Controller for cooling applications

Order number: 900312.022

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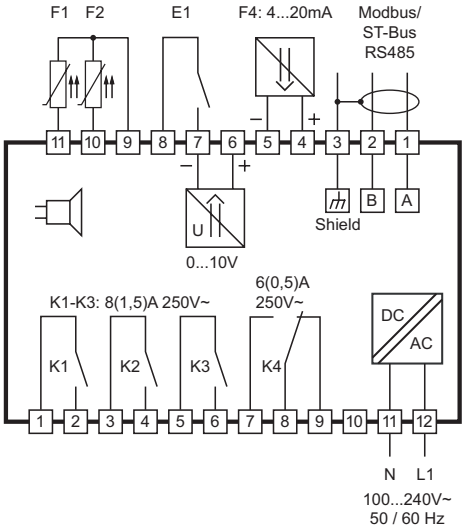
Wiring diagram



Product description

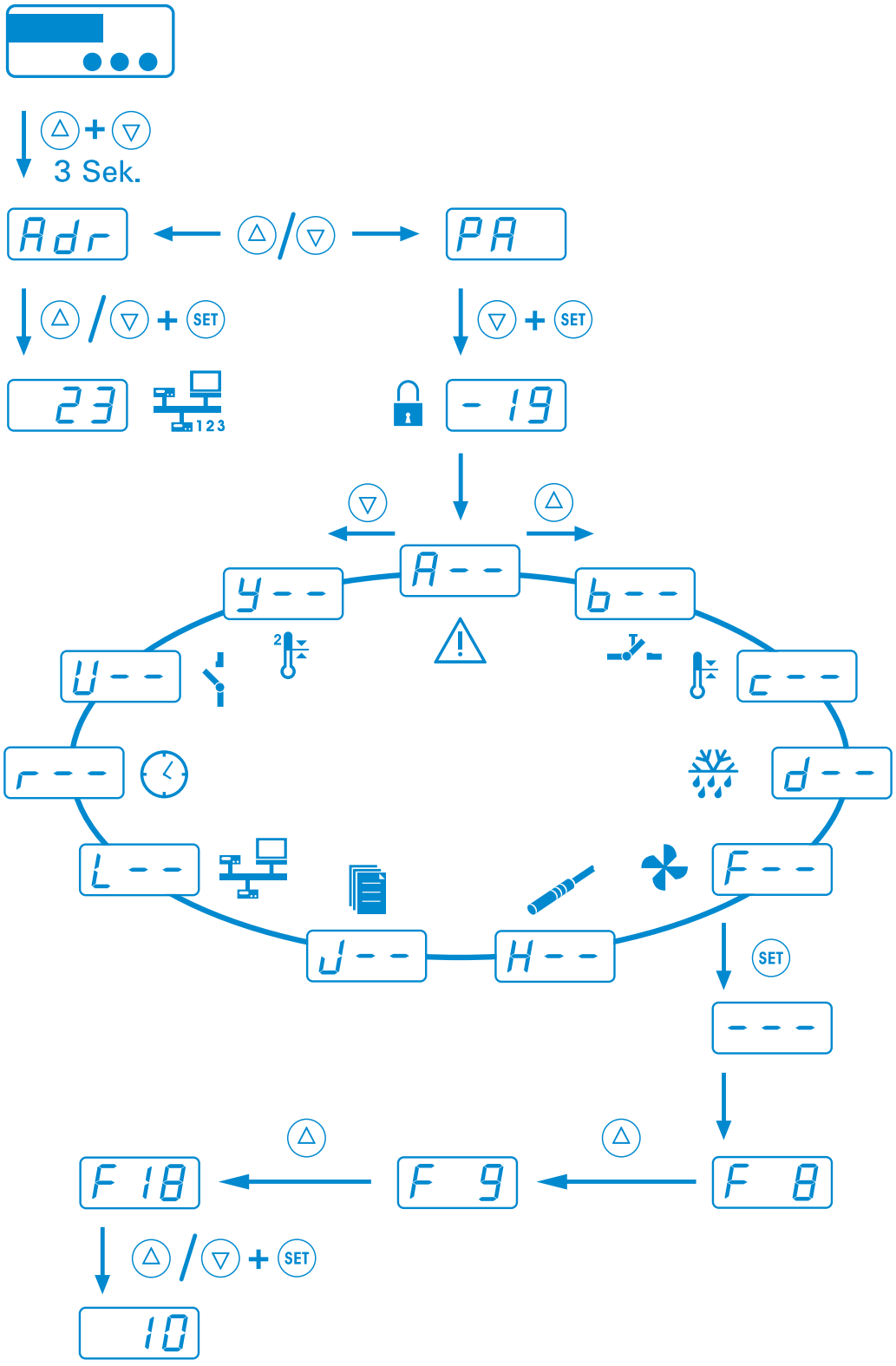
The refrigeration controller ST710-PNXUR.112 has an interface for the ST-Bus. The controller has two sensor inputs for Pt100 sensors and can be supplied with a voltage of 100 ... 240V AC.
The functions of the switching input, the 0-10V analog output and the four switching relays can be freely set, allowing a wide range of applications with just one controller. For example, the controller can serve two refrigeration units if the evaporator sensor is parameterized as a second cold room sensor.
The controller is networked by means of an ST-Bus interface.

Sensor: Multi-resistant
Range: dependent on type of sensor
Front size: 84mm x 42mm
Panel cut-out: 67.5mm x 31.5mm
Tightness: Front IP65
Connection: plug and socket

Operating levels:

SOFTWARE

COOLING CONTROLLER ST710-xxx.112



GENERAL NOTES

The ST.....112 controllers are designed for general use in refrigerating plants.

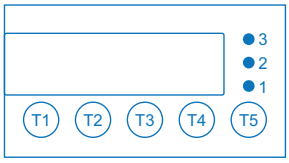
Depending on the existing hardware, up to four temperature sensors can be connected. These can either be used for capturing the cold store temperature, evaporator temperature, super-frost core temperature, the temperature of a second control circuit or the temperature of the condenser. The type, function, 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.

The max. four digital inputs can also be configured separately, depending on the hardware installed. Possible functions include: standby, door contact, high-pressure or low-pressure switch.

Depending on the hardware, up to eight 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.

All parameters can also be accessed via the RS485 interface. If an internal clock is provided in the hardware, the corresponding functions, e.g. defrosting or night-time increase/decrease of setpoint, can be set and started via parameters.

CONTROL KEYS



Key T1: UP
By pressing this key, the parameter or parameter value is increased. A further function of the key can be set with parameter b 1.

Key T2: DOWN
By pressing this key, the parameter or parameter value is decreased. A further function of the key can be set with parameter b2.

Key T3: function key
The function of the key can be set with parameter b3.

Key T4: SET
While this key is pressed, the setpoint is indicated. The function of the key can be set with parameter b4 (unchangeable in this case)..

Key T5: Standby
The function of the key can be set with parameter b5. It is preset as standby key. Thus the unit can be switched on or off (no mains disconnection).

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.

If you press the STANDBY button during operation (for at least 3 seconds), the cooling controller is switched off and the message AUS will be displayed. To switch on the controller again, press the STANDBY button again.
In addition to setting the temperature value, the buttons UP and DOWN perform other functions, too. Pressing the UP for 3 seconds will trigger a non-standard defrosting operation of the refrigerating plant. In the case of an alarm (with buzzer triggered), the DOWN button can be used for acknowledging the buzzer sound.

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 PA and Adr. 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
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Adr NETWORK ADDRESS

The code word Adr allows you to set a network address. This is mandatory for the commissioning of networked systems.

PA ENTERING A PASSWORD

By selecting code word PA, you can enter a password required for parameterisation. Once the password has been entered - 19, the name of the first group of parameters is displayed A-- (alarms). Now, using the buttons UP and DOWN you can select any of the parameter groups quickly.

A-- ALARMS

Once you have selected a parameter group, it will normally be sufficient if you press the button SET (--- will be displayed) and then release the button again. Now, the first parameter of the group will be displayed (parameter A0 in parameter group A--, for example).

Using the buttons UP and DOWN you can scroll the parameter group and change certain parameter values using the default value setting method. Press buttons UP and DOWN at the same time to quit any parameter group and return to the list of parameter groups. To quit the list of parameter groups and return to the standard level, press buttons UP and DOWN at the same time.

In some cases, certain parameter groups may be protected by a password. In this case, you will have to enter a specific password for the parameter group like in the case of activation of the parameterisation level.

		A--	**Alarms**
	*	b--	**Buttons and switching inputs**
		c--	**Control circuits 1**
		d--	**Defrosting control circuits 1**
		F--	**Fan control circuits 1**
		H--	**Temperature sensors**
	*	J--	**Pre-defined sets of parameters**
	*	L--	**Networking and display**
	*	U--	**Relay contacts and lamps**
	*	y--	**Control circuit 2**
	*		These levels by default are protected by a password.

A-- Alarms

Parameter	Description of function	Setting range	Default value	
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	+0.1...+99.0°C (0.0: inactive)	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	Upper absolute alarm limit	A7 ... 999 °C	150	
A7	Lower absolute alarm limit	-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 acknowledgment 3: with buzzer, with acknowledgment	1	
A15	Function buzzer and/or display in the case of alarm (temperature 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 acknowledgment	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	Default value	
b1	Function of key T1	0: without function 1: controller on/standby 2: defrosting request 3: Acknowledge alarm 4: Relay function light 1, not active in standby 5: Relay function light 1, independent of standby 6: Relay function light 2, not active in standby 7: Relay function light 2, independent of standby 8: Relay function window heating, not active in standby 9: Relay function window heating, independent of standby 10: Relay function blade scraper, not active in standby 11: Relay function blade scraper, independent of standby 12: Relay function door frame heating, not active in standby 13: Relay function door frame heating, independent of standby 14: Relay function F, not active in standby 15: Relay function F, independent of Standby 16: Set1 / Set2 - changeover 17: Day / Night - changeover 18: “Superfrost” on/off 19: Evaporator fan permanently on 20: Control circuit 1 on/off 21: Control circuit 2 on/off 22: Set for setpoint Y1 23: display MIN 24: display MAX 25: display sensor F1 26: display sensor F2 27: display sensor F3 28: display sensor F4 29: display sensor F5 30: reset both MIN/MAX 31: reset MIN 32: reset MAX 33: reserved (set time) 34: reserved (set date) 35: reserved (like 22 + switch display) 36: like 16 + remember state 37: like 5 + remember state 38: like 7 + remember state	2	
b2	Function of key T2	see b1	3	
b3	Function of key T3	see b1	0	
b4	Function of key T4	see b1	0	
b5	Function of key T5	see b1	1	
b6	Function of key T6	see b1	0	
b7	Function of key T7	see b1	0	
b8	Function of key T8	see b1	0	

Parameter	Description of function	Setting range	Default value	
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 (blade scraper), not active in standby 12: relay function D (blade scraper), regardless of standby 13: relay function E (door frame heating), not active in standby 14: relay function E (door frame heating), 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: like 17 + remember state 26: like 5 + remember state 27: like 7 + remember state 28: like 4 + additionally compressor off (extended door contact)	0	
b12	Switching input E1 inverse / not inverse	0: normal 1: inverse	0	
b13	Function E2	see b11	0	
b14	E2 inverse / not inverse	see b12	0	
b15	Function E3	see b11	0	
b16	E3 inverse / not inverse	see b12	0	
b17	Function E4	see b11	0	
b18	E4 inverse / not inverse	see b12	0	
b41	Minimum duration function standby	0 ... 60 sec.	10	
b99	Password parameter level b--	-99 ... 999	-19	

c-- Control circuit 1

Parameter	Description of function	Setting range	Default value	
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	

Parameter	Description of function	Setting range	Default value	
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	
c13	Additional condition: compressor off if evaporator sensor < c13	-99 ... 50.0 °C	-99	
c14	Hysteresis for c13	0.1 ... 15.0 K	2.0	
c15	On-time in emergency operation	0 ... 100%	50	
c16	Cycle time in emergency operation	5 ... 60 min.	10	
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	c40 ... c39	50%	
c32	Night setpoint, humidity (relative to c31)	-20 ... +20 %	0	
c33	Humidity setpoint for Set2	c40 ... c39	50%	
c34	Humidity mode	0: off 1: evaporator fan on (continuous operation) 2: Moisturize 3: Dehumidification with counter-heating	1	
c35	Hysteresis humidity	0.1% ... 15.0 %	5,0%	
c36	Hysteresis mode humidity	0: symmetrical 1: one-sided	1	
c37	Setpoint offset counter-heating for dehumidification (relative to cold store setpoint c1/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 c31/c33	c40 ... 100%	100%	
c40	Lower setpoint limit c31/c33	0,0% ... c37	0,0%	
c99	Password of parameter level c--	-99 ... 999	0	

d-- Defrosting control circuit 1

Parameter	Description of function	Setting range	Default value	
d0	Assignment of evaporation sensors (defrosting 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	2	
d1	Defrosting interval	1...99 hrs. (0: no automatic defrosting)	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 d--	-99 ... 999	0	

F-- Fan control circuit 1

Parameter	Description of function	Setting range	Default value	
F8	Fan speed control mode, Set1	0 ... 100%	80.0	
F9	Fan speed defrosting, Set1	0 ... 100%	80.0	
F 10	Fan speed control mode, Set2	0 ... 100%	100	
F 11	Fan speed defrosting, Set2	0 ... 100%	100	
F 12	Start-up time	0 ... 60 sec.	5	
F 13	Minimum speed (output variable if result=0)	0 ... 100%	10.0	
F 15	Evaporator fan Fan mode normal operation Remark: Control setpoint if F 15>4 is c 1 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	
F 16	Evaporator fan Fan mode defrosting	0: off 1: on	0	
F 17	Evaporator fan, delay after compressor start	0 ... 600 sec.	0	
F 18	Evaporator fan, delay after defrosting	0 ... 600 sec.	120	
F 19	Evaporator fan, drip interruption time if F 15=2	0 ... 600 sec.	180	
F20	Evaporator fan, control offset if F 15=4 or 5	-15.0 ... +15.0°C	0.0	
F21	Evaporator fan, control hysteresis if F 15=4 or 5	0.1 ... 15.0°C	2.0	
F22	Fan speed control mode, Set1, NIGHT	0 ... 100%	80.0	
F23	Fan speed control mode, Set2, NIGHT	0 ... 100%	100	
F50	Assignment of condenser sensors 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	
F51	Condenser fan setpoint (only if F65 = 3 or 4 and F70=0)	-55...+150°C	60.0	
F54	Condenser fan switching hysteresis (only if F65 = 3)	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 F70 4: like 3, (setpoint F70), as P controller	2	
F66	Proportional range P-controller if F65=4	0.1 ... 30.0°C	10.0	
F67	Minimum speed (output PWM if result =0)	0 ... 100 %	10.0	
F68	Condenser fan start-up time	0 ... 60 sec.	10	
F69	Maximum speed	0 ... 100 %	100 %	
F70	Setpoint selection	0: according to F51 1: current cold room setpoint (c 1, c2, c3)		
F71	Setpoint offset	-20,0 ... 20,0 K	0,0 K	
F99	Password of parameter level F--	-99 ... 999	0	

H-- Temperature sensors

Parameter	Description of function	Setting range	Default value	
H 1	Mains frequency	0: 50Hz 1: 60Hz	0	
H 11	Act. value sensor F1	Measured value, not adjustable		
H 12	Calibration sensor F1 (actual value correction)	-20...+20.0°C	0,0	
H 13	Weighting factor sensor F1	0.50...1.50	1,00	
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 0/4mA 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	0	
H35	Software filter sensor F3	1 .. 32	8	
H36	Display at 0/4mA 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 0/4mA 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	

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

Parameter	Description of function	Setting range	Default value	
d1	Parameter set	0 ... 5	0	
d2	Parameter reset	0 ... 31 (see parameter description)	0	
d98	Password for entering the level selection (when PA is displayed)	-99 ... 999	-19	
d99	Password of parameter level d--	-99 ... 999	-19	

If required, various preset parameter sets can be realized by means of d1.
The parameter d98 is only visible and adjustable via the ST-Bus.
Attention: A change of the parameter set changes all parameter settings!

L-- Networking and display (password protected)

Parameter	Description of function	Setting range	Default value	
L0	Own address ST-bus (identical to setting Adr)	0: deactivated 1 ... 250	1	
L2	Temperature scale	0: °C 1: °F	0	
L3	Display mode	0: 3 digits, integers 1: 3 digits, rounded to 0.5 2: 3 digits, 0.1 3: 4 digits, integers 4: 4 digits, rounded to 0.5 5: 4 digits, 0.1	2	
L4	Display value	See actual values table	0	
L6	Software version			
L7	Display in standby mode	0: OFF 1: AUS 2: right decimal point 3: right decimal point flashing	1	
L10	Bus protocol	0: ST-Bus 1: Modbus, rtu (8 data bits) 2: Modbus, ascii (7 data bits)	0	
L11	Modbus Baudrate	0: 115200 1: 57600 2: 38400 3: 19200 4: 9600 5: 4800	4	
L12	Modbus Parity	0: none 1: odd 2: even	2	
L40	ST bus release mask for functions	0 .. 255	249	
L41	ST bus release mask for functions	0 .. 255	255	
L42	Release for a deletion of the counter/runtimes	0: no release 1: Deletion is approved for 10 min (see A17, N98, T98, d2)	0	
L99	Password of parameter level L--	-99 ... 999	-19	

U-- Relay contacts and lamps (password-protected)

Parameter	Description of function	Setting range	Default value	
U 1	Function relay K1	0: no function (off) 1: compressor 2: defrosting circuit 1 3: evaporator fan 4: condenser fan 5: alarm 6: control contact circuit 2 7: defrosting circuit 2 8: relay function A (light 1) 9: relay function B (light 2) 10: relay function C (window heating) 11: relay function D (door frame heating) 12: relay function E (blade scraper) 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 mode active 23: on if Superfrost active 24: Counter-heating during dehumidification 25: Humidify	1	
U2	Function relay K2	see U 1	2	
U3	Function relay K3	see U 1	3	
U4	Function relay K4	see U 1	5	
U5	Function relay K5	see U 1	15	
U6	Function relay K6	see U 1	0	
U7	Function relay K7	see U 1	0	
U8	Function relay K8	see U 1	0	
U 11	Function LED1	0: no function (off) 1: compressor/magnetic valve 2: defrosting control circuit 1 3: evaporator fan 4: condenser fan 5: alarm 6: control circuit 2 7: defrosting circuit 2 8: Light 1 9: Light 2 10: window heating 11: blade scraper 12: door frame heating 13: relay function F 14: drip tray heating 15: ”super-frost“ 16: ”humidity” 17: control circuit 1 active 18: control circuit 2 active 19: set 1 active 20: set 2 active 21: day mode active 22: night mode active 23: display “MIN” 24: display “MAX”	3	

Parameter	Description of function	Setting range	Default value	
U11	Function LED1	25: Display circuit 1 active 26: Display circuit 2 active 27: Controller active 28: Counter-heating during dehumidification 29: Humidify		
U12	Function LED2	see U11	2	
U13	Function LED3	see U11	1	
U14	Function LED4	see U11	0	
U15	Function LED5	see U11	0	
U16	Function LED6	see U11	0	
U20	Function LED week days	0: no function (off) 1: display weekday 2: see U21...U27	0	
U21	Function LED7 (Mo)	see U11	0	
U22	Function LED8 (Tu)	see U11	0	
U23	Function LED9 (We)	see U11	0	
U24	Function LED10 (Th)	see U11	0	
U25	Function LED11 (Fr)	see U11	0	
U26	Function LED12 (Sa)	see U11	0	
U27	Function LED13 (Su)	see U11	0	
U31	Function voltage output	0: disabled (always 0V) 1: fan 1 (evaporator fan) 2: fan 2 (condenser fan)	0	
U99	Password of parameter level U--	-99 ... 999	-19	

Y-- Control circuit 2 (password protected)

Parameter	Description of function	Setting range	Default value	
Y0	Assignment of sensors to control circuit 2 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	
Y1	2nd control circuit: setpoint	Y8...Y7	10,0	
Y2	2nd control circuit: absolute setpoint or DeltaW	0: absolute 1: DeltaW	1	
Y4	2nd control circuit: switching mode	0: heating 1: refrigerating	1	
Y5	2nd control circuit: hysteresis	0.1...99.0°C	2,0	
Y6	2nd control circuit: hysteresis mode	0: symmetrical 1: one-sided	1	
Y7	Upper setpoint limit	Y8 ... +999°C	50,0	
Y8	Lower setpoint limit	-99°C ... Y7	-50	
Y9	Function in the case of sensor fault	0: contact off 1: contact on	1	
Y10	Defrosting interval control circuit 2	0: no defrosting 1...99 hrs.	0	
Y11	Defrosting time limitation thermostat 2	1...99 min.	30	
Y99	Password of parameter level Y--	-99 ... 999	-19	

N level (counters)

This level contains the parameters for counters. Parameters only accessible via the ST-Bus.

Parameter	Description of function	Setting range		
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	Deleting the relay switching cycles	0: - 1: reset	0	
N99	Password of parameter level N	-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)

This level contains the parameters for operating times. Parameters are only accessible via the ST-Bus.

Parameter	Description of function	Setting range		
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 K1 (lower 16 bit)	—		
T15	On-time relay K1 (upper 16 bit)	—		
T16	On-time relay K2 (lower 16 bit)	—		
T17	On-time relay K2 (upper 16 bit)	—		
T18	On-time relay K3 (lower 16 bit)	—		
T19	On-time relay K3 (upper 16 bit)	—		
T20	On-time relay K4 (lower 16 bit)	—		
T21	On-time relay K4 (upper 16 bit)	—		
T22	On-time relay K5 (lower 16 bit)	—		
T23	On-time relay K5 (upper 16 bit)	—		
T24	On-time relay K6 (lower 16 bit)	—		
T25	On-time relay K6 (upper 16 bit)	—		
T26	On-time relay K7 (lower 16 bit)	—		
T27	On-time relay K7 (upper 16 bit)	—		
T28	On-time relay K8 (lower 16 bit)	—		
T29	On-time relay K8 (upper 16 bit)	—		

Para-meter	Description of function	Setting range		
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 and T11). It depends on the setting of parameter L42. The return value is set back to “0” automatically.

EC level (Reserved for internal use)

The level is accessible only via the ST bus.

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.

STATUS DISPLAY AND ERROR MESSAGES

Message	Cause	Remedy
H 1	Over-temperature, temperature above alarm limit of parameter A1/A31	
Lo	Under-temperature, temperature below alarm limit of parameter A2/A33	
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
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
rtc	Error of internal clock	Set clock again. If error occurs again, the controller must be repaired
AUS / OFF flashing with temperature or ---	Control circuit 1 not active	1: Switch controller off and on again via standby. 2: Parameterize c0 > 0

The EP0 and EP1 errors disable the controller. The controller is not enabled until the error has been eliminated.
The error EP0 (and EP2) can only be removed by repair.
The errors are displayed alternately with the currently measured temperature.

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 A 10, 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 suppression 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 acknowledgment. The corresponding time is indicated in A 16. The error mes-sage and the temperature will be dis-played 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 acknowledgment
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 mes-sages, 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 parameterised, 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 1 ... b8 Function buttons 1 ... 8
Certain functions can be assigned to the buttons. The buttons are arranged according to the front foil, the layout may differ from case to case. For the function of the buttons, refer to the operating manual of the relevant device. The "SET" cannot be assigned another function!

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 make contact (normal) or break contact (inverse).

b99 Password for parameter 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 set-tings 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 prevent-ed 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 operation
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.

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.

c21 "super-frost": lime limit, "shock-frost", max. refrigerating pow-er
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 c21, 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 c34 = 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.

c31 Setpoint humidity (Set1)
c32 Setpoint offset humidity at night
c33 Setpoint humidity (Set2)
For c34>=2 and assigned sensor, the value set here is used for control. The value in parameter c32 is added to c31 when night mode is active.

c34 Humidity control mode
In the setting c34=1 only the evaporator fan is set to continuous operation for humidification. As a result, the humidity that forms on the evaporator is transported back into the cold room. The function is switched manually via the Humidity function (see b parameter). In the setting c34=2, a relay is switched for humidification, which distributes moisture in the form of e.g. mist in the cold room. If no sensor is specified, this relay can be switched manually via the Humidity function (see b parameter). In the setting c34=3 the compressor is switched on for dehumidification. So that the cold room does not get too cold, a counter heating is switched according to c37 and c38. If no sensor is specified, this function is deactivated.

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 corresponding 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 Switch-on point counter-heating
c38 Switch-off point counter-heating
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. To do this, the value in c37 is added to the current cold store setpoint and if the value falls below this calculated value, the counter heating is switched on (see U parameters). At the switch-off point c38 (relative, above c37), the heating is switched off.

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

c99 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.

d 1 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 d 1 has elapsed. If d 1=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 max 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.

d 10 Drip time
Directly after the end of defrosting, the dripping time or drainage time follows in order to let the evaporator drip off. During this time, the compressor, defrost and evaporator fan outputs are switched off.

d 11 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 can 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 defrosting and active Set1

F 10 Fan speed in control mode, Set2
Fan speed in control mode and active Set2.

F 11 Fan speed during defrosting, Set2
Fan speed during defrosting and active Set1

F 12 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.

F 13 Minimum speed
Here, you can set the lowest voltage value at which a connected fan will still be running.

F 15 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 per-forming a defrosting operation, the fan will be controlled via parameter F 16.
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 or the difference between the evaporator and the cold store sensor is to be used for controlling the fan. The control setpoint and hysteresis are defined via parameters F20 and F2 1.

F 16 Fan mode defrosting
This parameter defines 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 F15=4 or 5)
The control hysteresis is always set above the theoretical switching point.

F22 Fan speed in control mode, Set1, NIGHT
Fan speed at night in normal control mode and active Set1

F23 Fan speed in control mode, Set2, NIGHT
Fan speed at night in normal control mode and active Set1

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.

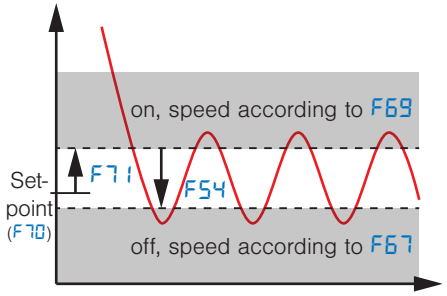
F51 Condenser fan: setpoint
Only effective if F65=3 or 4 and F70=0. If the value defined here is exceeded, the condenser fan will be switched on.

F54 Condenser fan: switching hysteresis
Only effective if F65=3. The hysteresis is set on one side above the setpoint of parameter F51.

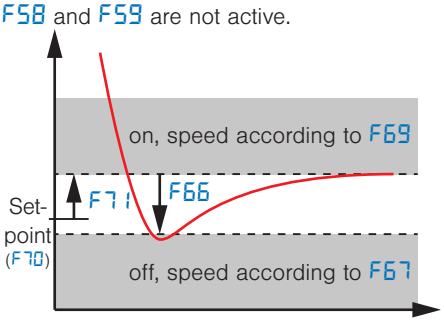
F58 Condenser fan: Delay after compressor start
On-delay of condenser fan after activation of the compressor.

F59 Condenser fan: Delay after compressor stop
Off-delay of condenser fan after shut-down of the compressor. This delay is not active if F65 = 3 or .4

F65 Function of condenser fan
0: no function, i.e. condenser fan is off
1: condenser fan on at all times, speed according to F69
2: condenser fan on (speed F69) if compressor is on, otherwise speed after F67, F58 and F59 are active
3: Condenser fan thermostatically controlled by sensor according to F50, setpoint according to F70 and F71, hysteresis according to F54.
F58 and F59 are not active.



4: Condenser fan as P-controller, sensor according to F50, setpoint according to F70 and F71, proportional band according to parameter F66.
F58 and F59 are not active.



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

F67 Condenser fan: Minimum speed
Here, you can set the lowest voltage value at which a connected fan will still be running.
When operating as a P controller, it makes sense to specify a minimum speed (F67>0) if F69 > 0. Otherwise unnecessary "switching sequences" will occur.

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.
This start boost is always 100% regardless of F69.

F69 Maximum speed
The maximum speed can be set here.

F70 Selection of the active setpoint
0: fixed setpoint, according to parameter F51
1: Control setpoint of the cooling circuit (c1, c2, c3)

F71 Setpoint offset
Offset for the selected setpoint according to F70. The offset is added to the setpoint.

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

H-- Temperature sensors

H1 Mains frequency
In this parameter, you must define the mains frequency.

H11, H21, H31, H41 Actual value sensor 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 unfavourable 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 unfavourable 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 mea-

sured 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--
Password for level H--.

d-- Predefined parameter sets
(password protected)

d1 Internal: active data set
This parameter is intended to set certain predefined data sets. The data sets are preset by Störk-Tronic. If a new data set is imported, all previously set parameters are overwritten. They can be changed freely afterwards. The data set can also be changed via the ST bus, provided that it has been enabled via L42.

d2 Parameter Reset
With this parameter the parameters of the current parameter set (see d1) 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 d1).
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!

d98 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.

d99 Password of parameter level d--
The access to the parameter group d-- is blocked with the password -19 in the standard version.

L-- Networking and display
(password protected)

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.

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 provides 3 digits only, the left digit will be lost, i.e. the sign in the case of negative numbers. 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 this parameter:

L4	Description
0	Last temperature before defrosting
1	Cold store temperature
2	Evaporator temperature
3	Cur. control value for evaporator fan
4	Current setpoint cold store, circuit 1
5	Condenser temperature (pressure?)
6	P-control result for condenser fan
7	Cur. control value for condenser fan
8	current setpoint of condenser
9	Cold store temperature via test bottle function
10	MIN value of cold store temperature since last reset
11	MAX value of cold store temperature since last reset
12	Act. value control circuit 2
13	Current setpoint control circuit 2

L6 Software version
Here, the software version of the controller is displayed.

L7 Display in standby mode
In this parameter, you can define what is to be displayed in standby.

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

	Bit	Val.	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: defrosting 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: defrosting request
	9	+2	Function A: light 1
	10	+4	Function B: light 2
	11	+8	Function C: window heating
	12	+16	Function D: door frame heating
	13	+32	Function E: blade scraper
	14	+64	Function F: reserved
	15	+128	reserved

To determine the value to be parameterised, all valences must be added together.

L42 Release to delete counters/ Run times
Here the deletion of the running times, the relay counters and the min/max memory is enabled for 10 min. Only within the 10 min. the parameters T98, N98 and A17 can actively delete the corresponding timers, counters or memory locations. After the 10 min. have elapsed, the release is removed. The deletion of the min/max memory by a function assignment of the keys is not influenced by this.

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

U-- Relay contacts and lamps
(password protected)

U 1 ... U8 Function relay K1...K8
Assignment of internal output signals to the corresponding output relays.

U 11 ... U 16 Function LED 1...6
Assignment of status LEDs (signal lamps) to the internal signals.

U20 Function LED weekdays
If 1 is entered here, the 7 LEDs are assigned to the weekdays. In this case, parameters U2 1..U27 will not be active. If 2 is entered, the LEDs will be assigned according to parameters U2 1...U27.

U2 1 ... U27 Function LED 7..13 (Mo..Su)
Assignment of weekday LEDs to certain internal signals (signal lamps).

U31 Function Voltage output
The output voltage is calculated linearly according to the speed of the selected fan.

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

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.

Y 1 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/relative setpoint
If Y2=0, the setpoint Y 1 is an absolute value, if Y2=1 the setpoint of control circuit 2 is the sum of Y 1 and the actual setpoint c 1/c2/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 hystere-sis. 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 lim.
Y8 Control circuit 2: lower setpoint limit
With these parameters, you can limit the setting range of setpoint Y 1 to avoid that the end user does not enter non-permissible values.

Y9 Control circuit 2: Function in the case of sensor fault
Here it is defined whether the controlled output contact opens or closes in case of an error of the assigned sensor.

Y 10 Control circuit 2: Defrost 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.

Y 11 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--.

MODBUS RTU

Remote Terminal Unit

The ST710 is the slave (server).
The slave address is set as parameter Lo and can only be changed using the keys.

Physics
Baud rate 4800, 9600, 19200, 57600, 115200 bps
Format 11 Bit
(1 Start bit, 8 data bits with LSB first, 1 Parity bit, 1 stop bit)
Parity even

List of implemented function codes that are supported
0x03 Read Holding Register
0x04 Read Input Register
0x06 Write Single Register
0x11 Report Slave ID

Examples

Read Holding Register

Request: Read Register 2 (Read actual value sensor F1, e.g. +15.3°C)

Slave address	Function code	Start address (0x0000...0xFFFF)		Number of registers 1...125 (0x01...0x7D)		CRC (CRC 16, MSB first)	
0x01	0x03	0x03	0xE8	0x00	0x01		

Answer: Read Register 2

Slave address	Function code	Byte Count	Register value (MSB first)		CRC (CRC 16, MSB first)	
0x01	0x03	0x02	0x00	0x99		

F: Read Register 2

Slave address	Function code	Exception code	CRC (CRC 16, MSB first)	
0x01	0x83	0x01...0x04		

Exception Code	0x01	Invalid function
	0x02	Invalid address
	0x03	Invalid value
	0x04	Slave device error

Write Single Register

Request: Writing a single register for a new setpoint1 = +21.0°C)

Slave address	Function code	Register Address (0x0000...0xFFFF)		Register value (MSB first)		CRC (CRC 16, MSB first)	
0x01	0x06	0x04	0xAF	0x00	0xD2		

Response: Write Single Register 4

Slave address	Function code	Register value (MSB first)		Register value (Echo of Request)		CRC (CRC 16, MSB first)	
0x01	0x06	0x04	0xAF	0x00	0xD2		

Error: Write Single Register 4

Slave address	Function code	Exception code	CRC (CRC 16, MSB first)	
0x01	0x86	0x01...0x04		

Exception Code	0x01	Invalid function
	0x02	Invalid address
	0x03	Invalid value
	0x04	Slave device error

Report Slave ID

Request: Slave ID

Slave address	Function code	CRC (CRC 16, MSB first)	
0x01	0x11		

Response: Slave ID

Slave address	Function code	Byte Count	Slave ID	Run indicator status	Additional data	CRC (CRC 16, MSB first)	
0x01	0x11	0x08	0x01	0x00 (Off) 0xFF (On)	6 Bytes MSB first		

Additional data	Byte 1,	0x34
	Byte 2	0x00 or 0xFF
	Byte 3	0x24 Software number (high Byte)
	Byte 4	0x2C Software number (low Byte)
	Byte 5	Software version (high Byte)
	Byte 6	Software version (low Byte)

Error: Slave ID

Slave address	Function code	Exception Code	CRC (CRC 16, MSB first)	
0x01	0x91	0x01...0x04		

Exception Code	0x01	Invalid function
	0x02	Invalid address
	0x03	Invalid value
	0x04	Slave device error

Register table

The base address for the registers is 1000 (= 0x03E8).
Up to register number 19 the values have an accuracy of one decimal place, i.e. you have to divide the transmitted value by 10 to get the actual value.

Reg. No.	Register Address	R/W	Name	Function	Range	Unit
0	0x03E7	R	–1	Display	-50.0...150.0 °C -1000.0 = error	signed
1	0x03E8	R	H11	Cold room temperature	-50.0...150.0 °C -1000.0 = error	signed
2	0x03E9	R	H21	Evaporator temperature	-50.0...150.0 °C -1000.0 = error	signed
3	0x03EA	R	–4	Control value evaporator fan	0.0...100.0 %	signed
4	0x03EB	R/W	–5	Setpoint cold room	-50.0...150.0 °C -1000.0 = error	signed
5	0x03EC	R	H–	Condenser temperature	-50.0...150.0 °C -1000.0 = error	signed
6	0x03ED	R	–7	P-control result for condenser fan	-100.0...100.0 %	signed
7	0x03EE	R	–8	Control value condenser fan	0.0...100.0 %	signed
8	0x03EF	R/W	-12	Setpoint condenser fan	-50.0...150.0 °C -1000.0 = error	signed
9	0x03F0	R	–9	Cold store temperature via test bottle function	-50.0...150.0 °C -1000.0 = error	signed
10	0x03F1	R	A19	Min temperature	-50.0...150.0 °C -1000.0 = error	signed
11	0x03F2	R	A18	Max temperature	-50.0...150.0 °C -1000.0 = error	signed
12	0x03F3	R	H–	Temperature circuit 2	-50.0...150.0 °C -1000.0 = error	signed

Reg. No.	Register Address	R/W	Name	Function	Range	Unit
13	0x03F4	R/W	-13	Setpoint circuit 2	-50.0...150.0 °C -1000.0 = error	signed
14	0x03F5	R	t 0	Time	-50.0...150.0 °C -1000.0 = error	signed
15	0x03F6	R	H11	Sensor F1 direct	-50.0...150.0 °C -1000.0 = error	signed
16	0x03F7	R	H21	Sensor F2 direct	-50.0...150.0 °C -1000.0 = error	signed
17	0x03F8	R	H31	Sensor F3 direct	-50.0...150.0 °C -1000.0 = error	signed
18	0x03F9	R	H41	Sensor F4 direct	-50.0...150.0 °C -1000.0 = error	signed
19	0x03FA	R	H51	Sensor F5 direct	-50.0...150.0 °C -1000.0 = error	signed
20	0x03FB	R	n 0	Switching cycles relay K1 *1	0 ... 999	unsigned
21	0x03FC	R	n 1	Switching cycles relay K1 *1000	0 ... 999 (*1000)	unsigned
22	0x03FD	R	n 2	Switching cycles relay K2 *1	0 ... 999	unsigned
23	0x03FE	R	n 3	Switching cycles relay K2 *1000	0 ... 999 (*1000)	unsigned
24	0x03FF	R	n 4	Switching cycles relay K3 *1	0 ... 999	unsigned
25	0x0400	R	n 5	Switching cycles relay K3 *1000	0 ... 999 (*1000)	unsigned
26	0x0401	R	n 6	Switching cycles relay K4 *1	0 ... 999	unsigned
27	0x0402	R	n 7	Switching cycles relay K4 *1000	0 ... 999 (*1000)	unsigned
28	0x0403	R	n 8	Switching cycles relay K5 *1	0 ... 999	unsigned
29	0x0404	R	n 9	Switching cycles relay K5 *1000	0 ... 999 (*1000)	unsigned
30	0x0405	R	n10	Switching cycles relay K6 *1	0 ... 999	unsigned
31	0x0406	R	n11	Switching cycles relay K6 *1000	0 ... 999 (*1000)	unsigned
32	0x0407	R	n12	Switching cycles relay K7 *1	0 ... 999	unsigned
33	0x0408	R	n13	Switching cycles relay K7 *1000	0 ... 999 (*1000)	unsigned
34	0x0409	R	n14	Switching cycles relay K8 *1	0 ... 999	unsigned
35	0x040A	R	n15	Switching cycles relay K8 *1000	0 ... 999 (*1000)	unsigned
36	0x040B	R	t10	Operating hours total *1	0 ... 999 h	unsigned
37	0x040C	R	t11	Operating hours total *1000	0 ... 999 (*1000 h)	unsigned
38	0x040E	R	t12	Operating hours *1	0 ... 999 h	unsigned
39	0x040F	R	t13	Operating hours *1000	0 ... 999 (*1000 h)	unsigned
40	0x0410	R	t14	On-time relay K1 *1	0 ... 999 h	unsigned
41	0x0411	R	t15	On-time relay K1 *1000	0 ... 999 (*1000 h)	unsigned
42	0x0412	R	t16	On-time relay K2 *1	0 ... 999 h	unsigned
43	0x0413	R	t17	On-time relay K2 *1000	0 ... 999 (*1000 h)	unsigned
44	0x0414	R	t18	On-time relay K3 *1	0 ... 999 h	unsigned
45	0x0415	R	t19	On-time relay K3 *1000	0 ... 999 (*1000 h)	unsigned
46	0x0416	R	t20	On-time relay K4 *1	0 ... 999 h	unsigned
47	0x0417	R	t21	On-time relay K4 *1000	0 ... 999 (*1000 h)	unsigned
48	0x0418	R	t22	On-time relay K5 *1	0 ... 999 h	unsigned
49	0x0419	R	t23	On-time relay K5 *1000	0 ... 999 (*1000 h)	unsigned
50	0x041A	R	t24	On-time relay K6 *1	0 ... 999 h	unsigned
51	0x041B	R	t25	On-time relay K6 *1000	0 ... 999 (*1000 h)	unsigned
52	0x041C	R	t26	On-time relay K7 *1	0 ... 999 h	unsigned
53	0x041D	R	t27	On-time relay K7 *1000	0 ... 999 (*1000 h)	unsigned
54	0x041E	R	t28	On-time relay K8 *1	0 ... 999 h	unsigned
55	0x041F	R	t29	On-time relay K8 *1000	0 ... 999 (*1000 h)	unsigned

Status Register table

The base address of the status registers is 1100 (= 0x044C) .

Reg. No.	Register Address	R/W	Name	Function	Range	Unit
0	0x044B	R/W	-S0	Status 0 (Bit 0..15)	0x0000...0xFFFF	unsigned
1	0x044C	R	-S1	Status 1 (Bit 16..31)	0x0000...0xFFFF	unsigned
2	0x044E	R	-S2	Status 2 (Bit 32..47)	0x0000...0xFFFF	unsigned
3	0x044F	R	-S3	Status 3 (Bit 48..63)	0x0000...0xFFFF	unsigned
4	0x0450	R	-E0	Error 0 (Bit 0..15)	0x0000...0xFFFF	Unsigned
5	0x0451	R	-E1	Error 1 (Bit 16..31)	0x0000...0xFFFF	unsigned
6	0x0452	R	-E0	Error 0 (Bit 32..47)	0x0000...0xFFFF	Unsigned
7	0x0453	R	-E1	Error 1 (Bit 48..63)	0x0000...0xFFFF	unsigned
8	0x0454	R	-I0	Intern 0 (Bit 0..15)	0x0000...0xFFFF	unsigned
9	0x0455	R	-I1	Intern 1 (Bit 16..31)	0x0000...0xFFFF	unsigned
10	0x0456	R	-I2	Intern 2 (Bit 32..47)	0x0000...0xFFFF	unsigned
11	0x0457	R	-I3	Intern 3 (Bit 48..63)	0x0000...0xFFFF	unsigned

Details Status 0

Bit	Status 0	Value=0	Value=1	R/W
15	General error	inactive	active	R
14	Buzzer	off	on	R
13	Error rtc	no	yes	R
12	Test mode	inactive	active	R
11	Error EP2	inactive	active	R
10	Error EP1	inactive	active	R
9	Error EP0	inactive	active	R
8				
7				
6				
5				
4	Acknowledge buzzer			R/W
3	Defrost	inactive	active	R/W
2	Control circuit 2 active	off	on	R/W
1	Control circuit 1 active	off	on	R/W
0	Controller ON	off	on	R/W

Writing to bits that are READ ONLY is ignored; bits that are not used are always read with zero.

Details Status 1

Bit	Status 1	Value=0	Value=1	R/W
15				
14				
13				
12				
11				
10				
9				
8				
7				
6				
5				
4				
3	Reset MAX memory			R
2	Reset MIN memory			R
1	Night mode active	no	yes	R
0	Set 2 active	no	yes	R

Writing to bits that are READ ONLY is ignored; bits that are not used are always read with zero.

Details Status 2

Bit	Status 2	Value=0	Value=1	R/W
15				
14	Nom.: drip tray heating	inactive	active	R
13	Nom.: defrost circuit 2	inactive	active	R
12	Nom.: control contact circuit 2	inactive	active	R
11	Nom.: condenser fan	inactive	active	R
10	Nom.: evaporator fan	inactive	active	R
9	Nom.: defrost circuit 1	inactive	active	R
8	Nom.: compressor	inactive	active	R
7				
6	Act.: drip tray heating	inactive	active	R
5	Act.: defrost circuit 2	inactive	active	R
4	Act.: control contact circuit 2	inactive	active	R
3	Act.: condenser fan	inactive	active	R
2	Act.: evaporator fan	inactive	active	R
1	Act.: defrost circuit 1	inactive	active	R
0	Act.: compressor	inactive	active	R

Writing to bits that are READ ONLY is ignored; bits that are not used are always read with zero.

Details Error 0

Bit	Error 0	Value=0	Value=1	R/W
15				
14				
13				
12	Cold room over-temperature		active	R
11	Cold room under-temperature		active	R
10	E7 „low pressure“		active	R
9	E6 „high pressure“		active	R
8	E5 „door“		active	R
7	Error „E4H“		active	R
6	Error „E4L“		active	R
5	Error „E3H“		active	R
4	Error „E3L“		active	R
3	Error „E2H“		active	R
2	Error „E2L“		active	R
1	Error „E1H“		active	R
0	Error „E1L“		active	R

Writing to bits that are READ ONLY is ignored; bits that are not used are always read with zero.

Details Error 1
Details Error 2
Details Error 3
Bits that are not used are always read with zero.

Details Status 3

Bit	Status 3	Value=0	Value=1	R/W
15	Relay K8	inactive	active	R
14	Relay K7	inactive	active	R
13	Relay K6	inactive	active	R
12	Relay K5	inactive	active	R
11	Relay K4	inactive	active	R
10	Relay K3	inactive	active	R
9	Relay K2	inactive	active	R
8	Relay K1	inactive	active	R
7				
6				
5				
4				
3	Input E4	inactive	active	R
2	Input E3	inactive	active	R
1	Input E2	inactive	active	R
0	Input E1	inactive	active	R

Writing to bits that are READ ONLY is ignored; bits that are not used are always read with zero.

Details Intern 0

Bit	Intern 0	Value=0	Value=1	R/W
15				
14	Act.: relay function „F“	off	on	R
13	Act.: relay function „E“	off	on	R
12	Act.: relay function „D“	off	on	R
11	Act.: relay function „C“	off	on	R
10	Act.: relay function „B“ (light 2)	off	on	R
9	Act.: relay function „A“ (light 1)	off	on	R
8	Act.: defrost circuit 2	off	on	R
7	Act.: Day / night switching	Day	Night	R
6	Act.: Set1 / Set2	Set1	Set2	R
5	Act.: „Humidity“	off	on	R
4	Act.: „Superfrost“	off	on	R
3	Act.: defrost circuit 1	off	on	R
2	Act.: control circuit 2	off	on	R
1	Act.: control circuit 1	off	on	R
0	Act.: control	off	on	R

Writing to bits that are READ ONLY is ignored; bits that are not used are always read with zero.

Details Intern 1

Bit	Intern 1	Value=0	Value=1	R/W
15				
14	Nom.: relay function „F“	off	on	R
13	Nom.: relay function „E“	off	on	R
12	Nom.: relay function „D“	off	on	R
11	Nom.: relay function „C“	off	on	R
10	Nom.: Relay function „B“ (light 2)	off	on	R
9	Nom.: Relay function „B“ (light 1)	off	on	R
8	Nom.: request defrosting circuit 2	off	on	R
7	Nom.: Day- / night switching	Day	Night	R
6	Nom.: Set1 / Set2	Set1	Set2	R
5	Nom.: „Humidity“	off	on	R
4	Nom.: „Superfrost“	off	on	R
3	Nom.: Request defrosting circuit 1	off	on	R
2	Nom.: control circuit 2	off	on	R
1	Nom.: control circuit 1	off	on	R
0	Nom.: control	off	on	R

Writing to bits that are READ ONLY is ignored; bits that are not used are always read with zero.

Details Intern 2

Bit	Intern 2	Value=0	Value=1	R/W
15				
14	Relay function „F“ available	no	yes	R
13	Relay function „E“ available	no	yes	R
12	Relay function „D“ available	no	yes	R
11	Relay function „C“ available	no	yes	R
10	Relay function „B“ (light 2) available	no	yes	R
9	Relay function „A“ (light 1) available	no	yes	R
8	Function available: request defrosting circuit 2	no	yes	R
7	Function available: Day- / night switching	no	yes	R
6	Function available: Set1 / Set2 changeover	no	yes	R
5	Function available: „Humidity“ on/off	no	yes	R
4	Function available: „Superfrost“ on/off	no	yes	R
3	Function available: request defrosting circuit 1	no	yes	R
2	Function available: control circuit 2 on/off	no	yes	R
1	Function available: control circuit 1 on/off	no	yes	R
0	Function available: control on/off	no	yes	R

Writing to bits that are READ ONLY is ignored; bits that are not used are always read with zero.

Details Intern 3

Bits that are not used are always read with zero.

Setpoint register table

The base address for the setpoint registers is 1200 (= 0x04B0).
The values have an accuracy of one decimal place, i.e. you have to divide the transmitted value by 10 to get the actual value.
To transfer a new value, you must multiply the real value by 10 and then transfer it.

Reg. No.	Register address	R/W	Name	Function	Range	Unit
0	0x04AF	R/W	c 1	Setpoint 1 Set 1	-50.0...150.0 °C	signed
1	0x04B0	R/W	c 3	Setpoint 1 Set 1	-50.0...150.0 °C	signed
2	0x04B1	R/W	Y 1	Setpoint 2	-50.0...150.0 °C	signed

Inputs	**E1:**	external potential-free contact, function defined by parameter b11
Measuring inputs	**F1:**	Resistance sensor Pt100-2L
	F2:	Resistance sensor Pt100-2L
	Measuring range: -99°C...+400 °C (with suitable probe)	
	Measuring accuracy of the controller at 25°C: +/-0.5K and +/-0.5% of the measuring range	
	F4:	Linear input 4...20 mA, display range to be adjusted by parameter.
Outputs	**K1:**	Relay, normally-open contact, 8(1.5)A 250V~, function defined by parameter U1
	K2:	Relay, normally-open contact, 8(1.5)A 250V~, function defined by parameter U2
	K3:	Relay, normally-open contact, 8(1.5)A 250V~, function defined by parameter U3
	K4:	Relay, change-over contact, 6(0.5)A 250V~, function defined by parameter U4
	Voltage output 0 ... 10V, internal resistance approx. 100 Ohm, short-circuit proof	
	Additional built-in buzzer, 85dB	
Display	1 4-digit LED display, height 13mm, colour red, temperature display.	
	3 LEDs, diameter 3mm, colour red, for status display	
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!	
Power supply	100 ... 240V AC +/-10% (50/60Hz)	
Connectors	Screw/plug-in terminals	
	Terminal A: 12-pole, grid 5.0mm, for cables up to 2.5 mm²	
	Terminal B: 11-pole, grid 3.5mm, for cable up to 1.5 mm²	
Ambient conditions	Storage temperature:	-20...+70°C
	Operating temperature:	0...+55°C
	Relative humidity:	max. 75% without dew
Weight	ca 140 g, without sensor	
Enclosure	Front IP65, IP00 from back	
Installation data	Unit is to be installed in an instrument panel.	
	Front size:	84 x 42 mm
	Panel cut-out:	67.5 x 31.5 mm
	Installation depth:	ca. 103 mm
	Mounting by fixing strap