Operating unit

Order number: 900240.005

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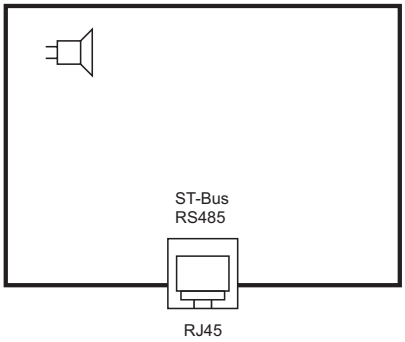
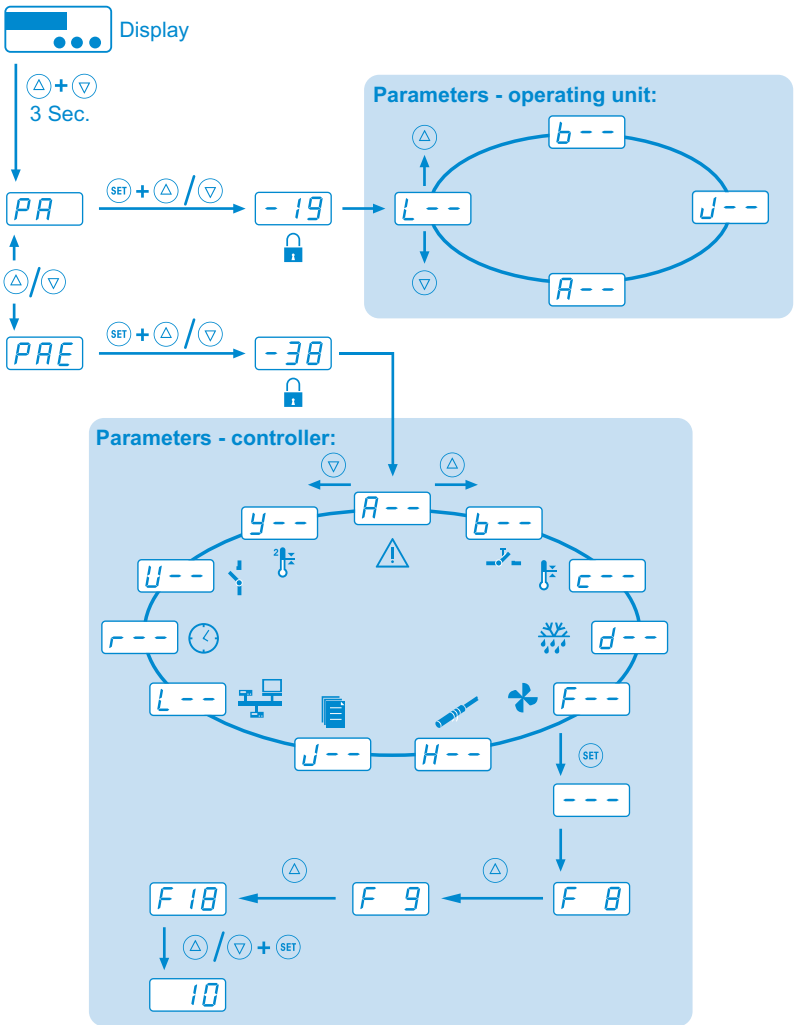
Wiring diagram



Product description

The ST961 control unit is equipped with an RJ45 plug and thus serves as a control unit for a remote ST-BOX. It has eight keys and a and four-digit LED display.
The operating unit is networked with the help of the RJ45 interface.

Front size:	96 x 48 mm
Installation size:	71.5 x 29.5 mm
Tightness:	Front IP63
Connection:	RJ45



Parameter groups

- L - - **Networking and display**
- b - - **Key functions**
- J - - **Pre-defined parameter sets**
- A - - **Display**

Control keys

Key 1: UP
By pressing this key the parameter or parameter value is increased. Another function of the key may be defined with b1.

Key 2: DOWN
By pressing this key the parameter or parameter value is decreased. Another function of the key may be defined with b2.

Key 3: SET
While SET key is pressed, the set-point is indicated.

Key 4: Selection key
The function of this key is defined with b4.

Key 5: Light
The function of this key is defined with b5.

Key 6: TIME
The function of this key is defined with b6.

Key 7: control circuit on/off
The function of this key is defined with b7.

Key 8: StandBy
The function of the standby key is defined with b8. By pressing this key for at least 3 seconds the controller is completely switched off. Pressing the stand-by key again restarts the controller.

The unit 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 dis-play to the re-quired cold store setpoint.

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 the unit are listed.

Parameterisation is possible at any time. The control operation is not interrupted during parameterization, 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 parameterization mode, press buttons UP and DOWN at the same time. After approx. 3 seconds, the code word PA will be displayed. Press UP or DOWN to switch between code words PA and PAE. All other settings / value specifications in parameter setting mode are per-formed using the de-fault value setting method, i.e. pressing buttons SET and UP / DOWN at the same time.

PA ENTERING DISPLAY PASSWORD
By selecting code word PA, you can enter a password required for parameterization. Once the password -19 has been entered, the name of the first group of parameters of the display is displayed. Now, using the buttons UP and DOWN you can select any of the parameter groups quickly

PAE ENTERING ST-BOX PASSWORD
By selecting code word PAE, you can enter a password required for parameterisation. Once the password -38 has been entered, the name of the first group of parameters of the controller is displayed. Now, using the buttons UP and DOWN you can select any of the parameter groups quickly.

Important note:

The same parameters or parameter groups can appear as well under PA (internal, dis-play) as under PAE (external, controller).

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--).

Setting the time and date

The time can be set either directly via the TIME key or in the parameter level of the connected control unit.

A. Adjusting using the TIME button directly on the control unit:

Time:

- - Press key briefly	Time is displayed
- - Press the key together with	Time is adjusted
- Release all keys again.	New time is saved.

Date:

- Double-click on key: Year is displayed	Adjusting with
- Press the key again: Month is displayed	Adjusting with
- Press the key again: the time is displayed	Adjusting with
- Pressing the key again saves all settings.	

Note: If no key is pressed for a certain time during the setting, the display shows the temperature again and no setting is saved.

B. Setting the time via operating keys and parameter menu of the display (4-digit display)

1. Press and hold the UP and DOWN keys on the control unit
2. Change to the parameter menu of the ST box with PAE –> -38
3. Set parameter L42 to 1
4. Switch to parameter level r--
5. Set parameters r2 (time), r3 (date) and r4 (year)

C. Setting the time via operating keys and parameter menu directly on the ST-Box (3-digit display)

1. Press and hold the UP and DOWN keys on the ST box
2. Change to level r-- with PA –> - 19
3. Set the desired parameters:
   - r5: Year
   - r6: Month
   - r7: Day
   - r8: Hour
   - r9: Minute

L-- Networking and display

Parameter	Function	Setting range	Values default	
L0	Own address ST-bus	1...250	80	
L1	ST-Bus address of the connected controller (controller providing the measured value)	1...255	2	
L2	Temperature scale	0: Celsius 1: Fahrenheit	0	
L3	Display mode for actual value	0: integrals 1: rounded to 0.5 2: rounded to 0.1	2	
L4	Parameter address of measured value	0...255	0	
L4b	Parameter address of measured value 2 (bxx = 17)	0...255	2	
L5	Scanning cycle of measured value	1...99.9 sec.	1.0 sec.	
L6	Software-Version			
L7	Display in standby mode	0: OFF 1: AUS 2: right decimal point 3: right decimal point flashing 4: Time (if clock available), otherwise OFF 5...9 with standby key lit: 5: Display dark 6: OFF 7: AUS 8: right decimal point 9: right decimal point flashing 10: Time (if clock available), otherwise OFF	0	
L8	Key lock	0 ... 63 (see parameter description) **Bit mask** (add values): +1 Setpoint “read-only” +2 Setpoint invisible +4 2nd setpoint “read-only” +8 Time “read-only” +16 Level PA “read-only” +32 Level PAE “read-only”	0	
L9	Read/display status	0: Read and display status 1: Status not read, display shows measured value	0	
L13	Setpoint Offset / setpoint 1	0: inactive 1: Setpoint (c1) 2. Setpoint Set2 (c3) 3: Setpoint 2nd control circle (y1) 4: Setpoint Humidity (c31) 5: Setpoint Humidity Set2 (c33) 6: Setpoint Triac (U10)	1	
L15	Active function keys in standby mode	0 ... 63 (see parameter description) **Bitmask** (add values): +1 A (light 1) +2 B (light 2 +4 C (window heating) +8 D (door frame heating) +16 E (blade scraper) +32 Relay function F	5	
L16	Setpoint offset or setpoint 2 (button assignment with b1 ... b10, setting 18...21)	see L13	3	
L18	Behaviour of the LEDs for the standby function, Control circuit 1 and 2	0 ... 7 (see parameter description) **Bit mask** (add values): 1 Controller on/off (standby) 2 Control circuit 1 on/off 4 Control circuit 2 on/off	2	

Parameter	Function	Setting range	Values default	
L30	Display mode for actual value (Display 2, if available)	0: integrals 1: rounded to 0.5 2: rounded to 0.1	2	
L31	Parameter address of measured value (Display 2, if available)	0...255	18	
PA	Password internal level (Operating unit)	-99...999	-19	
PAE	Password external level (connected controller)	-99...999	-38	
L99	Password for parameter level L--	-99...999	0	

* The parameters L0, L1, PA and PAE appear only via ST-Bus

b-- Key functions

Parameter	Function	Setting range	Values default	
b 1	Function key 1	0: inactive 1: Standby function 2: Relay function A (Light 1) 3: Relay function B (Light 2) 4: Relay function C 5: Relay function D 6: Relay function E 7: Relay function F 8: Relay function G 9: Set1 activated 10: Set2 activated 11: „Super-Frost“ on/off 12: „Humidity“ on/off 13: control circuit 1 on/off 14: control circuit 2 on/off 15: defrosting request 16: acknowledge alarm 17: show 2nd actual value (→ L46) 18: Set for 2nd setpoint (→ L16) + function humidity (like 12) after delay (b21...) 19: Set for 2nd setpoint (→ L16) + control circuit 2 on/off after key delay 20: Set for 2nd setpoint (→ L16) + function C after key delay 21: Set for 2nd setpoint (→ L16), without additional function 22: Set for clock/date 24: Set for 3rd setpoint (see L17), if available, without additional function 25: Set for 3rd setpoint (see L17), if available + relay function C 26: Set for 1st setpoint + control circuit 1 on/off	15	
b 2	Function key 2	see b1	17	
b 3	Function key 3	see b1	0	
b 4	Function key 4	see b1	4	
b 5	Function key 5	see b1	2	
b 6	Function key 6	see b1	22	
b 7	Function key 7	see b1	13	
b 8	Function key 8	see b1	1	
b 9	Function key 9	see b1	0	
b 10	Function key 10	see b1	0	
b21	Delay key 1	0.2...5.0 sec	2.0	
b22	Delay key 2	0.2...5.0 sec	2.0	
b23	Delay key 3	0.2...5.0 sec	5.0	
b24	Delay key 4	0.2...5.0 sec	1.0	

Parameter	Function	Setting range	Values default	
b25	Delay key 5	0.2...5.0 sec	1.0	
b26	Delay key 6	0.2...5.0 sec	0.5	
b27	Delay key 7	0.2...5.0 sec	3.0	
b28	Delay key 8	0.2...5.0 sec	3.0	
b29	Delay key 9	0.2...5.0 sec	0.5	
b30	Delay key 10	0.2...5.0 sec	0.5	
b99	Password for level b--	-99...999	0	

J-- Pre-defined sets of parameters

Parameter	Function	Setting range	Values default	
J1	Parameter set	0 ... 1	0	
J99	Password for parameter level J--	-99 ... 999	0	

Warning: Changes made in the parameter set will change all parameter settings!

A-- Display

Parameter	Function	Setting range	Values default	
A 1	Dimming of the display	5...100 %	60	
A 2	Dimming 2nd display (if available)	5...100 %	25	
A 3	Dimming of LEDs	5...100 %	25	
A 4	Visible levels	0 ... 31 (see parameter description) **Bitmask** (add values): +1 Adr +2 Con +4 PA +8 PAE +16 USr +32 rtc	13	
A 5	Start level (after pressing UP + DOWN)	0: Adr 1: Con 2: PA 3: PAE 4: USr 5: rtc	3	
A6	Switch on relay function when switching on via standby button	0 ... 63 (see parameter description) **Bitmask** (add values): +1 A (light 1) +2 B (light 2 +4 C (window heating) +8 D (door frame heating) +16 E (blade scraper) +32 Relay function F	0	
A7	Delay after keystroke until function from A6 is executed	0.5 ... 2.0 s	0.5 s	
A8	Switch off relay function when switching off via standby button	see A6	0	
A9	Allow text display during defrost	0: no 1: yes, text is given by the controller	0	
A99	Password for parameter level A--	-99...999	-19	

Parameter description

L0: ST-Bus, own address
Each bus client must have its own ad-dress. Addresses must be unique, i.e. must not be assigned several times.

L 1: ST-Bus, controller address
Address of the controller providing the measured values.

L2: Temperature scale
With this parameter, you can define if temperature values are to be displayed in °F or °C.

L3: Display mode of actual value
The measured values transferred from the controller to the satellite display are always of highest accuracy. However the display can round the values to .5 decimals or to integrals.
Generally all parameter settings and setpoints are shown in 0.1K resolution.

L4: Parameter address, actual value
L4b: Parameter address, actual value 2
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 setpoint. Possible values which can be set via this parameter list:

0	like ST-Box
1	During defrosting last temperature before defrosting, otherwise current cold room temperature
2	Evaporator temperature
3	Current setpoint for evaporator fan
4	Current setpoint cold store
5	Condenser temperature
6	P-control result for condenser fan
7	Current setpoint for condenser fan
8	Current setpoint of condenser
9	Display via test bottle function
10	MIN value of cold store temperature
11	MAX value of cold store temperature
12	Actual value control circuit 2
13	Current setpoint control circuit 2
14	Time
15	Sensor F1
16	Sensor F2
17	Sensor F3
18	Sensor F4
19	Sensor F5

L5: Scanning cycle
The measured values are requested periodically. The display is refreshed in the same interval.

L6: Software Version

L7: Display in Standby mode
With the setting L9=0 the actual state of the connected controller is requested periodically. The setting of L7 is to define how the "OFF" condition of the controller is indicated. If L9=1 the setting of L7 is ignored

L8: Key-lock function
This parameter defines if the setpoint, the internal or the external parameters can be displayed and/or adjusted with the keys. If it is set to "0" everything is permitted.

Bit	Val.	Function
0	1	Setpoint „read-only"
1	2	Setpoint invisible
2	4	2. setpoint „read-only"
3	8	Time „read-only"
4	16	Level PA „read-only"
5	32	Level PAE „read-only"

To determine the value that is to be parameterised, the corresponding values must be added together.

L9: Read/analyze state
If set to "1" the actual state of the connected controller is not read. The display permanently shows the measured value. If set to "0" the actual state is read and evaluated.

L 13: Setpoint Offset
This parameter selects the setpoint that is shown with the SET key.
The setting "0" is only reasonable with controllers with Bus-version < 4.0.

L 15: Active function keys in standby mode
This parameter can be used to define the function keys for the relay functions A...F that are allowed to be active during standby..

Bit	Val.	Function
0	1	Relay function A (Light 1)
1	2	Relay function B (Light 2)
2	4	Relay function C (Window heating)
3	8	Relay function D (Door frame heating)
4	16	Relay function E (Blade scraper)
5	32	Relay function F

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

L 16: Setpoint Offset or setpoint 2
With this parameter the setpoint 2 is selected, which can be displayed and adjusted by a further SET button. The setting "0" is only recommended for controls with bus version <4.0.

L 18: Inverting key LEDs
This parameter can be used to set which button LEDs are to be inverted compared to the following standard behaviour:

L30: Display mode for actual value of 2nd display (if available)
see L3.

L3 1: Parameter address , actual value 2nd display (if available)
see L4.

L99: Password for parameter level L--
With this parameter, you can set the password for this parameter level.
ATTENTION: If the password is forgotten the access to the parameter list is only possible with a master password

b 1...b 10 Function of keys 1 ... 10
These parameters assign predefined functions to the keys.
The functions are switched each time you press, i.e. on or off. Only the functions 9, 10, 15 and 16 turn the function on, but not off. Whether a function is executed depends on the connected controller. The corresponding LED is then switched off again by the controller accordingly.
The parameters b2 1 ... b30 specify how long the button must be pressed to perform the function (or additional function with setting 18 ... 20).

b2 1...b30 Delay for key 1 ... 10
These parameters specify how long the button must be pressed to execute a specific function.

A1: Dim 1st display
A2: Dim 2nd display
A3: Dim LEDs
With these parameters, the intensity (brightness) of the displays or LEDs can be adjusted. These parameters are only visible and adjustable via the ST-Bus.

A4: Visible levels
This parameter can be used to set which levels are shown.

Bit	Val.	Function
0	1	Adr
1	2	Con
2	4	PA
3	8	PAE
4	16	USr

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

A5: Start level
This determines which of the levels shown in A4 appears first after pressing the UP + DOWN key

A6: Switch on relay function when switching on via standby button
This parameter can be used to define the relay functions A...F that are switched on when the controller is switched on via the standby button. The parameter is only effective if the controller is switched on via the standby button.

Bit	Val.	Function
0	1	A (Light 1)
1	2	B (Light 2)
2	4	C (Window heating)
3	8	D (Door frame heating)
4	16	E (Blade scraper)
5	32	Relay function F

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

A7: Delay for A6
After pressing the button to switch on the controller, the relay functions are delayed by this time.

A8: Switch off relay function when switching off via standby button
This parameter can be used to define the relay functions A...F that are switched off when the controller is switched off via the standby button. The parameter is only effective if the controller is switched off via the standby button.

Bit	Val.	Function
0	1	A (Light 1)
1	2	B (Light 2)
2	4	C (Window heating)
3	8	D (Door frame heating)
4	16	E (Blade scraper)
5	32	Relay function F

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

A9: Allow text display during defrost
With this parameter, a text can be displayed during the defrost signal if the controller supports this. If it is not supported, the temperature is displayed. The possible texts are "dEF" and "dE9".

Status messages

Message	Cause	Remedy
Decimal	Connected controller is switched off	
F90	Data transfer error, Controller not found	Check the wiring of the interface. Check address. PAE -> L-- -> L0 must be identical to L1 / Con . Note that at first the correct ST-Bus address of the display must be set via Con. Otherwise the controller can't be accessed anymore with this error message. Optionally the controller may be de-energized.
F9c	Another unit has the same address as the satellite display.	Change address, prior to that disconnect ST-Bus (Pin 1) (procedure see F90)
CrC	Internal flash error, display	Repair display
EP	Error in parameter memory	Check all parameters
dEF	Defrosting active	if allowed via parameter A9
dE9	Defrosting active	if allowed via parameter A9

Display	Four digit LED display, height 13 mm, color clear white 3 LEDs, diameter 2.2 mm, color white, for status display 7 LEDs, diameter 1.8 mm, color white, for week days
Power supply	12V=, provided by the controller
Connection	RJ45 for CAT5 cable (4x Twisted Pair) ATTENTION: do not use for ETHERNET
Ambient conditions	Storage temperature: -20 °C ... +70 °C Working temperature: 0 ... 55 °C Relative humidity: max. 75 %, no condensation
Protection class	Protection class III (Unit carries low voltage)
Enclosure	Front IP63, IP00 from back
Interface	ST-Bus for connection with a controller ST-Bus with RS485 interface, galvanically not separated, 56kBaud, max, length 1000m,
Installation data	Front size: 96 x 48 mm Installation size: 71.5 x 29.5 mm Installation depth 38.5 mm (without connectors)