ST710-PWHVR.126

Six-stage controller

Order number 900310.050

Wiring diagram

Product description

The six-stage controller was developed for the control of compressor groups of up to 6 machines, and/or the control of compressors with bypass-valves (max. 3 machines). The basic gas characteristics are part of the fixed program data - therefore, it is possible to execute a pressure control (4...20mA) and to show the temperature values at the same time. The compressor running times can be optimised by help of the sequential or time-conditioned load replacement. The controller that can be parametered in various ways has an alarm contact and a hour meter.
Networking of the controller takes place via the ST-Bus interface.

Front size: 84mm x 42mm
Panel cut-out: 67.5mm x 31.5mm
Connector: plug and socket

ST 710 (715)... / ST71...

ST710 = 84
(ST71 = 72)

ST710 = 42
(ST71 = 36)

31

69

77

13

90

2,5

max 6

31,5

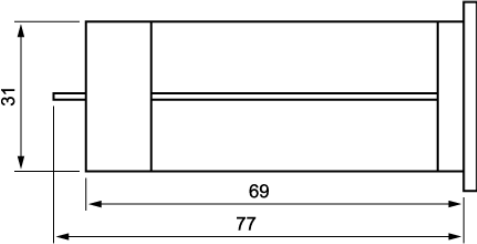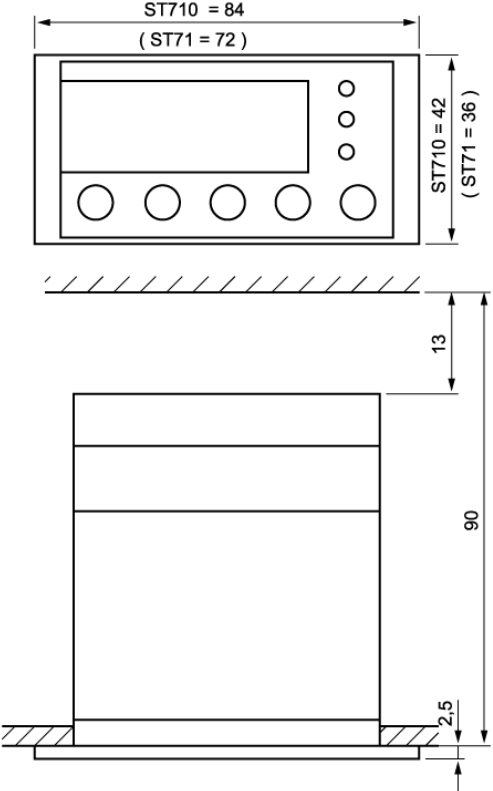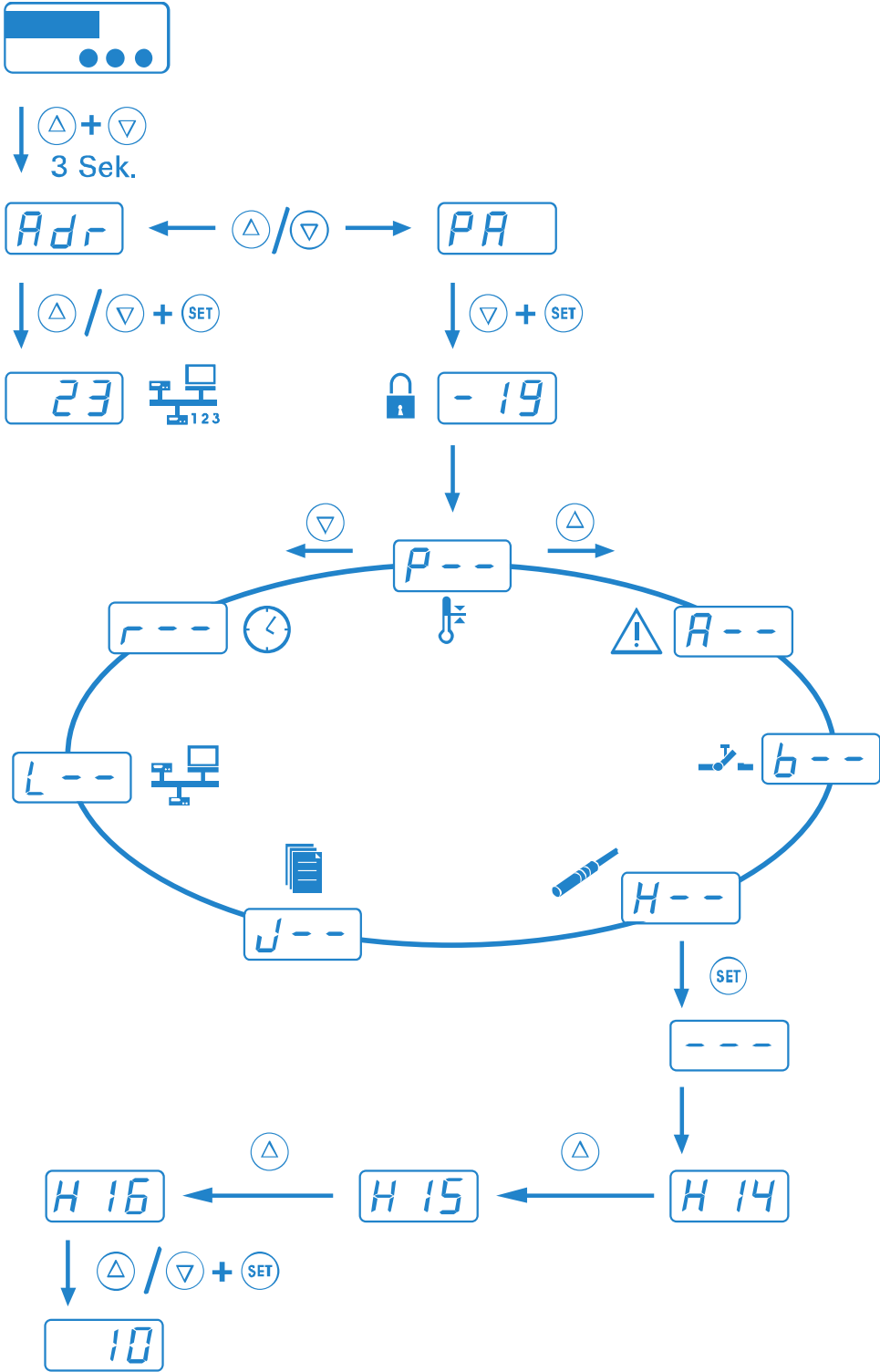67,5

SOFTWARE

SIX-STAGE CONTROLLER ST710-xxx.126

GENERAL INFORMATION

The ST……126 controllers are designed as multi-stage temperature controllers and offer numerous characteristics intended for cooling industries.

Depending on the hardware, up to six relay outputs are possible the functions of which can be configured as required via parameters.

A special exchange and replacement logic guarantees a balanced load of the connected modules in case of partial load operation. Operating times are recorded.

To protect the connected compressors minimum downtimes can be specified for each exit separately. In addition a mutual switch-on delay is possible. In case of a remaining control deviation a setpoint offset can be adjusted, which is not visible in the display.

Depending on the existing hardware, a temperature sensor or a linear senor (pressure) can be connected. The type, function, offset and weighting of each sensor can be configured separately via parameters.

The max. two digital inputs can also be configured separately, depending on the hardware installed. Possible functions include: standby, setpoint changeover.

The controller is equipped with six relays whose function is determined by the operating mode set with parameter A44. If a relay is not used by A44, its function can be set with parameter A51...A56. Please note the specifications of the respective hardware so that the relays are not overloaded.

All parameters can also be accessed via the RS485 interface.

CONTROL KEYS
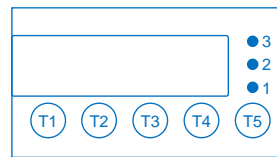
Key T1: UP
By pressing this key the parameter or parameter value is increased. A further function of the key can be set with parameter $b1$.

Key T2: DWON
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 **SET** key is pressed, the setpoint S1 is indicated.

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 controller is generally controlled using the buttons **UP**, **DOWN** and **SET**. The standard display indicates the actual value of the activated sensor, either a pressure (bar) or a temperature (°C). Press **SET** button to switch over the display to the required 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.

If you press the **STANDBY** button during operation (for at least 3 seconds), the controller is switched off and the message set with parameter $L7$ 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. 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.

Adr NETWORK ADDRESS

Under code word Adr you can set a network address. This is required for commissioning 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.

$P--$ CONTROL CIRCUIT

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 $P1$ in parameter group $P--$, 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.

		*	$A--$	**Plant**
		*	$b--$	**Buttons and switching inputs**
			$P--$	**Control circuit**
			$H--$	**Sensors**
		*	$J--$	**Pre-defined sets of parameters**
		*	$L--$	**Networking and display**
			$5--$	**Main setpoints**

* These levels by default are protected by a password.

⚠️ A-- **Plant**

Para-meter	Description of function	Setting range	Values default
A 1	Function of relay K1 in case of sensor error	0: relay off 1: relay on	0
A2	Function of relay K2 in case of sensor error	0: relay off 1: relay on	0
A3	Function of relay K3 in case of sensor error	0: relay off 1: relay on	0
A4	Function of relay K4 in case of sensor error	0: relay off 1: relay on	0
A5	Function of relay K5 in case of sensor error	0: relay off 1: relay on	0
A6	Function of relay K6 in case of sensor error	0: relay off 1: relay on	0
A 12	Selection setpoint 2 or Delta W1	0: Setpoint 2 (P1) 1: Delta W1 (P1r)	1
A 13	Selection setpoint 3 or Delta W2	0: Setpoint 3 (P2) 1: Delta W2 (P2r)	1
A 14	Selection setpoint 4 or Delta W3	0: Setpoint 4 (P3) 1: Delta W3 (P3r)	1
A 15	Selection setpoint 5 or Delta W4	0: Setpoint 5 (P4) 1: Delta W4 (P4r)	1
A 16	Selection setpoint 6 or Delta W5	0: Setpoint 6 (P5) 1: Delta W5 (P5r)	1
A 17	Temperature alarm mode relative limits with (P30, P31, P32) absolute limits with (P33, P34, P32)	0: Boundary alarm, relative limits 1: Boundary alarm, absolute limits 2: Range alarm, relative limits 3: Range alarm, absolute limits 4: as 0, but inverted 5: as 1, but inverted 6: as 2, but inverted 7: as 3, but inverted	0
A 18	Function of the buzzer and/or the display at temperature alarm	0: no display, no buzzer 1: display flashes 2: only buzzer enabled 3: display flashes, buzzer enabled 4: as 2., alarm can be cancelled 5: as 3., buzzer can be cancelled 6: as 5., alarm returns after A 19	1
A 19	New alarm after alarm acknowledging	0...360 min.	30
A21	Minimum action time K1 "Off"	0...999 sec.	0
A22	Minimum action time K2 "Off"	0...999 sec.	0
A23	Minimum action time K3 "Off"	0...999 sec.	0
A24	Minimum action time K4 "Off"	0...999 sec.	0
A25	Minimum action time K5 "Off"	0...999 sec.	0
A26	Minimum action time K6 "Off"	0...999 sec.	0
A30	Mutual delay of contacts	0...999 sec.	0
A31	Delay after "Power-on"	0...999 sec.	0

Para- meter	Description of function	Setting range	Values default	
A32	Alarm suppression after "Power-On" or after a setpoint/alarm limits change	0...999 min.	0	
A33	Operating time before time depending load replacement	0...999 (sec. or Min.)	240	
A34	Time scale for parameter A33	0: sec. 1: min.	1	
A35	Active measuring input	0: Sensor F1: temperature 1: Sensor F2: 4..20mA, pressure	0	
A37	Refrigerant	0: R134A 1: R22 2: R407C 3: R404A 4: R507	0	
A40	Activation of time-dependent load replacement	0: not activated 1: activated	1	
A41	Sequential operation mode	0: not activated 1: activated	1	

A44	Operating mode	0: K1-K6 without load replacement
		1: K1+K2 with load replacement
		2: K1+K2 as bypass-group (K2)
		3: K1-K3 with load replacement
		4: K1-K4 with load replacement
		5: K1-K4 as bypass-group (K2+K4)
		   with load replacement
		6: K1-K5 with load replacement
		7: K1-K6 with load replacement
		8: K1-K6 as bypass-group (K2+K4+K6)
		   with load replacement
		9: as 2, K2 inverted
		10: as 5, K2+K4 inverted
		11: as 8, K2+K4+K6 inverted
		12: K1-K3 as bypass-group (K2)
		13: K1-K6 as double bypass-group
		   (K2+K3,K5+K6) with load replacement
			0	

A51	Switch mode relay K1	0: heating contact 1: cooling contact	1	
A52	Switch mode relay K2	0: heating contact 1: cooling contact	1	
A53	Switch mode relay K3	0: heating contact 1: cooling contact	1	
A54	Switch mode relay K4	0: heating contact 1: cooling contact	1	
A55	Switch mode relay K5	0: heating contact 1: cooling contact	1	
A56	Switch mode relay K6	0: heating contact 1: cooling contact	1	
A59	Setpoint offset	-20...+20.0 (bar or °C)	0.0	
A99	Password of parameter level A--	-99 ... 999	0	

Para-meter	Description of function	Setting range	Values default
b1	Function of key T1	0: without function 1: controller on/standby 2: Display output power (%) 3: acknowledge alarm 4: Changeover setpoint S1' (absolute) 5: Changeover setpoint S1" (relative) 6: display MIN 7: display MAX 8: display sensor F1 9: display sensor F2 10: Reset both MIN/MAX 11: Reset MIN 12: Reset MAX	0
b2	Function of key T2	see b1	3
b3	Function of key T3	see b1	2
b5	Function of key T5	see b1	1
b11	Function of external switching input E1	0: without function 1: controller on/standby 2: Changeover setpoint S1' (absolute) 3: Changeover setpoint S1" (relative)	
b12	Switching input E1 inverse / not inverse	0: normal 1: inverted	
b13	Function of external switching input E2	0: without function 1: controller on/standby 2: Changeover setpoint S1' (absolute) 3: Changeover setpoint S1" (relative)	
b14	Switching input E2 inverse / not inverse	0: normal 1: inverted	
b99	Password of parameter level b‑‑	-99 ... 999	-19

P-- Control circuit

Para-meter	Description of function	Setting range	Values default
P 1	Auxiliary setpoint S2 absolute	P 17...P 18 (bar or °C)	10.0
P 1r	DeltaW 1	-99.0 ... +99.9 (bar or °C)	10.0
P2	Auxiliary setpoint S3 absolute	P 17...P 18 (bar or °C)	10.0
P2r	DeltaW 2	-99.0 ... +99.9 (bar or °C)	10.0
P3	Auxiliary setpoint S4 absolute	P 17...P 18 (bar or °C)	10.0
P3r	DeltaW 3	-99.0 ... +99.9 (bar or °C)	10.0
P4	Auxiliary setpoint S5 absolute	P 17...P 18 (bar or °C)	10.0
P4r	DeltaW 4	-99.0 ... +99.9 (bar or °C)	10.0
P5	Auxiliary setpoint S6 absolute	P 17...P 18 (bar or °C)	10.0
P5r	DeltaW 5	-99.0 ... +99.9 (bar or °C)	10.0
P 11	Hysteresis for main setpoint	0.1...99.9 (bar or °C)	1.0
P 12	Hysteresis for auxiliary setpoint S2 or DeltaW 1	0.1...99.9 (bar or °C)	1.0
P 13	Hysteresis for auxiliary setpoint S3 or DeltaW 2	0.1...99.9 (bar or °C)	1.0
P 14	Hysteresis for auxiliary setpoint S4 or DeltaW 3	0.1...99.9 (bar or °C)	1.0
P 15	Hysteresis for auxiliary setpoint S5 or DeltaW 4	0.1...99.9 (bar or °C)	1.0
P 16	Hysteresis for auxiliary setpoint S6 or DeltaW 5	0.1...99.9 (bar or °C)	1.0
P 17	Lower setpoint limit	-99.0...P 18 (bar or °C)	-99.0
P 18	Upper setpoint limit	P 17...+999 (bar or °C)	100.0
P30	Lower alarm limit, relative to main setpoint	-99.0 ... +99.9 (bar or °C)	-10.0
P31	Upper alarm limit, relative to main setpoint	-99.0 ... +99.9 (bar or °C)	10.0
P32	Hysteresis alarm contact	-99.0 ... +99.9 (bar or °C)	1.0
P33	Lower alarm limit, absolute	-99.0...P34 (bar or °C)	-99.0
P34	Upper alarm limit, absolute	P33...+999 (bar or °C)	100.0
P40	Total operating time K1, hours	Not adjustable	0
P41	Total operating time K1, *1000 hours	Not adjustable	0
P42	Total operating time K2, hours	Not adjustable	0
P43	Total operating time K2, *1000 hours	Not adjustable	0
P44	Total operating time K3, hours	Not adjustable	0
P45	Total operating time K3, *1000 hours	Not adjustable	0
P46	Total operating time K4, hours	Not adjustable	0
P47	Total operating time K4, *1000 hours	Not adjustable	0
P48	Total operating time K5, hours	Not adjustable	0
P49	Total operating time K5, *1000 hours	Not adjustable	0
P50	Total operating time K6, hours	Not adjustable	0
P51	Total operating time K6, *1000 hours	Not adjustable	0
P99	Password of parameter level c--	-99 ... 999	0

H-- Temperature sensors

Para-meter	Description of function	Setting range	Values default	
H 1	Mains frequency	0: 50Hz 1: 60Hz	0	
H 11	Actual value of sensor F1	Measured value, not adjustable		
H 12	Calibration sensor F1 (act. 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 existent 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 9: 0-10V	2	
H 15	Software filter sensor F1	1 ... 32	12	
H 16	Display at 0/4mA and sensor *H 14*=7/8/9	-99..+999	0.0	
H 17	Display at 20mA and sensor *H 14*=7/8/9	-99..+999	100	
H21	Actual value of 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*	8	
H25	Software filter sensor F2	1 ... 32	16	
H26	Display at 0/4mA and sensor *H24*=7/8/9	-99..+999	2.0	
H27	Display at 20mA and sensor *H24*=7/8/9	-99..+999	30.0	
H99	Password of parameter level *H--*	-99 ... 999	0	

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

Para-meter	Description of function	Setting range	Values default	
J 1	Parameter set	0: Temperature sensor 1: Pressure sensor, refrigerant R134A 2: Pressure sensor, refrigerant R22 3: Pressure sensor, refrigerant R407C 4: Pressure sensor, refrigerant R404A 5: Pressure sensor, refrigerant R507	0	
J98	Password for entering level selection (*PA* in display)	-99 ... 999	-19	
J99	Password of parameter level *J--*	-99 ... 999	-19	

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

L‑‑ Networking and display (password-protected)

Para-meter	Description of function	Setting range	Values default	
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	5	
L6	Software version			
L7	Display in standby mode	0: OFF 1: AUS 2: right decimal point 3: right decimal point flashing 4: time, OFF in case of an error	1	
L8	Access restriction	0: all parameters read/writeable 1: Setpoints write-protected 2: Parameter write-protected 3: Setpoints and parameters write-protected. 4: as 3, **Adr** also write-protected	0	
L40	ST bus release mask for functions	0 .. 255	233	
L50	Reset MIN- and/or MAX -memory	0: - 1: reset MIN 2: reset MAX 3: reset MIN and MAX	0	
L51	Reset operating time of relay K1	0: - 1: reset	0	
L52	Reset operating time of relay K2	0: - 1: reset	0	
L53	Reset operating time of relay K3	0: - 1: reset	0	
L54	Reset operating time of relay K4	0: - 1: reset	0	
L55	Reset operating time of relay K5	0: - 1: reset	0	
L56	Reset operating time of relay K6	0: - 1: reset	0	
L99	Password of parameter level L‑‑	-99 ... 999	-19	

MASTER PASSWORD

All passwords can be edited through parameteri-sation. 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 deacti-vated. 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
Hi	High temperature and/or overpressure above alarm limit	
Lo	Low temperature and/or low-pressure below alarm limit	
$E1L$	Error on sensor F1, short-circuit	Check sensor F1
$E1H$	Error on sensor F1, wire broken	Check sensor F1
$EP0$	Internal error in control unit	Repair control unit
$EP1$	Error in parameter memory	Check all parameters
rtc	Error of internal clock	Set clock again. If error occurs again, the controller must be repaired

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

⚠️ _A--_ **Plant**

_A 1_ **Function of relay K1 in case of sensor error**
_A2_ **Function of relay K2 in case of sensor error**
_A3_ **Function of relay K3 in case of sensor error**
_A4_ **Function of relay K4 in case of sensor error**
_A5_ **Function of relay K5 in case of sensor error**
_A6_ **Function of relay K6 in case of sensor error**
At sensor error the display flashes and indicates either _E 1H_ or _E 1L_. The respective relay falls back into the condition pre-set here.

_A 12_ **Selection setpoint 2 or Delta W1**
This parameter determines whether the setpoints for thermostat 1 and 2 are independently adjustable (A12=0, _P 1_) or whether they are tied with one another via a switching offset DeltaW1 (A12=1, _P 1r_).

_A 13_ **Selection setpoint 3 or Delta W2**
This parameter determines whether the setpoints for thermostat 1 and 3 are independently adjustable (A13=0, _P2_) or whether they are tied with one another via a switching offset DeltaW2 (A13=1, _P2r_).

_A 14_ **Selection setpoint 4 or Delta W3**
This parameter determines whether the setpoints for thermostat 1 and 4 are independently adjustable (A14=0, _P3_) or whether they are tied with one another via a switching offset DeltaW3 (A14=1, _P3r_).

_A 15_ **Selection setpoint 5 or Delta W4**
This parameter determines whether the setpoints for thermostat 1 and 5 are independently adjustable (A15=0, _P4_) or whether they are tied with one another via a switching offset DeltaW4 (A15=1, _P4r_).

_A 16_ **Selection setpoint 6 or Delta W5**
This parameter determines whether the setpoints for thermostat 1 and 6 are independently adjustable (A16=0, _P5_) or whether they are tied with one another via a switching offset DeltaW5 (A16=1, _P5r_).

_A 17_ **Temperature alarm mode**
The alarm exit evaluates an upper and a lower limit value, whereas a selection is possible as to whether the alarm is a boundary or a range alarm and weather it has absolute or relative limit values.

_A 18_ **Function of the buzzer and/or the display at temperature alarm**
Here, you can define if a temperature alarm is to be displayed or not and if the buzzer is to sound.

Additionally, you can define if the buzzer is to sound again after acknowledgement. The corresponding time is indicated in A19. The error message and the temperature will be displayed alternately as long as the alarm is present. If more than one alarm messages are present, they will be displayed alternately. The alarm relay will signal the alarm at all times.

_A 19_ **New alarm after alarm acknowledging**
Alarms which have not been eliminated will be switched on again by the buzzer after the set time. This only applies if [_A 18_=6].

_A21_ **Minimum action time K1 "Off"**
_A22_ **Minimum action time K2 "Off"**
_A23_ **Minimum action time K3 "Off"**
_A24_ **Minimum action time K4 "Off"**
_A25_ **Minimum action time K5 "Off"**
_A26_ **Minimum action time K6 "Off"**
These parameters permit a delay in switching on the relay in order to reduce the switching frequency. The adjusted time sets the entire minimum time period for a switching-off phase.

_A30_ **Mutual delay of contacts**
This parameter makes a mutual switching-on delay of relays possible, depending on whichever contact is switched first. It ensures that two output contacts do not switch simultaneously. If there are multiple bypass groups defined with parameter _A44_ the mutual delay affects entire groups. The mutual delay affects no free contacts that are not involved in the load replacement. With _A44_=0 the delay is always effective

_A31_ **Delay after "Power-on"**
This parameter allows a switching-on delay of relays after switching-on the mains voltage. This delay corresponds with the time set here. The delay applies not to alarm contact K7

_A32_ **Alarm suppression after "Power-On" or after a setpoint/alarm limits change**
If boundary alarm is selected with parameter _A 17_ this parameter allows a switching-on delay of the alarm contact K7 after switching on the mains voltage. This delay corresponds with the time set here. This suppression does not apply to sensor error alarm or, if activated, external alarms. If range alarm is selected, this parameter is ineffective

A33 Operating time before time depending load replacement

Load replacement depending on time is mainly used in the field of refrigeration technology to balance the use of the connected compressors. If only some of the outputs are continuously active, outputs that have not yet been activated will be used.

This parameter determines the time to elapse before outputs are changed for the first time. If there are multiple bypass groups defined with parameter A44 the load replacement affects entire groups.

A34 Time scale for parameter A33

Parameter A34 sets the time scale for parameter A33 (seconds or minutes).

A35 Active measuring input

This parameter selects either temperature or pressure measuring. Deactivated sensors can be disconnected; their measuring input causes no error message. At the same time the scale of the main display is set to either "°C" or "bar".

A37 Refrigerant

Selection of the used refrigerant in the plant.

A40 Time-dependent load replacement

This parameter either activates or deactivates time-dependent load replacement to balance the use of the connected compressors. The replacement takes place after the operating time set with parameters A33 and A34.

A41 Sequential operation mode

This parameter either activates or deactivates the sequential operation mode. If this mode is activated different compressors or bypass-groups will be activated or deactivated (if possible) at each change of output stage to ensure an even load of the compressors.
Concerning the switching of the compressors or bypass-groups the following applies:
If several compressors or bypass-groups are activated the first started unit will be deactivated first. If several units are deactivated the first stopped unit will be activated first.
If in sequential operation mode the connections of the units to the respective output stage is ineffective. The control prevents the switching of valves if the compressor has not started and assures the simultaneous switch-off of valves when the compressor is switched off. The minimum action times (parameters A21-A25) concerning valves will be adjusted to the times of the respective compressors.

A44 Operating mode

If a sequential operation mode or the time-dependent load replacement is activated with parameter A40 and A41, parameter A44 selects which outputs are involved in this mode.
Additionally it is possible to define pairs of outputs that work as bypass-groups. In this case the activation of the valve output leads to a smaller cooling performance. In the bypass-groups there is a standard linkage of the outputs, i.e.
K1=compressor,
K2=bypass,
K3=compressor,
K4=bypass,
K5=compressor,
K6=bypass.
Bypass-groups with an inverted valve output are intended for plants where the bypass is switched on together with the compressor and switched off together with the valve output.
A special function (A44=12) allows the operation of two compressors together with a common bypass with
K1+K3=compressor,
K2=bypass.
In this case K4 becomes inactive, because parameters P3 and P14 are reserved. A further special function (A44=13) is intended for the operation with double bypass-groups with
K1=compressor,
K2+K3=bypass,
K4=compressor,
K5+K6=bypass.
Not that the sequential operation mode and the time-dependent load replacement are effective independently of each other if activated with parameters A40 and A41. If bypass operation mode is selected, the required valves are determined summarily in the control program.
If the respective setting requires several bypass valves to be switched on, the output with the highest number will be switched on first.

A51 **Switch mode relay K1**
A52 **Switch mode relay K2**
A53 **Switch mode relay K3**
A54 **Switch mode relay K4**
A55 **Switch mode relay K5**
A56 **Switch mode relay K6**

The switching sense for the relays, i.e. cooling or heating function, can be programmed independently. The respective relay may not be part of the load replacement mode (see parameter **A44**) or part of any bypass-group. If this applies the respective relay switches to cooling function independently of this parameter. Note that the power display indicates the active outputs K1-K6 only summarily. A differentiation of heating and cooling power is not possible.

A59 **Setpoint offset**

The here adjusted value will build the difference to the activated setpoint, i.e. there is no regulation according to the pre-set value, but according to the sum of setpoint and the value of A59. All auxiliary setpoints that apply to outputs involved in the load replacement or bypass-groups are affected by this parameter as well. The remaining free outputs and the alarm limit values are not affected

A99 **Password of parameter level** **A--**

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

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

b1 … b5 **Function of key T1… T8**

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!

b11, b13 **Function of E1 and E2**

Certain functions can be assigned to the switching inputs.

b12, b14 **Switching sense E1 and E2**

You can define if the switching input is used as a NO contact (normal) or NC contact (inverse).

b99 **Password of parameter level** **b--**

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

P-- Control circuit

P1 **Auxiliary setpoint S2**
P2 **Auxiliary setpoint S3**
P3 **Auxiliary setpoint S4**
P4 **Auxiliary setpoint S5**
P5 **Auxiliary setpoint S6**

Adjustment of the auxiliary setpoints if **A12...A16**=0. The adjustment range is set with parameters **P17** and **P18**.

P1r **Delta W1**
P2r **Delta W2**
P3r **Delta W3**
P4r **Delta W4**
P5r **Delta W5**

If **A12...A16**=1 this value is added to the main setpoint and results in the auxiliary setpoint.

P11 **Hysteresis for relay K1**
P12 **Hysteresis for relay K2**
P13 **Hysteresis for relay K3**
P14 **Hysteresis for relay K4**
P15 **Hysteresis for relay K5**
P16 **Hysteresis for relay K6**

The hysteresis is set symmetrically at the setpoints, i.e. half of the hysteresis' value is effective below and half of the value above the switching point. Note that a small hysteresis permits a more exact regulation, however also leads to more frequent switching frequency decreasing the lifetime of the relay.

P17 **Lower setpoint limit**
P18 **Upper setpoint limit**

The adjustment range of the setpoint can be limited in both directions. This is to prevent the end user of a unit from setting inadmissible or dangerous setpoints.

P30 **Lower alarm limit, relative**

The lower alarm limit value is the sum of the active main setpoint and the value of **P30**. It is effective if **A17**=0, 2, 4 or 6. If the temperature falls below this value, an alarm is triggered according to **A18** and the alarm contact K7 is switched according to **A17**.

P31 **Upper alarm limit, relative**

The upper alarm limit value is the sum of the active main setpoint and the value of **P31**. It is effective if **A17**=0, 2, 4 or 6. If the temperature exceeds this value, an alarm is triggered according to **A18** and the alarm contact K7 is switched according to **A17**.

P32 Hysteresis alarm contact
Hysteresis is set symmetrically at the adjusted limit value. It becomes effective depending on alarm definition.

P33 Lower alarm limit, absolute
This is the absolute lower alarm limit. It is effective if A17=1, 3, 5 or 7. If the temperature falls below this value, an alarm is triggered according to A18 and the alarm contact K7 is switched according to A17.

P34 Upper alarm limit, absolute
This is the absolute upper alarm limit. It is effective if A17=1, 3, 5 or 7. If the temperature falls below this value, an alarm is triggered according to A18 and the alarm contact K7 is switched according to A17.

P40 Total operating time K1, hours
P41 Total operating time K1, *1000 hours
The total operating time of the switched-on relay K1 in hours results of P41*1000+P40. The value is stored every operating hour, resulting in a maximum inaccuracy of one hour in case of mains failure. After replacing plant components the counter can be reset with parameter L51.

P42 Total operating time K2, hours
P43 Total operating time K2, *1000 hours
The total operating time of the switched-on relay K2 in hours results of P43*1000+P42. The value is stored every operating hour, resulting in a maximum inaccuracy of one hour in case of mains failure. After replacing plant components the counter can be reset with parameter L52.

P44 Total operating time K3, hours
P45 Total operating time K3, *1000 hours
The total operating time of the switched-on relay K3 in hours results of P45*1000+P44. The value is stored every operating hour, resulting in a maximum inaccuracy of one hour in case of mains failure. After replacing plant components the counter can be reset with parameter L53.

P46 Total operating time K4, hours
P47 Total operating time K4, *1000 hours
The total operating time of the switched-on relay K4 in hours results of P47*1000+P46. The value is stored every operating hour, resulting in a maximum inaccuracy of one hour in case of mains failure. After replacing plant components the counter can be reset with parameter L54.

P48 Total operating time K5, hours
P49 Total operating time K5, *1000 hours
The total operating time of the switched-on relay K5 in hours results of P49*1000+P48. The value is stored every operating hour, resulting in a maximum inaccuracy of one hour in case of mains failure. After replacing plant components the counter can be reset with parameter L55.

P50 Total operating time K6, hours
P51 Total operating time K6, *1000 hours
The total operating time of the switched-on relay K6 in hours results of P51*1000+P50. The value is stored every operating hour, resulting in a maximum inaccuracy of one hour in case of mains failure. After replacing plant components the counter can be reset with parameter L56.
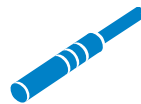
c99 Password of parameter level c--
With this parameter, you can set the password for parameter level c-- .

H-- Sensors

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

H11, H21 Act. value sensor F1 .. F2
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.

H12, H22 Calibration sensor F1 and F2 act. 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 Wichtungsfaktor F1 und F2
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.

H I4, H24 Sensor selection F1 / F2

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.

H I5, H25 Software filter F1 / F2

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").

H I6, H26 F1/F2: Display at 0mA / 4mA / 0V

If, when choosing the sensor H I4 / H24 = 7, 8 or 9 is selected (0/4…20mA or 0...10V linear sensor), you can define via this parameter which value is to be displayed in the case of a current of 0 or 4mA or a voltage of 0V. The value to be displayed for 20mA/10V can be defined in the next parameter. The actual measured value is calculated as linear interpolation between these two values.

H I7, H27 F1/F2: Display at 20mA / 10V

If, when choosing the sensor H I4 / H27 = 7, 8 or 9 is selected (0/4…20mA or 0...10V linear sensor), you can define via this parameter which value is to be displayed in the case of a current of 20mA or a voltage of 10V. The display value for 0/4mA or 0V is defined in the previous parameter. The actual measured value is calculated as linear interpolation between these two values.

H99 Password for parameter level H⁻⁻

This parameter sets the password for level H⁻⁻.

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

J I Intern: active data set

With this parameter, you can set up pre-defined data sets. The data sets are provided by Störk-Tronic. If a new data set is loaded, all previously set parameters will be overwritten. After that, they can be edited as required. The most important settings are shown in the appendix. Basically the different refrigerants are configured.

J98 Password for accessing level selection

With this parameter, you can set the level selection password, i.e. in display PA. In the standard design, access to level selection is blocked by password - I9.

J99 Password of parameter level J⁻⁻

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

L-- Networking and display (password-protected)

L0 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.

L6 Software-Version
The software version of the controller is indicated.

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

L8 Access restriction
With this parameter certain settings can be locked:

L8	Setpoints	Parameters	Adr
0	**rw**	**rw**	**rw**
1	**ro**	**rw**	**rw**
2	**rw**	**ro***	**rw**
3	**ro**	**ro***	**rw**
4	**ro**	**ro***	**ro**

rw: value is read- and writeable
ro: value is read-only (write-protected)

*Note: The parameter L8 is **always** adjustable!

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

Para	Bit	Valency	Function
L40	0	1	controller on/off
	1	2	control circuit 1 on/off
	2	4	Defrosting request
	3	8	Acknowledge alarm
	4	16	Main setpoint S1' absolute
	5	32	Main setpoint S1'' relative
	6	64	Reset MIN
	7	128	Reset MAX

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

L50 Reset MIN and/or MAX memory
Chose a value to reset the respective memory. L50 is set back to 0 automatically. This function can be locked by appropriate setting of parameter L40.

L51 Reset operating time of relay K1
L52 Reset operating time of relay K2
L53 Reset operating time of relay K3
L54 Reset operating time of relay K4
L55 Reset operating time of relay K5
L56 Reset operating time of relay K6
If set to 1, the operating time of the respective relay is reset to 0. The parameter itself is set back to 0 automatically.

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

Appendix A:

If one of the parameters J1, A35 or A37 is changed, the following values are set automatically:

If parameter J1 is modified **all** parameters are reset to their default value, even if they are not listed in the table below. The operating times of the relays and the passwords of the individual parameter levels are excluded from this.

If parameter A35 (active measuring input) is modified from 1 (pressure) to 0 (temperature) only the values of the first column are considered.

If A35 is modified from 0 (temperature) to 1 (pressure) the values of the column corresponding to the setting of A37 are considered.

If the refrigerant is changed and A35 = 1 (pressure), the values of the column corresponding to the new setting of A37 are considered. If A35 = 0 (temperature) only parameter A37 is modified but no further parameters.

J1	0	1	2	3	4	5	
A35	0	1	1	1	1	1	
	Temperature	Pressure					
A37	0	0	1	2	3	4	
	R134A	R134A	R22	R407C	R404A	R507	
A59	0.0	0.0	0.0	0.0	0.0	0.0	
P1	10.0	3.1	5.8	5.4	7.1	7.4	
P1r	10.0	1.1	1.7	1.8	2.1	2.2	
P2	20.0	4.6	8.0	7.8	9.9	10.1	
P2r	20.0	2.6	3.9	4.2	4.9	4.9	
P3	30.0	6.7	10.9	10.7	13.1	13.4	
P3r	30.0	4.7	6.8	7.1	8.1	8.2	
P4	40.0	9.2	14.2	14.4	17.2	17.3	
P4r	40.0	7.2	10.1	10.8	12.2	12.2	
P5	50.0	12.1	18.4	18.9	21.9	21.9	
P5r	50.0	10.1	14.3	15.3	16.9	16.8	
P11	1.0	0.2	0.2	0.2	0.2	0.2	
P12	1.0	0.2	0.2	0.2	0.2	0.2	
P13	1.0	0.2	0.2	0.2	0.2	0.2	
P14	1.0	0.2	0.2	0.2	0.2	0.2	
P15	1.0	0.2	0.2	0.2	0.2	0.2	
P16	1.0	0.2	0.2	0.2	0.2	0.2	
P17	-99.0	-0.9	-0.9	-0.9	-0.8	-0.9	
P18	100.0	30.0	30.0	30.0	30.0	30.0	
P30	-10.0	-1.0	-1.6	-1.4	-1.7	-1.7	
P31	10.0	1.1	1.7	1.9	2.2	2.2	
P32	1.0	0.2	0.2	0.2	0.2	0.2	
P33	-99.0	-0.9	-0.9	0.0	0.0	-0.9	
P34	100.0	30.0	30.0	30.0	30.0	30.0	

J 1	0	1	2	3	4	5	
H 12	0.0	0.0	0.0	0.0	0.0	0.0	
H 13	1.0	1.0	1.0	1.0	1.0	1.0	
H 14	2	2	2	2	2	2	
H 15	12	12	12	12	12	12	
H 16	0.0	0.0	0.0	0.0	0.0	0.0	
H 17	30.0	30.0	30.0	30.0	30.0	30.0	
H22	0.0	0.0	0.0	0.0	0.0	0.0	
H23	1.0	1.0	1.0	1.0	1.0	1.0	
H24	8	8	8	8	8	8	
H25	16	16	16	16	16	16	
H26	0.0	-0.9	-0.9	-0.9	-0.8	-0.9	
H27	30.0	30.0	30.0	30.0	30.0	30.0	
S1	0.0	2.0	4.1	3.6	5.0	5.1	
S1'	0.0	2.0	4.1	3.6	5.0	5.1	
S1''	0.0	0.0	0.0	0.0	0.0	0.0	

Appendix B:

Conversion help to convert the former controller ST710-PWHV.26 into the new ST710-PWHVR.126:

old .26	Description	new .126	Notice
P1	Setpoint S2	**P1**	
	Delta W1	**P1r**	
P2	Setpoint S3	**P2**	
	Delta W2	**P2r**	
P3	Setpoint S4	**P3**	
	Delta W3	**P3r**	
P4	Setpoint S5	**P4**	
	Delta W4	**P4r**	
P5	Setpoint S6	**P5**	
	Delta W5	**P5r**	
P11	Hysteresis K1	**P11**	
P12	Hysteresis K2	**P12**	
P13	Hysteresis K3	**P13**	
P14	Hysteresis K4	**P14**	
P15	Hysteresis K5	**P15**	
P16	Hysteresis K6	**P16**	
P17	Lower setpoint limit	**P17**	
P18	Upper setpoint limit	**P18**	
P19	Key lock	**-> L8**	
P20	Display actual value	**-> H11 or H21**	
P21	Actual value correction	**-> H12 or H22**	
P30	Lower alarm limit, rel.	**P30**	
	Abs.	**P33**	
P31	Upper alarm limit, rel.	**P31**	
	Abs.	**P34**	
P32	Alarm hysteresis	**P32**	
P33	Operating time of K1	**-> P40**	
P34		**-> P41**	
P35	Operating time of K2	**-> P42**	
P36		**-> P43**	
P37	Operating time of K3	**-> P44**	
P38		**-> P45**	Only hours instead of years and days
P39	Operating time of K4	**-> P46**	
P40		**-> P47**	
P41	Operating time of K5	**-> P48**	
P42		**-> P49**	
P43	Operating time of K6	**-> P50**	
P44		**-> P51**	
A1	K1 at sensor error	**A1**	
A2	K2 at sensor error	**A2**	
A3	K3 at sensor error	**A3**	
A4	K4 at sensor error	**A4**	
A5	K5 at sensor error	**A5**	
A6	K6 at sensor error	**A6**	
A10	Setpoint S2 / DeltaW1	**-> A12**	
A11	Setpoint S3 / DeltaW2	**-> A13**	
A12	Setpoint S4 / DeltaW3	**-> A14**	
A13	Setpoint S5 / DeltaW4	**-> A15**	
A14	Setpoint S6 / DeltaW5	**-> A16**	
A15	Display unit	**--**	Unit is based on the selected measuring sensor

A16	Display mode	-> L3	
A17	Alarm mode	A17	
A18	Special function	-> A18	More selections possible
A20	Minimum action time for K1 "Off"	-> A21	
A21	Minimum action time for K2 "Off"	-> A22	
A22	Minimum action time for K3 "Off"	-> A23	
A23	Minimum action time for K4 "Off"	-> A24	
A24	Minimum action time for K5 "Off"	-> A25	
A25	Minimum action time for K6 "Off"	-> A26	
A30	Mutual delay of contacts	A30	
A31	Delay after "Power-on"	A31	
A32	Alarm suppression after "Power-On"	A32	
A33	Operating time before time depending load replacement	A33	
A34	Time scale for A33	A34	
A35	Active measuring input	A35	
A36	Temperature scale	-> L2	
A37	Refrigerant	A37	
A38	Value at 4mA/0V	->H26	
A39	Value at 20mA/10V	->H27	
A40	Activation of time-dependent load replacement	A40	
A41	Sequential operation mode	A41	
A42	Locking of operating times	--	Operation times can only be reset with parameters L50…L56
A43	Function E1	-> b11 und b12	
A44	Operating mode	A44	
A45	Function Standby	-> b5	
A51	Switch mode K1	A51	
A52	Switch mode K2	A52	
A53	Switch mode K3	A53	
A54	Switch mode K4	A54	
A55	Switch mode K5	A55	
A56	Switch mode K6	A56	
A59	Setpoint offset	A59	

Appendix C:

Table of actual values of the six-stage controller (Ac25_001) read via ST-Bus by ReadRam and/or ReadRamBurst:

	burst	Description	Unit
0	0;0	Actual value	°C/bar
1	0;1	Actual power demand	%
2	0;2	Setpoint	°C/bar
3	0;3	Actual MIN value	°C/bar
4	0;4	Actual MAX value	°C/bar
5	1;0	Actual value	°C
6	1;1	Actual power demand	%
7	1;2	Setpoint	°C
8	1;3	Actual MIN value	°C
9	1;4	Actual MAX value	°C
10	2;0	Actual value	bar
11	2;1	Actual power demand	%
12	2;2	Setpoint	bar
13	2;3	Actual MIN value	bar
14	2;4	Actual MAX value	bar
15	3;0	Temperature sensor F1 directly	°C
16	3;1	Linear sensor F2 directly	bar
17	3;2	Number of active compressors	
18	3;3	Number of active valves (bypass)	
19	3;4	reserved (internal sensor F3)	°C
20	4;0	Time	hh:mm
21	4;1	Date	tt.mm.
22	4;2	Year	
23	4;3	Operating hours counter	hours
24	4;4	Operating time of relay K1	hours
25	5;0	Operating time of relay K2	hours
26	5;1	Operating time of relay K3	hours
27	5;2	Operating time of relay K4	hours
28	5;3	Operating time of relay K5	hours
29	5;4	Operating time of relay K6	hours
30	6;0	Status S0 (see table on next page)	binary
31	6;1	Status S1 (see table on next page)	binary
32	6;2	Status S2 (see table on next page)	binary
33	6;3	Status S3 (see table on next page)	binary
34	6;4	Error E0 (see table on next page)	binary
35	7;0	Error E1 (see table on next page)	binary
36	7;1	Status I0 (see table on next page)	binary
37	7;2	Status I1 (see table on next page)	binary
38	7;3	Status I2 (see table on next page)	binary
39	7;4	Status I3 (see table on next page)	binary

When reading the actual value via ReadRamBurst, the first value (i.e. in front of the Semicolon) is the requested index and the second value (i.e. behind Semicolon) is the memory address in the reply.

The actual values 0...4 correspond to the display of the controller. If a temperature sensor is connected, the display unit is "°C", otherwise it is "bar".

Bit	Status S0	Status S1	Status S2	Status S3
0	Controller on	S1' absolute active		Input E1
1	Control circuit 1 active	S1'' relative active		Input E2
2		Reset Min		
3	Defrosting activated	Reset Max		
4	Acknowledge alarm	Pressure display		
5				
6				
7				
8	Battery operation			Relay K1
9	Error EP0			Relay K2
10	Error EP1			Relay K3
11	Error EP2			Relay K4
12	Check mode			Relay K5
13	Error rtc (clock)			Relay K6
14	Buzzer			Relay K7
15	General error			

Bit	Error E0	Error E1 (if needed)
0	Sensor 1 short circuit	
1	Sensor 1 open circuit	
2		
3		
4		
5		
6		
7		
8	Insufficient temperature	
9	Excess temperature	
10		
11		
12		
13		
14		
15		

Bit		Status I0	Status I1	Status I2	Status I3
0	Compressor 1				
1	Compressor 2				
2	Compressor 3				
3	Compressor 4				
4	Compressor 5				
5	Compressor 6				
6		ACTUAL state	TARGET state	Mask	
7					
8	Valve 1				
9	Valve 2				
10	Valve 3				
11	Valve 4				
12					
13					
14					
15					

Status I2 (Mask) is defined by parameter A44 (operating mode).

Technical data of ST710-PWHVR.126

Input
E1: External potential-free switching contact

Measuring input
F1: Resistance thermometer Pt100-3L
Measuring range: -200°C...350°C
Measuring accuracy: 0.5K +/- 0.5 % of scale range, without sensor
Operating range in case of temperature display like measuring range of the sensor, otherwise
-0.9...30.0 bar or –65...85 °C with R134A and -80...63 °C with R507.

F2: linear current input, 4...20mA, 2-wire connection
Measuring accuracy: +/- 0.7 % of scale range, without sensor
The display range must be customised by parameter settings.
Operating range in case of pressure display like measuring range of the sensor, otherwise
–65...85 °C or -0.9...30.0 bar with R134A and -80...63 °C with R507.

Outputs
K1: Relay, normally-open contact, 6A 250V
K2: Relay, normally-open contact, 6A 250V
K3: Relay, normally-open contact, 6A 250V
K4: Relay, normally-open contact, 6A 250V
K5: Relay, normally-open contact, 6A 250V
K6: Relay, normally-open contact, 8A 250V
K7: Relay, normally-open contact, 8A 250V
Please note: The continuous current on terminal A, pin 9, is the accumulated current for relays K1
- K6 and may not exceed 8A!

Display
One 4-digit LED-display, height 12 mm, colour red
3 LEDs, diameter 3mm, for status displays

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
12...24 V AC (50/60 Hz) or 16...36V DC, power consumption max 3 VA

Ambient conditions:
Storage temperature: -20...+70°C
Operating temperature: 0...+55°C
Relative humidity: max. 75% without dew

Gewicht
approx. 130 g

Connectors
Plug and socket
Terminal A: 12-pole, spacing 5.0 mm, for cable up to 2.5 mm²
Terminal B: 11-pole, spacing 3.5 mm, for cable up to 1.5 mm²

Enclosure
Front IP65, IP00 from behind

Installation data
Unit is to be installed in an instrument panel.
Front size: 84 x 42 mm
Panel cut-out: 67.2 x 31.2 mm
Installation depth: ca. 90 mm with connector

The controller is UL certified with the *UL File* number **E219051**.