on via a button, a digital switching input, the internal clock or the ST-bus. The value of c2 is added to the currently active setpoint c 1 or c3.

c4 Control circuit 1: Switching mode
The switching mode of the control output can be set to heating or refrigerating function. In the case of the heating function, the control output is switched on if the actual temperature is lower than the set temperature. In the case of the refrigerating function, the output is on if the temperature is higher than the setpoint.

c5 Control circuit 1: Hysteresis
In this parameter, you can specify the control hysteresis. A small hysteresis enables exact control, but will result in frequent switching of the relay.

c6 Hysteresis mode
With this parameter you can define if the hysteresis will be active at the corresponding switching point symmetrically or on one side only. In the case of a one-sided hysteresis, the hysteresis will be active below the setpoint in the case of the heating function [c4=0] and above the setpoint in the case of the refrigerating function [c4=1]. In the case of a symmetrical hysteresis, there is no difference.

c7 Upper setpoint limit
c8 Lower setpoint limit
Setpoints c 1 and c3 can only be set within the limits defined here.

c 10 Start protection after compressor start
This protection time starts as soon as the compressor is switched on. When the compressor is switched off, it cannot be switched on again until this time has elapsed. This is to avoid excessive activation and to increase the service life as a consequence.

c 11 Start protection compressor after compressor stop
This protection time starts as soon as the compressor is switched off. The compressor cannot be switched on again until this time has elapsed. This is to avoid excessive activation and to increase the service life as a consequence.

c 12 Start protection compressor after mains On
Activation of the control output is prevented after "Mains On" until this time has elapsed. This function can be used, for example, to avoid that several controllers are switched on at the same, which would result in a high load on the power supply network.

c 15 On-time in emergency operation
c 16 Cycle time in emergency oper.
With these parameters, you can define how the compressor is to behave in the case of a sensor fault. In emergency operation, the compressor is operated in a cycle of c 16. The on-time in c 15 is a percentage of the cycle time, with 100% meaning that the compressor runs continuously and 0% meaning that the compressor is off all the time. In deep-freeze stores, the compressor should continue operation in order to avoid defrosting. In normal cold stores above 0°C continued operation might result in frost damage, however. During emergency operation, no defrosting will be performed.

c 17 Compressor release after “door open”
If an input is configured as an extended door contact with bx=30, the fan is switched off, the light is switched on and the compressor is switched off as soon as the door is opened. If the door is open longer than the time parameterized here, the compressor is switched off and can be switched on again after expiry of all protection times (c 10, c 11, c 12).
If c 17= 0, the compressor is on as long as the door is open.

c 18 Compressor start protection after “door closed”
After closing the door, the start of the compressor is delayed by this time. At c 18 = 0 the compressor can start immediately if the door is closed. However, the compressor can not start until all protection times (c 10, c 11, c 12) have elapsed.

c20 Assignment of sensors for "super-frost" function
With this parameter, you can set which sensor input is to be assigned to the "super-frost" function. Depending on the sensor design, it can also be used as core and/or product temperature sensor. The selected sensor must be set up accordingly in the H parameters.

c2 1 "super-frost": lime limit, "shock-frost", max. refrigerating power
c22 "super-frost": temperature limit, "shock-frost", max. refrigerating power
c23 "super-frost": deactivation, "shock-frost", max. cooling power
If this function is activated, the lower warning limit is deactivated and the compressor is on permanently. In c23, you can define if automatic shut-down is to be performed and if this automatic shut-down is to be limited by time only or by temperature, too. Limitation by time is defined via c2 1, the temperature condition is defined via c22.

c30 Assignment of sensor for humidity control
With this parameter, you can set which sensor input is to be assigned for the humidity. If no sensor is assigned, the humidity control will be disabled. However, the function c39 = 2 can be used to switch a relay via the humidity function button. The selected sensor must be set up accordingly in the H parameters.

c3 1 Setpoint humidity (Set1)
c32 Setpoint offset humidity at night
c33 Setpoint humidity (Set2)
For [c34>=2] and associated sensor will be fixed to the value set here. The value the parameter c32will be become c3 1 or added when the c33night setpoint is active.

c34 Control mode humidity
The setting [c34= 1] is only used set the evaporator fan for the humidification to continuous operation. As a result the moisture formed on the evaporator is transported back into the cold store again. The function is switched on manually via the moisture function (see b-parameter). The setting [c34= 2] is used to switch a relay for the humidification, which distributes moisture in the cold store, for example, in the form of fog. If no sensor is specified, this relay can be manually switched with the moisture function (see b parameters). The setting [c34=3] is only used for the dehumidification of the compressor. In order for the refrigerator gets too cold, a counter-heating will be switched on according to the parameters c37 and c38. No sensor is specified, this function will be disabled.

c35 Hysteresis
In this parameter, you can specify the control hysteresis. A small hysteresis enables exact control, but will result in frequent switching of the relay.

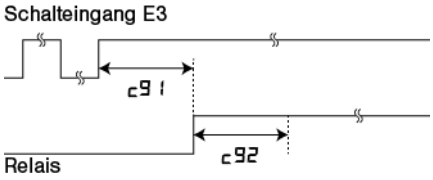
c36 Hysteresis mode humidity
With this parameter you can define if the hysteresis will be active at the correspond-

ing switching point symmetrically or on one side only. A single-sided programmed hysteresis is intended for a moistening [c34=2] below and a dehumidification [c34=3] above the setpoint. In the case of a symmetrical hysteresis, there is no difference.

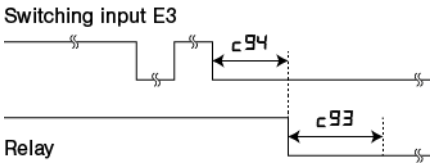
c37 Setpoint offset counter-heating
c38 Hysteresis for c37
In the dehumidification function [c34=3] the compressor is activated in order to reduce the moisture in the cold store. A counter-heating can be activated, to avoid the cooled from getting too cold. For this, the value in c37 is added to the cold store setpoint, and the counter-heating switched on (see U parameters) in case this value is underrun. The control hysteresis specified in c38 is always set above the setpoint.

c39 Upper humidity setpoint limit
c40 Lower humidity setpoint limit
Setpoints c31 and c33 can only be set within the limits defined here.

c90 Pumpdown during Standby
c91 Min. activation time E3
c92 Min. compressor ON-time



c93 Min. compressor OFF-time
c94 Min. time of the switching input for compressor OFF



c99 Password for the parameter level c--
With this parameter, you can set the password for parameter level c--.

d-- Defrosting control circuit 1

d0 Assignment of evaporator sensor (defrosting sensor)
With this parameter, you can set which sensor input is to be used as the evaporator/defrosting sensor. The selected sensor must be set up accordingly in the H parameters.

d1 Defrosting interval
The defrosting interval defines the time after which a defrosting operation is started. Once the defrosting operation is triggered, the defrosting interval starts again. A defrosting operation can also be triggered by pressing the **UP** button ("manual defrosting") for at least 3 seconds or another parameterised button. Via the internal week timer, defrosting can also be started in real time. Once switched on, the controller starts refrigeration immediately and will trigger the first defrosting operation as soon as the time set in d1 has elapsed. If [d1=0], no automatic defrosting operation will be performed.

d2 Defrosting mode
In this parameter, you can define if defrosting is to be performed and, if yes, how it is to be performed. You can choose among simple shut-down of the compressor, defrosting by electric heating or by hot gas. Electric defrosting will always be performed after a compressor break, defined in d9. Hot gas defrosting will always be performed directly after a refrigeration phase. Additionally, you can define via parameters d7 and d8 if the cold store temperature is to be lowered before defrosting.

d3 Defrosting temperature
A defrosting operation is complete as soon as the temperature set here is reached at the evaporator. If the defrosting operation is not completed within the time set in d4, it will be stopped.

d4 Defrosting time limitation
Here, you can set the max. time in which the defrosting operation must be completed. After the time set here, the defrosting operation will be stopped even if the evaporator was not hot enough to be free of ice.
No error message will be displayed.

d7 Temperature difference for refrigeration before defrosting
d8 maximum refrigerating time for refrigeration before defrosting
To avoid unnecessary heating up of the cold store, you can set up a refrigeration cycle to be performed before the defrosting operation.

d9 Delay after compressor stop before electric defrosting is started
If the compressor is on when an electric defrosting request is received, the start of the defrosting operation is delayed by the time specified here.

d10 Drip time
Directly after the end of the defrosting operation, the drip / dewatering time will start let the evaporator drain. During this time, the compressor, defrosting and evaporator fan outputs are switched off.

d11 Off-delay of drip tray heating
Here, you can define how long the drip tray heating is to remain switched on after a defrosting operation to avoid that the dripping water freezes again.

d20 Display, forced release after defrosting
With L4 = 0, the display may be frozen during defrosting. After successful defrosting the frozen display is released not later than the time set here. If 0 is set, there will be no forced release.
d99 Password for parameter level d--
With this parameter, you can set the password for parameter level d–.

F-- Fan control circuit 1

F8 Fan speed in control mode, Set1
Fan speed in normal control mode and active Set1

F9 Fan speed during defrosting, Set1
Fan speed during defrost and active Set1

F10 Fan speed in control mode, Set2
Fan speed in control mode and active Set2.

F11 Fan speed during defrosting, Set2
Fan speed during defrost and active Set2

F12 Start-up time (in seconds)
If necessary, the fan can be switched on at max. speed for the time set here to ensure it runs properly. This parameter is active only if the fan is switched on from standstill.

F13 Minimum speed
Here, you can set the lowest voltage value at which a connected fan will still be running.

F14 Fan behavior in case of door alarm
0: Fan reacts directly, i.e.
Door open → Fan off
Door closed → Fan acc. to F15/F16
1: Same as 0, but if a switching input is set to "0" (extended door contact), the fan can be enabled again by parameter c17.
2: Fan is independent of door signal

F15 Evaporator fan: Fan mode control mode
In this parameter, you can define how the fan is switched on in control mode. If the controller is performing a defrosting operation, the fan will be controlled via parameter F16. In the case of continuous operation, the fan will be running as soon as the controller is switched on. In the case of

continuous operation interrupted for draining, the fan will behave like in the case of continuous operation. However, it will be switched off for the time set in F 19 as soon as the defrosting operation is complete. After the drain time set in F 19, the fan will be switched on again. If the compressor is switched on before this time has elapsed, the fan will be restarted immediately (after the delay set in F 17). In the configuration with compressor On, the fan will be switched on/off together with the compressor. In order to avoid mains overload by starting the compressor and fan at the same time, a delay can be defined in F 17.

The fan can also be temperature-controlled. You can define if the evaporator sensor temperature (F15=4) or the difference between the evaporator and the cold store sensor (F15=5) is to be used for controlling the fan. The control setpoint and hysteresis are defined via parameters F20 and F21.

F 16 Fan mode defrosting
In this parameter, you can define if the fan is to be on or off during defrosting. This parameter will not be effective in temperature-controlled fan mode [F 15=4 or 5].

F 17 Delay after compressor On
In order to avoid mains overload by starting the compressor and fan at the same time, you can define a delay for the fan in this parameter. It will not be effective in temperature-controlled fan mode.

F 18 Delay after defrosting
At the end of a defrosting cycle, the fan will be switched on after the delay set in this parameter. This parameter will be effective in all fan modes set up.

F 19 Drip interruption time (if F 15=2)
If the fan runs in continuous mode, there is low temperature variation at high atmospheric moisture. In operation mode "with compressor on", the temperature variation will be greater while the atmospheric moisture is lower. This parameter is to enable a combination of both advantages. The fan runs in continuous mode and is switched off for the time specified here when the compressor is switched off. This enables the moisture accumulating at the evaporator to drain off.

F20 Control offset evaporator sensor (for F 15=4 or 5)
If [F 15=4] the following applies: The setpoint for control circuit 1 (c 1 or c3) forms the basis. If the evaporator temperature is below the setpoint, the evaporator fan will be switched on. This switching point can be shifted by the value defined here.
If [F 15=5] the following applies: The temperature difference between cold store (sensor from c0) and evaporator temperature (sensor from d0) determines the switching point for the evaporator fan. If the evaporator temperature is below the cold store temperature, the evaporator fan will be switched on. This switching point can be shifted by the value defined here.

F21 Hysteresis (if F 15=4 or 5)
The control hysteresis is always set above the theoretical switching point.

F50 Assignment of evaporator sensor
With this parameter, you can set which sensor input is to be used as the evaporator sensor. The selected sensor must be set up accordingly in the H parameters.

F51 Condenser fan: setpoint
Only effective for the setting [F65=3]. If the value defined here is exceeded, the condenser fan will be switched on.

F54 Condenser fan: switching hyst.
Only effective for the setting [F65=3]. The hysteresis is set one-sided above the setpoint of parameter F51.

F58 Condenser fan: delay after compressor start
On-delay of condenser fan after activation of the compressor.

F59 Condenser fan: Delay after compressor stop
Off-delay of condenser fan after shut-down of the compressor.

F65 Function condenser fan
0: no function, i.e. condenser fan is off
1: Condenser fan is on at all times
2: Condenser fan is on if the compressor is on
3: Condenser fan is controlled via setpoint in parameter F51. In case of a sensor error the fan will behave as defined in [F65=2].
4: as an 3., but the fan is continuously controlled via a voltage output The proportional range is specified in the parameter F66.

F66 Condenser fan: Proportional range P-controller
For the setting of the proportional range required if [F65=4], in which the fan is to be controlled.

F67 Condenser fan: minimum speed
Here, the lowest voltage value is set at which a connected fan will still be running.

F68 Condenser fan: start-up time
Here, you can define the time for which a fan is switched on from standstill at max. voltage to enable stable operation.

F99 Password for parameter level F--
With this parameter, you can set the password for parameter level F--.

H-- Temperature sensors

H 1 Mains frequency
In this parameter, you must define the mains frequency.

H11, H21, H31, H41 Act. Value F1 .. F4
The temperature value shown here is used for control. It is calculated as follows:
Actual control value =
(actual measured value * weighting factor)
+ actual value correction

Actual value correction and weighting factor must be defined in the following parameters. This corrects actual value deviations in special applications (refrigerated shelves or similar) due to unfavorable sensor location.

H51 Weighted mean value sensors F1 and F2
This theoretical mean value from sensors F1 and F2 may be useful for the control circuit or display. It is calculated as follows:
H51 = (H53 x H11 + (100 - H53) x H21) / 100

H12, H22, H32, H42 Calibration of sensor F1...F4 actual value correction
With this parameter it is possible to correct actual value deviations caused by sensor tolerances, very long sensor cables or structural protections (e.g. ex-barriers), for example. The value defined here is added to the measured value.

H13, H23, H33, H43 Weighting factor F1...F4
With this parameter, it is possible to correct actual value deviations due to unfavorable sensor location. The value measured by the controller is multiplied by the value set here.

H14, H24, H34, H44 Sensor selection F1...F4
With this parameter, you can define the sensor type. Depending on the hardware, not all sensor types may be supported. For the NTC sensor, a parallel resistor will have to be connected.

H15, H25, H35, H45 Software filter F1...F4
In this parameter, you can define how many measured values are to be used for

calculating a mean value. A mean value is calculated from the last measured values, with the oldest measured value being deleted (so called "Moving Average Filter").

H16, H26, H36, H46 F1...F4: Display at 0 / 4mA

If, when choosing the sensor, H14 / H24 / H34 / H44 = 7 or 8 is selected (0...20mA or 4..20mA linear sensor), you can define via this parameter which value is to be displayed in the case of a current of 0 or 4mA. The value to be displayed for 20mA can be defined in the next parameter. The actual measured value is calculated as linear interpolation between these two values.

H17, H27, H37, H47 F1...F4: Display at 20mA

If, when choosing the sensor, H14 / H24 / H34 / H44 = 7 or 8 is selected (0...20mA or 4..20mA linear sensor), you can define via this parameter which value is to be displayed in the case of a current of 20mA. The display value for 0 / 4mA is defined in the previous parameter. The actual measured value is calculated as linear interpolation between these two values.

H53 Weighting of sensor F1 for display H51 (weighted mean value of sensor F1 and F2)

This theoretical mean value from sensors F1 and F2 may be useful for the control circuit or display. It is calculated as follows:

H51 = (H53 x H11 + (100 - H53) x H21) / 100

H99 Password for parameter level H--

This parameter sets the password for level H--.

J-- Pre-defined parameter sets (password-protected)

J1 Internal: active data set

With this parameter, you can set up predefined 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.

J2 Parameter reset

With this parameter the parameters of the current parameter set (see J1) can be reset to their default settings.

To determine the value of the parameters to be reset, the values of the following bit mask must be added.

Bit	Value	Function
0	1	Control parameters
1	2	Clock (r--)
2	4	Relay counter (N98)
3	8	Operating time (T98)
4	16	Passwords

Depending on the set bit, the corresponding parameters are reset to factory settings, depending on the current parameter set (according to J1).

In order for this function to work, a release must be triggered with parameter L42=1.

Generally not volatile parameters such as T10 are not deleted!

J98 Password for accessing level selection

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.

J99 Password of parameter level J--

With this parameter, you can set the password for parameter level J--.

L-- Networking and display (password-protected)

L0 Own address in the ST-bus

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.

L2 Temperature scale

With this parameter, you can define if temperature values are to be displayed in °F or °C.

L3 Display mode

Here, you can switch over between 3-digit and 4-digit display. However, if the hardware only provides 3 digits, the left digit will be lost, i.e. in case of negative numbers this will be the sign. You can also define here if values are to be displayed without decimal places, with rounded decimal place or exactly.

L4 Display value

Here, you can define which actual value is to be displayed. This refers to the display in normal operation. You will have to leave the parameter level in order to see the set value.

Possible values which can be set via parameter L4:

0	Cold store temperature frozen during defrosting
1	Cold store temperature
2	Evaporator temperature
3	Current setpoint evaporator fan
4	Current setpoint cold store (control circuit 1)
5	Condenser temperature
6	P-control result for condenser fan
7	Current setpoint for condenser fan
8	current setpoint of condenser
9	Cold store temp. via test bottle function
10	MIN cold store temperature
11	MAX cold store temperature.
12	Act. value control circuit 2
13	Current setpoint control circuit 2
14	Time
15	Sensor F1 direct
16	Sensor F2 direct
17	Sensor F3 direct
18	Sensor F4 direct
19	Sensor F5 direct

L6 Software version

Here, the software version of the controller is displayed.

L7 Display during standby

In this parameter, you can define what is to be displayed in standby.

L40 Mask on enabled functions (Bit 0..7)
L41 Mask on enabled functions (Bit8..15)
Here, you can specify the functions enabled via the bus using a binary mask The bits have the following meaning:

Para	Bit	Value	Function
L40	0	1	controller on/off
	1	2	control circuit 1 on/off
	2	4	Control circuit 2 on/off
	3	8	Control circuit 1: defrost request
	4	16	Control circuit 1: super-frost request
	5	32	Control circuit 1: reserved
	6	64	Control circuit 1: Set1/Set2 change-over
	7	128	Control circuit 1: day/night change-over
L41	8	1	Control circuit 2: defrost request
	9	2	Function A: light 1
	10	4	Function B: light 2
	11	8	Function C:
	12	16	Function D:
	13	32	Function E:
	14	64	Function F:
	15	128	reserved

To determine the value to be parameterized, all other values must be added up.

L42 Release for a deletion of the counter/runtimes
Here, the deleting of the runtimes, the relay counter and the min/max memory will be released for 10 minutes. Only within these 10 minutes, can the parameters T98, N98 and A17 actively delete the corresponding timers, counters, or memory locations. After the 10 minutes, the release will be removed. The deletion of the min / max memory through a button function assignment will not be affected by this.

L99 Password for the level L--
With this parameter, you can set the password for parameter level L--.

U-- Relay contacts and lamps (password protected)

U1 ... U8 Function relay K1...K8
Assignment of internal output signals to the corresponding output relays.

U9 Function Triac
U10 Power limitation function TRIAC
With U9, every function can be allocated to the TRIAC. If the selected signal is active, the output will be set to the limit specified in parameter U10 (phase cutting). However, the limitation must be evaluated differently depending on the connected consumer. In particular, there is no linear relationship.
In the setting [U9=4] (condenser fan) the parameters F50 - F68 will also be included in the evaluation. The parameter U10 thereby limits the maximum signal.

U11 Upper limit for U10
U12 Lower limit for U10
The power limitation can only be set within the limits defined here.

U99 Password for the level U--
With this parameter, you can set the password for parameter level U--.

2 y-- Control circuit 2 (password-protected)

y0 Assignment of sensor for independent 2nd control circuit (thermostat)
With this parameter, you can set which sensor input is to be assigned to the 2nd control circuit.

y1 Control circuit 2: setpoint
Here, you can set the setpoint for the 2nd control circuit (thermostat). If a button is parameterised accordingly, the setpoint can also be viewed and set up via this button directly.

y2 Control circuit 2: absolute setpoint or DeltaW
With y2=0 the setpoint y1 is an absolute setpoint.
With y2=1 the setpoint is the sum of y1 and the actual cold room setpoint (c1, c2 or c3).

y4 Control circuit 2: switching mode
Heating contact or cooling contact.

y5 Control circuit 2: hysteresis
In this parameter, you can specify the control hysteresis. A small hysteresis enables exact control, but will result in frequent switching of the relay.

y6 Control circuit 2: Hysteresis mode
With this parameter you can define if the hysteresis will be active at the corresponding switching point symmetrically or on one side only. In the case of a one-sided hysteresis, the hysteresis will be active below the setpoint in the case of the heating function [[y4=0] and above the setpoint in the case of the refrigerating function [y4=1]. In the case of a symmetrical hysteresis, there is no difference.

y7 Control circuit 2: upper setpoint limit
y8 Control circuit 2: lower setpoint limit
With these parameters, you can limit the setting range of setpoint y1 to avoid that the end user does not enter non-permissible values.

y9 Control circuit 2: Function in the case of sensor fault
Here, you can define if, in the case of a fault, the addressed output contact will open or close.

y10 Control circuit 2: Defrosting interval
The defrosting interval defines the time after which a defrosting operation is started. As soon as the defrosting cycle is triggered, the defrosting interval starts again. In this way, periodic defrosting at a fixed time interval is ensured.

y11 Control circuit 2: Defrosting time limitation
Here, you can set the max. time in which the defrosting operation must be completed.

y99 Password of parameter level y--
With this parameter, you can set the password for parameter level y--.

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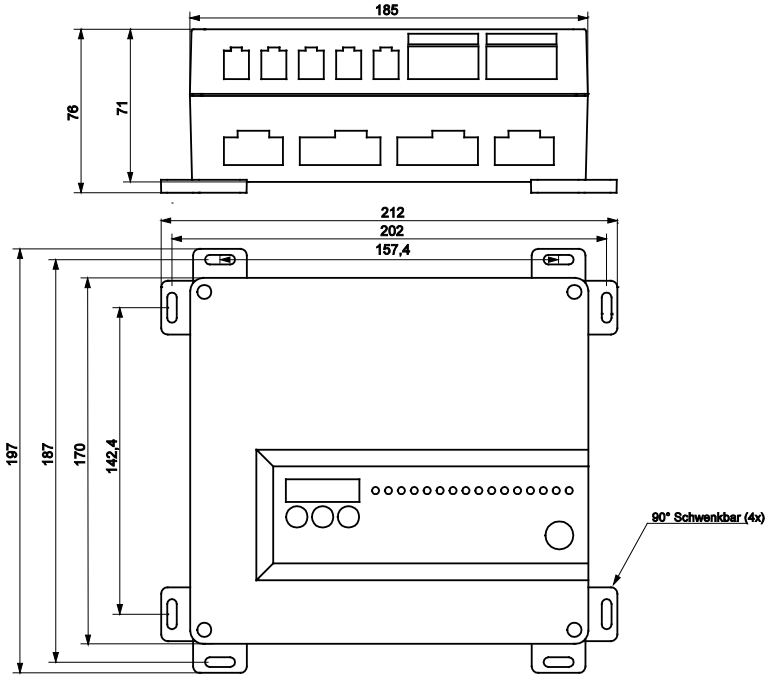
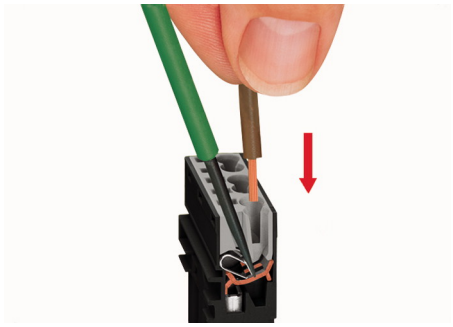
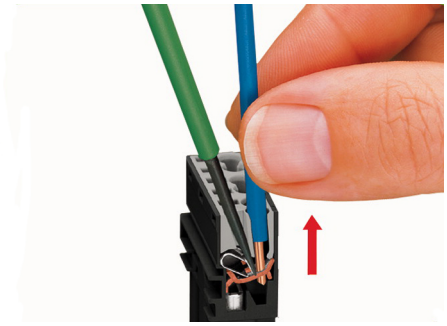
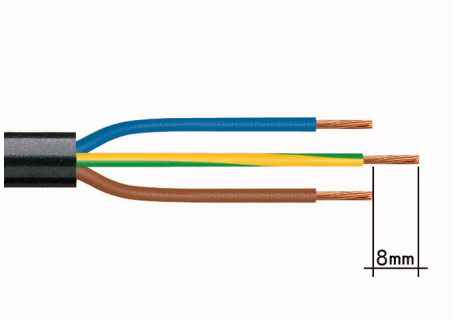
Measuring inputs	**F1:** Resistance thermometer Pt100/PTC, Kühlraum **F2:** Resistance thermometer Pt100/PTC, Verdampfer **F3:** Resistance thermometer PTC Measuring range: Pt100 -99.0 ... 150 °C PTC -55.0 ... 150 °C **F4:** Humidity sensor, 4 ... 20 mA Measuring range: 0 ... 100% rH Measuring accuracy: ±0.5 K ±0.5 % at 25 °C, without sensor
Outputs	**K1:** Relay, 30(9)A / 250V~, Normally-open contact, compressor **K2:** Relay, 16(2.2)A / 250V~, Normally-open contact, defrosting **K3:** Relay, 16(2.2)A / 250V~, Normally-open contact, light **K4:** Relay, 16(2.2)A / 250V~, Normally-open contact **S1:** Voltage output for DC fan: 0..24V, max. 1A **S2:** TRIAC for power limitation 230V~, max 2A (Fuse Si1 2A T)
Display	One 3-digit LED-display for temperature indication, 7mm height, red 7 LEDs for status display
Power supply	90...250V~ 50/60Hz, max. 16A
Connection	WAGO-terminal
Ambient conditions	Storage temperature: -20...+70°C Operating temperature: 0...+50°C Relative humidity: max. 75% without dew
Weight	ca. 1400 g
Tightness	IP20
Interface	**2x ST-Bus communication interface (satellite display and external)** Local network (red label, connection to display or satellite) Interface driver: RS485, 57600 Baud, CAT5 cable, length up to 1000m Remote network (blue label, connection to Commander, PC, ...) Interface driver: RS485, 57600 Baud, CAT5 cable, length up to 1000m The remote network has to be installed in lines topology and terminated with a 120 Ohm resistance on each side.
Housing	Material: Ultramid® C3U Dimensions: 185mm x 170 mm x 76 mm (without connectors)

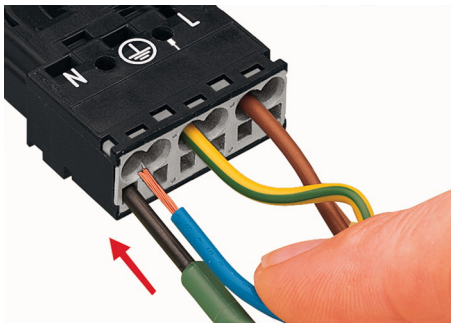




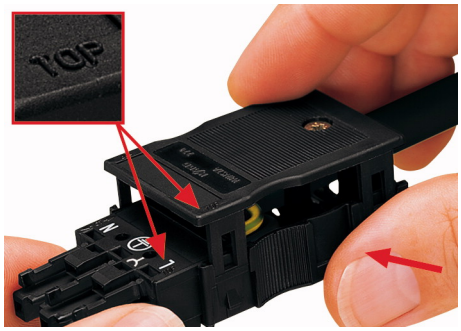


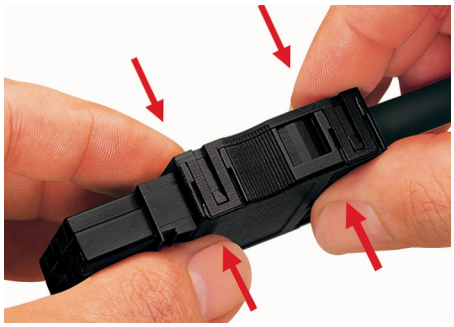
Use screwdriver (2.5mm) for wiring.

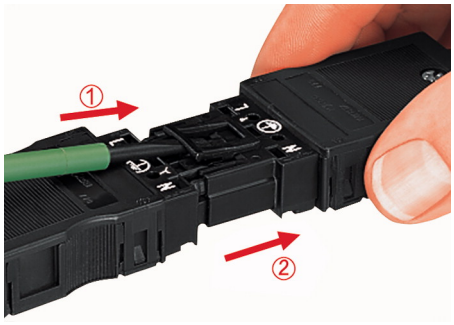




For safety reasons make sure that the PE cable (green/yellow) is at least 8mm longer.







The connectors snap into place.
Use srewdriver for separating.