

## ST710-PWHVM.26

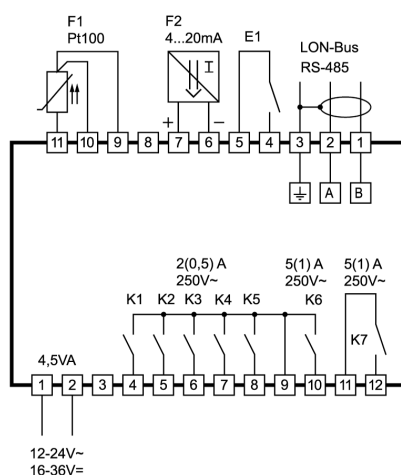
### Six-stage controller

Order number 900205.004

Old Id.Nr.: 175539



### Wiring diagram



### Product description

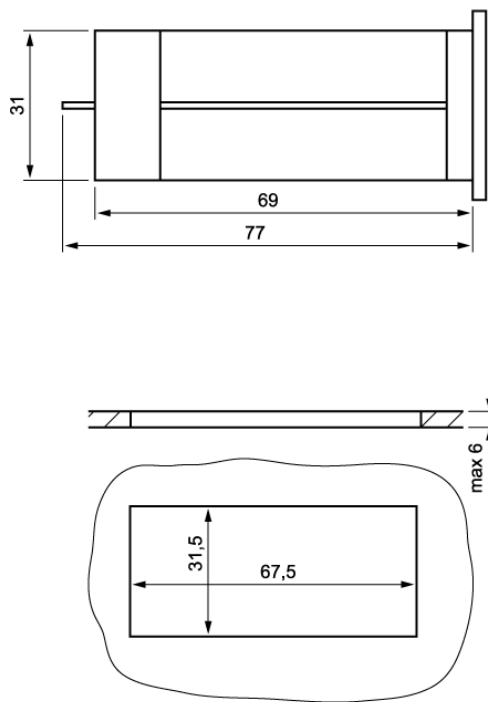
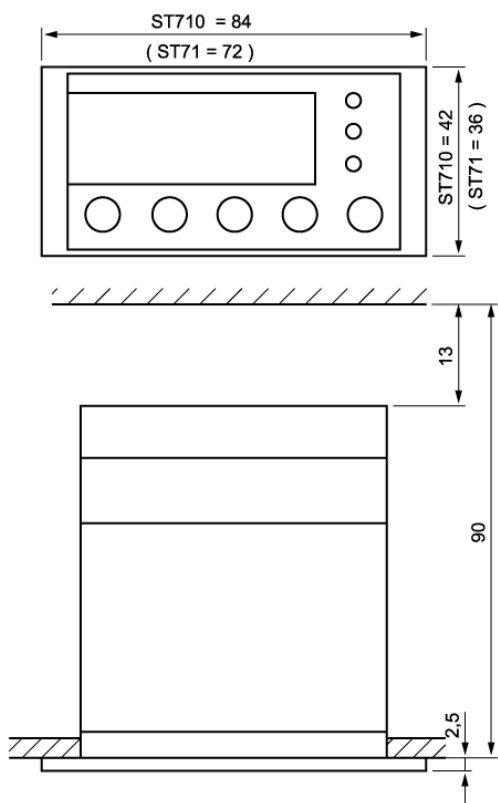
The six-stage controller was developed for the control of compressor groups of up to 6 machines, and/or the control of compressors with bypass-valves (max. 3 machines). The basic gas characteristics are part of the fixed program data - therefore, it is possible to execute a pressure control (4...20mA) 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.

**Front size:** 84mm x 42mm

**Panel cut-out:** 67.5mm x 31.5mm

**Connector:** plug and socket

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



## SOFTWARE .26

### Adjustment options

**Key UP**

Pressing this key you can increase the parameter or parameter value or scroll the parameter list.

**Key DOWN**

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

**Key Display:**

Shortly pressing this key shows the other value ("°C", "bar") of the actual display for 3 seconds. Pressing it for more than 5 seconds switches over to power display or back to temperature display. The LEDs indicate the actual display value.

**Key SET**

While SET key is pressed, the setpoint is indicated.  
In addition, the SET key is used for setting parameters.

**Key Standby**

This key puts the controller into standby mode. Pressing the key a second time, restarts the unit. The key can be deactivated.

### **First control level:**

After switching-on the mains voltage the display shows "OFF" if standby mode is activated and the actual value if the controller is not in standby mode.

The LEDs have the following functions:

"°C" = temperature display in °C (upper LED)

"bar" = pressure display in bar (middle LED)

"%" = power display in % (lower LED).

Note: The setpoint can also be adjusted by the LON-network. On every setpoint adjustment via LON-network the new value will be verified if in control range limitations.

### **Parameter setting of the main setpoint**

If none of the keys is pressed, the display indicates the actual value of the temperature. Pressing the SET key, the setpoint shows on the display.

If the setpoint is to be changed, the SET key is to be kept pressed while adjusting the setpoint with the keys UP and DOWN.

Please note that the setpoint can only be changed within the set setpoint limits.

The setpoint S1' (if available) can be adjusted in the same way. If setpoint S1' is activated it is indicated and relevant for the control in case of closed switching input E1.

Parameter	Function description	Adjustment range	Standard setting	Custom setting
<b>S1</b>	Setpoint	P4...P5	0.0°C	
<b>S1'</b>	Setpoint S1' (E1 closed)	-99.9 ... +99.9 K or: P17...P18	-5.0 K or 10.0°C	

**Note:** The setpoint can also be adjusted via LON-network. On every setpoint adjustment via LON-network the new value will be verified if in control range limitations.

### Second control level (P parameters):

#### Setting of control parameters

Simultaneously pressing the UP and DOWN key for at least 4 seconds opens a parameter list containing control parameters.

With the UP and DOWN keys the list can be scrolled in both directions.

Pressing the SET key will give you the value of the respective parameter. Pressing also the UP or DOWN key at the same time the value can be adjusted.

Return to the initial position takes place automatically, if no key is pressed for 60 seconds.

#### Important advice:

*The parameters P1-P5 as well P30+P31 are saved separately as absolute und relative values in the controller. The parameters A10-A14 resp. A17 of the third control level determine which group of values is accessed. It s recommended to adjust these parameters of the third control level first, otherwise performed adjustments of the respective P-parameters have to be repeated*

*Because a change of the display value with A15 and/or the refrigerant with A37 can cause a forced reset of the P-parameters, these parameters (A15 and A37) should be adjusted first as well. To delete or change the operating times P33-P34 parameter A42 must be set to "0".*

Para- meter	Function description	Adjustment range	Standard setting	Custom setting
P1	Setpoint 2 Delta W1	-99.9 ... 999.0°C -99.9 ... 99.9 K	10.0 K	
P2	Setpoint 3 Delta W2	-99.9 ... 999.0°C -99.9 ... 99.9 K	20.0 K	
P3	Setpoint 4 Delta W3	-99.9 ... 999.0°C -99.9 ... 99.9 K	30.0 K	
P4	Setpoint 5 Delta W4	-99.9 ... 999.0°C -99.9 ... 99.9 K	40.0 K	
P5	Setpoint 6 Delta W5	-99.9 ... 999.0°C -99.9 ... 99.9 K	500 K	
P11	Hysteresis 1 for K1	0.1...99.9 K	1.0 K	
P12	Hysteresis 2 for K2	0.1...99.9 K	1.0 K	
P13	Hysteresis 3 for K3	0.1...99.9 K	1.0 K	
P14	Hysteresis 4 for K4	0.1...99.9 K	1.0 K	
P15	Hysteresis 5 for K5	0.1...99.9 K	1.0 K	
P16	Hysteresis 6 for K6	0.1...99.9 K	1.0 K	
P17	Control range limitation – minimum setpoint	-99.9°C...P18	-99.9°C	
P18	Control range limitation – maximum setpoint	P17...999.0°C	999.0°C	
P19	Key-lock	0: no key-lock 1: key-lock	0	
P20	Indication actual value 1	N/A		
P21	Actual value correction	-30.0...+30.0 K	0.0 K	
P30	Lower alarm value	-99.9°C...P31 or -99.9...999.0 K	-99.9°C or -10.0 K	
P31	Upper alarm value	P30...999.0°C or -99.9...999.0 K	999.0°C or +10.0 K	
P32	Alarm hysteresis	0.1...99.9 K	1.0 K	

Parameter	Function description	Adjustment range	Standard setting	Custom setting
<b>P33</b>	Total operating time contact K1 in years	0 ... 25 years	0 years	
<b>P34</b>	Total operating time contact K1 in days	0 ... 364 days	0 days	
<b>P35</b>	Total operating time contact K2 in years	0 ... 25 years	0 years	
<b>P36</b>	Total operating time contact K2 in days	0 ... 364 days	0 days	
<b>P37</b>	Total operating time contact K3 in years	0 ... 25 years	0 years	
<b>P38</b>	Total operating time contact K3 in days	0 ... 364 days	0 days	
<b>P39</b>	Total operating time contact K4 in years	0 ... 25 years	0 years	
<b>P40</b>	Total operating time contact K4 in days	0 ... 364 days	0 days	
<b>P41</b>	Total operating time contact K5 in years	0 ... 25 years	0 years	
<b>P42</b>	Total operating time contact K5 in days	0 ... 364 days	0 days	
<b>P43</b>	Total operating time contact K6 in years	0 ... 25 years	0 years	
<b>P44</b>	Total operating time contact K6 in days	0 ... 364 days	0 days	

**Note:** To delete or change the operating times P33-P34 parameter A42 must be set to "0".

**Parameter description:****P1: Setpoint 2 / Delta W1****P2: Setpoint 3 / Delta W2****P3: Setpoint 4 / Delta W3****P4: Setpoint 5 / Delta W4****P5: Setpoint 6 / Delta W5**

Adjustment of the secondary setpoints. The respective secondary setpoint can be adjusted by parameters A10-A14 to be relative, i.e. going along with the main setpoint S1, or absolute, i.e. independent of the main setpoint.

Note that P3 together with P1 is effective for contact K2 if operating mode is A44=12.

**P11-P16: Hysteresis K1-K6**

The hysteresis can be adjusted separately for the main setpoint (P11) and the secondary setpoints (P12-P16) and 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: Control range limitation – minimum setpoint****P18: Control range limitation – maximum setpoint**

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.

**P19: Key-lock**

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

**P20: Actual value**

The here indicated temperature presents the actual measured value.

**P21: Actual value correction**

This parameter allows the correction of actual value deviations caused for example by sensor tolerances or extremely long sensor lines. The regulation measure value is increased or decreased by the here adjusted value.

**P30: Lower alarm value****P31: Upper alarm value**

The alarm exit K7 evaluates an upper and a lower limit value, whereas a selection is possible (with parameter A17) as to whether the alarm is active if the temperature lies within these two limits (range alarm), or whether the alarm is released if the temperature lies beyond them (boundary alarm). In the case of sensor error, the alarm is activated independently of this adjustment.

Depending on parameter A17 both at the boundary alarm and the range alarm, limit values can be relative, i.e. going along with the setpoint, or absolute, i.e. independent of the setpoint.

**P32: Hysteresis alarm circuit**

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

The operating time recorded by parameters P33-P44 is mainly used in the field of refrigeration technology to register the operating time of the connected compressors.

**P33: Total operating time contact K1 in years**

**P35: Total operating time contact K2 in years**

**P37: Total operating time contact K3 in years**

**P39: Total operating time contact K4 in years**

**P41: Total operating time contact K4 in years**

**P43: Total operating time contact K4 in years**

These parameters indicate the total operating times in years elapsed with the respective contact switched on.

**P34: Total operating time contact K1 in days**

**P36: Total operating time contact K2 in days**

**P38: Total operating time contact K3 in days**

**P40: Total operating time contact K4 in days**

**P42: Total operating time contact K4 in days**

**P44: Total operating time contact K4 in days**

These parameters indicate the remaining total operating times in days elapsed with the respective contact switched on.

Note: Time is recorded in minute cycles. Periods shorter than one minute are ignored. Storage in the non-volatile memory takes place twice daily, so that an inaccuracy of max. 12 hours may result if a power failure occurs.

Caution: Parameters P37-P44 are only effective when the pertinent output is available and activated by parameter A44.

To avoid statistical errors, it is essential that the operating mode set in parameter 44 corresponds to the number of external loads (e.g. compressors) that are connected.

Failure to do this will result in incorrect operating times being recorded by parameter P33-P44.

Operating times can be updated after replacement of components if parameters P19 and A19 together with parameter A42 are unlocked. Otherwise data can be irretrievable lost.



### Third control level, (A parameters):

#### Setting of control parameters

Access to the third control level is granted when selecting the last P-parameter on the second control level. Continue to press the UP key for approximately 10 seconds until "PA" appears. Continue to press the UP key and additionally press the DOWN key for about 4 seconds and the first A-parameter of the third control level is indicated.

With the keys UP and DOWN you can scroll the list in both directions. Pressing the SET key will give you the value of the respective parameter. By pressing the UP or DOWN key at the same time the value can be adjusted.

Return to the initial position takes place automatically, if no key is pressed for 60 seconds, or by simultaneously pressing the UP and DOWN key for approx. 4 seconds.

Parameter	Function description	Adjustment range	Standard setting	Custom setting
A1	Function of contact K1 at sensor error	0: relay off 1: relay on	0	
A2	Function of contact K2 at sensor error	0: relay off 1: relay on	0	
A3	Function of contact K3 at sensor error	0: relay off 1: relay on	0	
A4	Function of contact K4 at sensor error	0: relay off 1: relay on	0	
A5	Function of contact K5 at sensor error	0: relay off 1: relay on	0	
A6	Function of contact K6 at sensor error	0: relay off 1: relay on	0	
A10	Selection setpoint 2 or DeltaW1	0: operation with setpoint 2 1: operation with deltaW1	1	
A11	Selection setpoint 3 or DeltaW2	0: operation with setpoint 3 1: operation with deltaW2	1	
A12	Selection setpoint 4 or DeltaW3	0: operation with setpoint 4 1: operation with deltaW3	1	
A13	Selection setpoint 5 or DeltaW4	0: operation with setpoint 5 1: operation with deltaW4	1	
A14	Selection setpoint 6 or DeltaW5	0: operation with setpoint 6 1: operation with deltaW5	1	
A15	Display value	0: temperature display 1: pressure display	0	
A16	Display mode	0: integrals 1: with decimals	1	
A17	Alarm mode	0: Boundary alarm, relative boundaries 1: Boundary alarm, absolute boundaries 2: Range alarm, relative boundaries 3: Range alarm, absolute boundaries	0	
A18	Special function at boundary alarm	0: not activated 1: flashing display	0	
A20	Minimum action time K1 "Off"	0...999 sec.	0 sec.	
A21	Minimum action time K2 "Off"	0...999 sec.	0 sec.	

Parameter	Function description	Adjustment range	Standard setting	Custom setting
A22	Minimum action time K3 "Off"	0...999 sec.	0 sec.	
A23	Minimum action time K4 "Off"	0...999 sec.	0 sec.	
A24	Minimum action time K5 "Off"	0...999 sec.	0 sec.	
A25	Minimum action time K6 "Off"	0...999 sec.	0 sec.	
A30	Mutual delay of contacts	0...999 sec.	0	
A31	Delay after "Power-on"	0...999 sec.	0	
A32	Alarm suppression after "Power-On"	0...999 sec.	0	
A33	Operating time before time depending load replacement	0...999 sec. or min.	240	
A34	Time scale for parameter A33	0: seconds 1: minutes	1	
A35	Measuring input	0: temperature measuring input 1: pressure measuring input	0	
A36	Temperature scale	0: Fahrenheit (50 Hz) 1: Celsius (50 Hz) 2: Fahrenheit (60 Hz) 3: Celsius (60 Hz)	1	
A37	Refrigerant	0: R134A 1: R22 2: R407C 3: R404A	0	
A38	Indication value for lower value at pressure measuring	-99...999	0.0	
A39	Indication value for upper value at pressure measuring	-99...999	30.0	
A40	Activation of time-dependent load replacement	0: not activated 1: activated	1	
A41	Sequential operation mode	0: not activated 1: activated	1	
A42	Interlocking of total operating times	0: not locked 1: locked	1	
A43	Function of switching input E1	0: no function 1: S1' activated relative to setpoint S1 2: S1' activated absolute (freely adjustable) 3: switch to standby mode by closing E1 4: switch to standby mode by opening E1	0	

Parameter	Function description	Adjustment range	Standard setting	Custom setting
<b>A44</b>	Operating mode	0: K1-K6 without load replacement 1: K1+K2 with load replacement 2: K1+K2 as bypass-group (K1 = compressor) 3: K1-K3 with load replacement 4: K1-K4 with load replacement 5: K1-K4 as bypass-groups with load replacement (K1+K3 = compressor) 6: K1-K5 with load replacement 7: K1-K6 with load replacement 8: K1-K6 as bypass-groups with load replacement (K1+K3+K5 = compressor) 9: like 2, but K2 inverted 10: like 5, but K2+K4 inverted 11: like 8, but K2+K4+K6 inverted 12: K1-K3 as Bypass-group (K1+K3 = compressor, K4 = inactive) 13: K1-K6 as double bypass- groups with load replacement (K1+K4 = compressor)	0	
<b>A45</b>	Function of standby key	0: no function 1: standby function	1	
<b>A51</b>	Switch mode K1 (only effective if A44 = 0)	0: heating contact 1: cooling contact	1	
<b>A52</b>	Switch mode K2 (only effective if A44 = 0)	0: heating contact 1: cooling contact	1	
<b>A53</b>	Switch mode K3 (only effective if A44=0, 1, 2, 9)	0: heating contact 1: cooling contact	1	
<b>A54</b>	Switch mode K4 (only effective if A44=0, 1, 2, 3, 9)	0: heating contact 1: cooling contact	1	
<b>A55</b>	Switch mode K5 (only effective if A44=0, 1, 2, 3, 4, 5, 9, 10, 12)	0: heating contact 1: cooling contact	1	
<b>A56</b>	Switch mode K6 (only effective if A44=0, 1, 2, 3, 4, 5, 6, 9, 10, 12)	0: heating contact 1: cooling contact	1	
<b>A59</b>	Setpoint offset	-99.9 ... 99.9 K	0.0 K	
<b>L0</b>	Individual address LON- network, Node	1 ... 126 (0 reserved for data logger)	1	
<b>L1</b>	Individual address LON- network, Subnet	0 ... 255	1	

### Parameter description:

*The following values can change the equipment characteristics and are therefore to be set with utmost care.*

#### **A1-A6: Function of contact K1-K6 at sensor error**

In case of sensor error (open or short circuit) the display shows "F1-" flashing. At sensor error the respective relay falls back into the condition pre-set here.

#### **A10: Selection setpoint 2 or DeltaW1**

#### **A11: Selection setpoint 3 or DeltaW2**

#### **A12: Selection setpoint 4 or DeltaW3**

#### **A13: Selection setpoint 5 or DeltaW4**

#### **A14: Selection setpoint 6 or DeltaW5**

These parameters determine whether the setpoints for thermostat 1 and those of thermostat 2-6 are independently adjustable ( $Ax=0$ ) or whether they are tied with one another via a switching offset DeltaW ( $Ax=1$ ). (see parameter P1-P5)

#### **A15: Display value**

The display can indicate either a temperature or a pressure value. Measured value and indicated value must not be identical, therefore a calculated value can be indicated also. The measuring input is set with parameter A35. The calculation of the corresponding value depends on the selected refrigerant according to the setting of parameter A37.

#### **A16: Display mode**

The value can be indicated with or without decimals. In general, all parameter indications are presented in 0.1°K

#### **A17: 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 whether it has absolute or relative limit values.

#### **A18: Special function at alarm**

Here can be selected whether, in the case of an alarm, the indication is to flash.

#### **A20-A25: Minimum action time contact K1-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. A mutual delay set by parameter A30 becomes effective as soon as the first contact is switched on. The delay applies not to alarm contact K7

#### **A32: Alarm suppression after "Power-On"**

If boundary alarm is selected with parameter A17 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: Operating time range**

If operating mode with time-dependent load replacement is activated these time ranges are available for parameter A33.

### **A35: Measuring input**

This parameter selects either temperature or pressure measuring. Deactivated sensors can be disconnected; their measuring input causes no error message. Note the selection of the display value with parameter A15. Measured and indicated value must not be the same. It is possible to indicate a temperature value calculated by a pressure value or to indicate a pressure value calculated by a temperature value.

### **A36: Temperature scale**

Indication can be switched between Fahrenheit and Celsius. At conversion, the parameters and setpoints maintain their numerical value and adjustment range

### **A37: Refrigerant**

Selection of the used refrigerant in the plant.

### **A38: Indication value for lower value at pressure measuring**

### **A39: Indication value for upper value at pressure measuring**

If pressure measuring is selected with parameter A35 these parameters allow scaling of the measuring input. The value to be indicated for the lower and upper measuring value then defines the range the controller will indicate.

### **A40: Activation of 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 parameter A33.

### **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.

### **A42: Interlocking of total operating times**

This parameter releases the locking of the total operating times in parameters P33-P44. The adjustment of time values resulting from time registration is only necessary for updating purposes when plant components are replaced.

### **A43: Adjustment of setpoint S1' (not available on all types of controllers)**

By closing switching input E1, setpoint S1 can be switched to a setpoint S1'. Setpoint S1' can be either relative to setpoint S1 or an independent, freely adjustable, control setting. The setpoint S1' can only be accessed if input E1 is closed. An additional option is to activate the standby mode with the switching input E1. This mode has priority and is not affected by the setting of parameter A45.

### **A44: Operation 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.

### **A45: Standby mode**

Activation or deactivation of the standby key. In standby mode the display indicates "OFF".

### **A51-A56: Switch mode K1-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, if A44=0 and the switch modes are different. In this case a differentiation between heating and cooling power is not possible. In all other operation modes the invertible outputs are not effective for power determination.

### **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 secondary 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.

### **L0: Individual address in LON-network (Node)**

### **L1: Individual address in LON-network (Subnet)**

STOERK TRONIC devices can be hooked with "self installation". In this case, however, each participant has to be assigned a clear address. This address corresponds to the knot address and subnet address with Domain=0.

The address of the knot can only be changed, if the knot was not tied externally (SNVT "nciNetConfig" = CFG\_LOCAL), otherwise the changed value is not saved (after releasing the set key the old value is reset).

### Table of operation modes and power stages

<b>A44 = 0</b>	K1	17 %
	K1+K2	33 %
	K1+K2+K3	50 %
	K1+K2+K3+K4	67 %
	K1+K2+K3+K4+K5	83 %
	K1+K2+K3+K4+K5+K6	100 %
<b>A44 = 1</b>	K1	50 %
	K1+K2	100 %
<b>A44 = 2</b>	K1+K2	50 %
	K1	100 %
	(K2 = bypass)	
<b>A44 = 3</b>	K1	33 %
	K1+K2	67 %
	K1+K2+K3	100 %
<b>A44 = 4</b>	K1	25 %
	K1+K2	50 %
	K1+K2+K3	75 %
	K1+K2+K3+K4	100 %
<b>A44 = 5</b>	K1+K2	25 %
	K1 or K1+K2+K3+K4	50 %
	K1+K3+K4	75 %
	K1+K3	100 %
	(K2, K4 = bypass)	
<b>A44 = 6</b>	K1	20 %
	K1+K2	40 %
	K1+K2+K3	60 %
	K1+K2+K3+K4	80 %
	K1+K2+K3+K4+K5	100 %
<b>A44 = 7</b>	K1	17 %
	K1+K2	33 %
	K1+K2+K3	50 %
	K1+K2+K3+K4	67 %
	K1+K2+K3+K4+K5	83 %
	K1+K2+K3+K4+K5+K6	100 %
<b>A44 = 8</b>	K1+K2	17 %
	K1 or K1+K2+K3+K4	33 %
	K1+K3+K4 or K1+K2+K3+K4+K5+K6	50 %
	K1+K3 or K1+K3+K4+K5+K6	67 %
	K1+K3+K5+K6	83 %
	K1+K2+K3	100 %
	(K2, K4, K6 = bypass)	

<b>A44 = 9</b>	K1	50 %
	K1+K2	100 %
	(K2 = inverted bypass)	
<b>A44 = 10</b>	K1	25 %
	K1+K2 or K1+K3	50 %
	K1+K2+K3	75 %
	K1+K2+K3+K4	100 %
	(K2, K4 = invert. Bypass)	
<b>A44 = 11</b>	K1	17 %
	K1+K2 or K1+K3	33 %
	K1+K2+K3 or K1+K3+K5	50 %
	K1+K2+K3+K4 or K1+K2+K3+K5	67 %
	K1+K2+K3+K4+K5	83 %
	K1+K2+K3+K4+K5+K6	100 %
	(K2, K4, K6 = invert. Bypass)	
<b>A44 = 12</b>	K1+K2	25 %
	K1	50 %
	K1+K2+K3	75 %
	K1+K3	100 %
	(K2 = Bypass)	
<b>A44 = 13</b>	K1+K2+K3	17 %
	K1+K3 or K1+K2+K3+K4+K5+K6	33 %
	K1 or K1+K3+K4+K5+K6	50 %
	K1+K4+K5+K6 or K1+K3+K4+K6	67 %
	K1+K4+K6	83 %
	K1+K4	100 %
	(K2, K3, K5, K6 = Bypass)	

**Described are the switched-on outputs without load replacement. At some power stages further combinations are possible.**



## **Operation with different measuring and indicated value**

### **General notes**

Parameters A15 and A35 permit the independent selection of measured and indicated value. There are the possibilities temperature measuring with temperature display, temperature measuring with pressure display, pressure measuring with pressure display and pressure measuring with temperature display.

The measuring values are converted continuously in the equivalent value of the other unit, the latter can be indicated for 3 seconds by pressing shortly the display key. This conversion always takes place considering the refrigerant selected with parameter A37.

Note that longer pressing the display key switches the display over to power display.

With parameter A38 and A39 the range of the pressure measuring is defined. Regardless of this the operating range of the controller is 0.0 ... 30.0 bar. In case of temperature measuring with pressure display and pressure measuring with temperature display the exceeding of this range leads to the indication of "F b" in the display. Just as "F 1" in case of sensor error this message switches off the control.

The control parameters exist only once for temperature or pressure values in (not erasable) EEPROM memory, therefore parameters are reset to harmless values at each change of the display value with parameter A15.

When switching over to pressure display the reset values depend on the select refrigerant. If the refrigerant is changed with parameter A37 if pressure display is already selected with parameter A15, the values are reset again according this refrigerant.

The reset values are listed below.

## **Partially reset EEPROM to *temperature operation*:**

### **Setpoints 1 und 1'**

S1 = 0.0°C

S1' absolute = 0.0°C

S1' relative = 0.0 K

A59 = 0.0 K

### **Setpoints 2 to 6**

P1 absolute = 10.0°C

P1 relative = 10.0 K

P2 absolute = 20.0°C

P2 relative = 20.0 K

P3 absolute = 30.0°C

P3 relative = 30.0 K

P4 absolute = 40.0°C

P4 relative = 40.0 K

P5 absolute = 50.0°C

P5 relative = 50.0 K

### **Hysteresis'**

P11 – P16 = 1.0 K

### **Control range limitations**

P17 = -99.9°C

P18 = 99.9°C

### **Actual value correction**

P21 = 0.0 K

### **Alarm limit values**

P30 absolute = -99.9°C

P30 relative = -10.0 K

P31 absolute = 99.9°C

P31 relative = 10.0 K

### **Alarm hysteresis**

P32 = 1.0 K

### Partially reset EEPROM to *pressure operation*:

#### for refrigerant R134A (A37 = 0)

##### Setpoints 1 and 1'

S1 = 2.0 bar (or 0.7°C)  
 S1' absolute = 2.0 bar  
 S1' relative = 0.0 bar  
 A59 = 0.0 K

##### Setpoints 2 to 6

P1 absolute = 3.1 bar (or 9.6°C)  
 P1 relative = 1.1 bar  
 P2 absolute = 4.6 bar (or 19.3°C)  
 P2 relative = 2.6 bar  
 P3 absolute = 6.7 bar (or 29.9°C)  
 P3 relative = 4.7 bar  
 P4 absolute = 9.2 bar (or 40.1°C)  
 P4 relative = 7.2 bar  
 P5 absolute = 12.1 bar (or 49.8°C)  
 P5 relative = 10.1 bar

##### Hysteresis

P11 – P16 = 0.2 bar (or 1.7 K)

##### Control range limitations

P17 = 0.0 bar (or -26.4°C at 4.0 mA)  
 P18 = 30.0 bar (or 87.5°C at 20.0 mA)

##### Actual value correction

P21 = 0.0 bar

##### Alarm limit values

P30 absolute = 0.0 bar  
 P30 relative = -1.0 bar  
 (2.0-1.0 bar or -10.1°C for -10.0 K)  
 P31 absolute = 30.0 bar  
 P31 relative = 1.1 bar  
 (2.0+1.1 bar or 9.6°C for +10.0 K)

##### Alarm hysteresis

P32 = 0.2 bar (or 1.7 K)

#### for refrigerant R22 (A37 = 1)

##### Setpoints 1 and 1'

S1 = 4.1 bar (or 0.5°C)  
 S2 absolute = 4.1 bar  
 S2 relative = 0.0 bar  
 A59 = 0.0 K

##### Setpoints 2 to 6

P1 absolute = 5.8 bar (or 10.0°C)  
 P1 relative = 1.7 bar  
 P2 absolute = 8.0 bar (or 19.7°C)  
 P2 relative = 3.9 bar  
 P3 absolute = 10.9 bar (or 30.0°C)  
 P3 relative = 6.8 bar  
 P4 absolute = 14.2 bar (or 39.8°C)  
 P4 relative = 10.1 bar  
 P5 absolute = 18.4 bar (or 50.1°C)  
 P5 relative = 14.3 bar

##### Hysteresis

P11 – P16 = 0.2 bar (or 1.9 K)

##### Control range limitations

P17 = 0.0 bar (or -41.1°C at 4.0 mA)  
 P18 = 30.0 bar (or 71.7°C at 20.0 mA)

##### Actual value correction

P21 = 0.0 bar

##### Alarm limit values

P30 absolute = 0.0 bar  
 P30 relative = -1.6 bar  
 (4.1-1.6 bar or -10.4°C for -10.0 K)  
 P31 absolute = 30.0 bar  
 P31 relative = 1.7 bar  
 (4.1+1.7 bar or 10.0°C for +10.0 K)

##### Alarm hysteresis

P32 = 0.2 bar (or 1.9 K)

### For refrigerant R407C (A37 = 2)

#### Setpoints 1 and 1'

S1 = 3.6 bar (or -0.1°C)

S2 absolute = 3.6 bar

S2 relative = 0.0 bar

A59 = 0.0 K

#### Setpoints 2 to 6

P1 absolute = 5.4 bar (or 9.8°C)

P1 relative = 1.8 bar

P2 absolute = 7.8 bar (or 20.0°C)

P2 relative = 4.2 bar

P3 absolute = 10.7 bar (or 29.9°C)

P3 relative = 7.1 bar

P4 absolute = 14.4 bar (or 40.0°C)

P4 relative = 10.8 bar

P5 absolute = 18.9 bar (or 50.2°C)

P5 relative = 15.3 bar

#### Hysteresis

P11 – P16 = 0.2 bar (or 1.2 K)

#### Control range limitations

P17 = 0.0 bar (or -37.1°C at 4.0 mA)

P18 = 30.0 bar (or 69.4°C at 20.0 mA)

#### Actual value correction

P21 = 0.0 bar

#### Alarm limit values

P30 absolute = 0.0 bar

P30 relative = -1.4 bar

(3.6-1.4 bar or -10.2°C for -10.0 K)

P31 absolute = 30.0 bar

P31 relative = 1.9 bar

(3.6+1.9 bar or 10.3°C for +10.0 K)

#### Alarm hysteresis

P32 = 0.2 bar (or 1.2 K)

### For refrigerant R404A (A37 = 3)

#### Setpoints 1 and 1'

S1 = 5.0 bar (or 0.0°C)

S2 absolute = 5.0 bar

S2 relative = 0.0 bar

A59 = 0.0 K

#### Setpoints 2 to 6

P1 absolute = 7.1 bar (or 9.7°C)

P1 relative = 2.1 bar

P2 absolute = 9.9 bar (or 20.1°C)

P2 relative = 4.9 bar

P3 absolute = 13.1 bar (or 29.8°C)

P3 relative = 8.1 bar

P4 absolute = 17.2 bar (or 40.1°C)

P4 relative = 12.2 bar

P5 absolute = 21.9 bar (or 50.0°C)

P5 relative = 16.9 bar

#### Hysteresis

P11 – P16 = 0.2 bar (or 1.0 K)

#### Control range limitations

P17 = 0.0 bar (or -46.4°C at 4.0 mA)

P18 = 30.0 bar (or 64.0°C at 20.0 mA)

#### Actual value correction

P21 = 0.0 bar

#### Alarm limit values

P30 absolute = 0.0 bar

P30 relative = -1.7 bar

(5.0-1.7 bar or -10.2°C for -10.0 K)

P31 absolute = 30.0 bar

P31 relative = 2.2 bar

(5.0+2.2 bar or 10.1°C for +10.0 K)

#### Alarm hysteresis

P32 = 0.2 bar (or 1.0 K)

Instead of the unit “bar” the unit “Pascal” also comes into use.

1 mbar = 1 hPa.

## LON-bus and serial communication

### General note

The control program has some standardized variables of type "SNVT" which permit the communication with external units via LON-bus. There are input and output values. The input values permit settings for the controller, which are directly available for the control process. The output values indicate measuring values and status information of the unit.

### Automatic update of variables

At each adjustment of the values in the controller the corresponding output variables are updated. If there are no condition changes the values will be updated every "nciMaxSendTime" seconds. If "nciMaxSendTime" is less than 1.0 sec. the values are no more updated in intervals but only if there is any change.

(Therefore the following can occur: a master controller determines the setpoint of a slave controller. The setpoint of the slave controller will be updated immediately if there is a change at the master controller. If the setpoint is changed at the slave controller the "correct" value will be send to the slave after "nciMaxSendTime" seconds.)

Adjustments of the input variables will be applied to the controller immediately and cause an EEPROM write access. Keep in mind the limited amount of save cycles.

### Definition of the standard network variables

Object "Stufenschaltwerk"				
Name of variable	Type	Input/Output	Values	Resolution
nviSetPointTemp	SNVT_temp_p	Input	-273,17...327,66°C	0.01°C
nviSetPointPress	SNVT_press	Input	-32,768...32,767 bar or -32768...32767 hPa	0.001 bar or 1 hPa
nviStandbyMode	SNVT_lev_disc	Input	0...255	-----
nvoActualTemp	SNVT_temp_p	Output	-273,17...327,66°C	0.01°C
nvoActualPress	SNVT_press	Output	-32,768...32,767 bar or -32768...32767 hPa	0.001 bar or 1 hPa
nvoRelayState	SNVT_state	Output	On/Off for K1...K7	-----
nvoPowerPercent	SNVT_switch	Output	0...100 %, On/Off+error	0.5 %
nvoHrsCompr1	SNVT_time_hour	Output	0...65535 Std.	1 h
nvoHrsCompr2	SNVT_time_hour	Output	0...65535 Std.	1 h
nvoHrsCompr3	SNVT_time_hour	Output	0...65535 Std.	1 h
nvoHrsCompr4	SNVT_time_hour	Output	0...65535 Std.	1 h
nvoHrsCompr5	SNVT_time_hour	Output	0...65535 Std.	1 h
nvoHrsCompr6	SNVT_time_hour	Output	0...65535 Std.	1 h
Object "0"				
Name of variable	Type	Input/Output		
nvoStatus	SNVT_obj_status	Output	object status, see SNVT-list	
nciNetConfig	SNVT_config_src	Input	configuration, see SNVT-list	
nviRequest	SNVT_obj_request	Input	object request, see SNVT-list	

**Connection information**

Simultaneously pressing the keys SET, UP and DOWN sends a „Service-Pin“ message (the program version of the software is indicated in the display).

The controller responds to a “wave” command with a display flashing 3 times.

Note that if a data logger is used the node number will change at connection (the domain must remain “0”. After a controller reset the new address can be queried with parameter “L0” and “L1”.

These parameters may not be changed after connection (ensured by “nciNetConfig”).

## Connection to data logger

### General note

The following listed measuring values as well as the inputs and outputs are available for the data logger TRL1 via LON interface. In general the setpoints and parameters all are accessible.

### Data logger protocol

Parameter values (read/write)		
Adjustable parameters	P1,P2,P3,P4,P5,P11,P12,P13,P14,P15,P16,P17,P18,P19,P21,P30,P31,P32,P33,P34,P35,P36,P37,P38,P39,P40,P41,P42,P43,P44,A1,A2,A3,A4,A5,A6,A10,A11,A12,A13,A14,A15,A16,A17,A18,A20,A21,A22,A23,A24,A25,A30,A31,A32,A33,A34,A35,A36,A37,A38,A39,A40,A41,A42,A43,A44,A45,A51,A52,A53,A54,A55,A56,A59,L0,L1	
Adjustable setpoints	S1, S11 (=S1')	
Actual values (only read)		Memory address
Actual value temperature	A1	0
Actual value pressure	A2	1
Actual value power	A3	2
Controller status (only read)	D1  Bit 0: Standby-Mode ("1", if "On") Bit 1: Input E1 Bit 2: Bit 3: Bit 4: Bit 5: Bit 6: Output K1 Bit 7: Output K2 Bit 8: Output K3 Bit 9: Output K4 Bit 10: Output K5 Bit 11: Output K6 Bit 12: Bit 13: Bit 14: Bit 15: Alarm (=K7) active	3
Status (adjustable)		
Controller status	Bit 0: Standby-Mode ("1", if "On")	0

### Status messages

Message	Cause	Error elimination
<b>F1L</b>	Sensor error, short circuit	Check sensor
<b>F1H</b>	Sensor error, open circuit	Check sensor
<b>Fb</b>	Exceeding operating range -is interpreted as error if measuring value (P35) and indicated value (P15) are different	Stick to operating range
<b>Flashing display</b>	Temperature alarm	
<b>EP</b>	Data loss at parameter memory (Contacts K1 and K2 are switched off)	If error cannot be eliminated by switching on/off, the controller must be repaired

**Note:** If accordingly parametered the display flashes in case of error or alarm.



## Technical data of ST710-PWHVM.26

### Input

**E1:** External potential-free switching contact

### Measuring input

**F1:** Resistance thermometer Pt100 3-wire  
Measuring range: -200°C...350°C  
Measuring accuracy: 0.5K +/- 0.5 % of scale range, without sensor  
**F2:** linear current input, 4...20mA, 2-wire connection

### 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

### Display

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

### LON communication interface

shielded 2-wire line, Twisted Pair, 78kBaud, not polar, maximum cable length 100m

Interface driver: RS485, galvanically not separated.

The network must be installed in lines topology and be terminated with a resistance of 120 Ohm each on both sides.

### Power supply

12...24 V AC (50/60 Hz) or 16...36V DC  
4.5VA

### Ambient conditions:

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

### Connectors

Plug and socket

Terminal A: 12-pole, spacing 5.0 mm, for cable up to 2.5 mm<sup>2</sup>

Terminal B: 11-pole, spacing 3.5 mm, for cable up to 1.5 mm<sup>2</sup>

### 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