SAUTER

SAUTER
Applications

Technical manual RDT724

7010087003 A

Table of content

Table of content

1 Overview

All the applications described for the RDT724 are implemented in the controller on a fixed basis. The applications can be conveniently changed and parameterised. The entire commissioning of the plant can therefore be carried out without a PC or laptop.

Subsequent application changes are, of course, possible at any time - the procedure is described in the technical manual.

As required, each application can be adapted individually in the extension level. Your Sauter contact will be glad to advise you on the technical possibilities and prices.

As required, each application can be adapted individually in the extension level. Your Sauter contact will be glad to advise you on the technical possibilities and prices.

2 Possible applications: RDT74

Application	Function of application	Abbreviation	Seite
101	ta-led flow-temperature control 1 to 6 zones	**101: TF H 6Z**	**11**
112	ta-led flow-temperature control 2 zones, room connection and automatic pump change-over	**112: TF H 2Z 2P**	**21**
201	Constant supply air temperature control, air heater	**201: TS H**	**27**
202	Return air-(room)-supply air cascade control, air heater/air cooler	**202: CTR HC**	**38**
203	Return air-(room)-supply air cascade control, air heater/air cooler/mixing chamber	**203: CTR HCO**	**38**
204	Return air-(room)-supply air cascade control, air heater/air cooler/heat recovery	**204: CTR HCE**	**45**
205	Constant supply air temperature control, air heater, 2 zones	**205: TS H 2Z**	**52**
206	Return air-(room)-supply air cascade control, air heater/air cooler, 2 zones	**206: CTR HC 2Z**	**59**
211	Supply-return air cascade control, air heater/air cooler with change-over	**211: CTR c**	**67**
212	Supply-return air cascade control, air heater/air cooler with change-over, air heater	**212: CTR cH**	**73**
213	Supply-return air cascade control, air heater/air cooler with change-over, mixing chamber, air heater	**213: CTR cHO**	**79**
214	Return air-(room)-supply air cascade control, air heater/ air heater/air cooler/ mixing chamber	**214: CTR HCOH**	**86**
301	Return air-(room)-supply air cascade control, air heater/air cooler/energy recovery/humidification and dehumidification	**301: CTHR HCEh**	**92**
302	Return air-(room)-supply air cascade control, air heater/air cooler/heat recovery/humidification and dehumidification, humidity limitation	**302: CTHR HCEh L**	**101**
311	Return air-(room)-supply air cascade control, air heater/air cooler/mixing chamber/humidification and dehumidification	**311: CTHR HCOh**	**108**
312	Return air-(room)-supply air cascade control, heating/cooling/supply/demand/humidification and dehumidification, humidity limitation	**312: CTHR HCOh L**	**115**
313	Return air-(room)-supply air cascade control, heating/cooling/supply/demand/humidification and dehumidification, pre-heating	**313: CTHR HCOhH**	**122**
314	Return air-(room)-supply air cascade control, heating/cooling/supply/demand/humidification and dehumidification, humidity limitation, pre-heating	**314: CTHR HCOhHL**	**130**
901	ta-led flow-temperature control, 1 to 3 zones with summer/winter change-over	**901: TF H 3Z**	**138**
902	ta-led flow-temperature control, 2 zones, with summer/winter change-over	**902: TF H 2Z 2P**	**143**
903	Domestic hot water control	**903: DHW**	**148**
904	2-boiler cascade	**904: BC**	**151**
905	Flow temperature regulation with heating/cooling for surface temperature control, 1 zone	**905: TV HKC 1Z**	**155**

Application	Function of application	Abbreviation	Seite
906	Flow temperature control with heating/cooling for surface temperature control, 2 zones	**906: TV HKC 2Z**	**162**
907	Flow temperature control with heating/cooling for multiple-zone surface temperature control, 3 zones	**907: TV HKC 3Z**	**170**
911	Constant supply air temperature control, without/with humidification	**911:THS Hh**	**179**
912	Supply air/return air cascade control, without/with humidification	**912:CTHR HCh**	**184**
913	Supply air/return air cascade control, without/with humidification	**913:CTHR HCEh**	**190**
915	Constant supply air control, 2 zones	**915:TS H 2Z**	**196**
916	Supply air/return air cascade control, 2 zones	**916:CTR HC 2Z**	**201**
921	Supply air/return air cascade control with change-over, without/with humidification	**921: CTFR cB**	**209**
924	Supply air/return air cascade control and constant pre-heater control without/with humidification and dehumidification	**924:CTFR HCEHh**	**215**
935	Constant saturation control and constant supply air control with humidification	**935:THSS HCHh**	**222**
936	Constant saturation control and supply air/return air control with humidification and dehumidification	**936:CTHRS HCHh**	**228**
937	Supply air/return air cascade control with humidity control for swimming pool	**937:CTHRW HE**	**236**

3 Description

3.1.1 Application 101

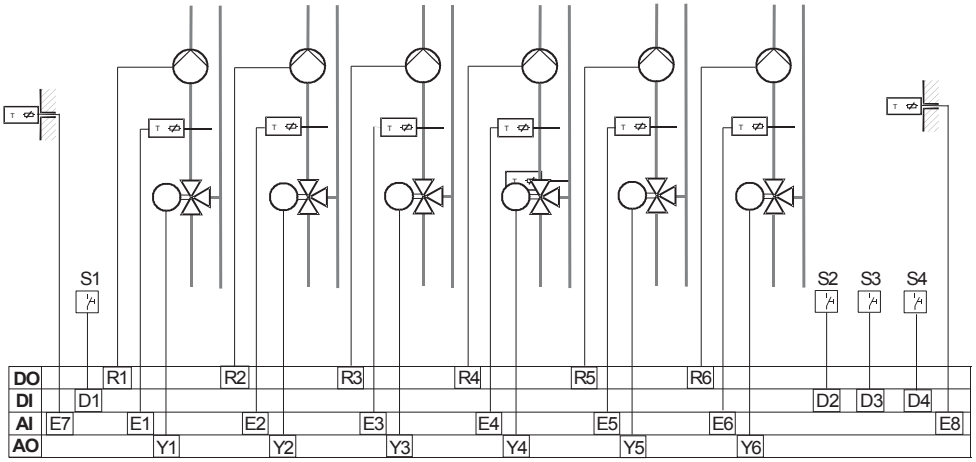
ta-led flow-temperature control, 1 to 6 zones (TF H 6Z)

Plant design:
- Up to 6 static heaters

Control functions:
- Up to 6 ta-led heating control loops

Control functions:
- 1-6 zones
- Timer with 3 channels (channels can be assigned freely).

Plant schematic:



Description:

Function

The temperature control compares the flow temperature with the setpoint and controls the heating valve according to the control deviation.
The number of zones can be set from 1- 6.
When the plant is switched off from the main switch, the frost protection setpoint is active. If zones 4 - 6 are not used their anlog and digital outputs can be configured for other functions.

Options

Reduced mode (timer or digital input)

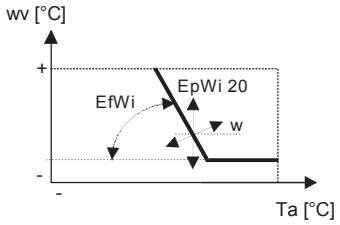
For reduced mode, 3 timer channels and 3 digital inputs are available, in pairs. The zones can be assigned to the timer channels and digital inputs.
The timer programme or the digital input switches the zone setpoint over to the reduced setpoint.

Setpoint shift

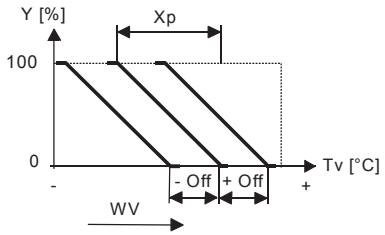
The change to the setpoint is dependent on the outside temperature, in accordance with the adjusted influence (see the diagram). The zones can be assigned

to one of the two outside sensors. The fixed point and influence can be adjusted for each zone.

3.1.1.1 Functional diagrams



Setpoint shift acc. to outside temperature



Heating sequence

3.1.1.2 Parameter list

ta-led flow-temperature control, 1 to 6 zones (TF H 6Z)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Z1 Setp	19.3°C	Flow setpoint	Zone 1		
Val	14.4°C	Actual flow value	Zone 1		
Z2 Setp	19.3°C	Flow setpoint	Zone 2		
Val	14.4°C	Actual flow value	Zone 2		
Z3 Setp	19.3°C	Flow setpoint	Zone 3		
Val	14.4°C	Actual flow value	Zone 3		
Z4 Setp	19.3°C	Flow setpoint	Zone 4		
Val	14.4°C	Actual flow value	Zone 4		
Z5 Setp	19.3°C	Flow setpoint	Zone 5		
Val	14.4°C	Actual flow value	Zone 5		
Z6 Setp	19.3°C	Flow setpoint	Zone 6		
Val	14.4°C	Actual flow value	Zone 6		
Setpoints					
	Shown according to parameter A002, zones				
D111	Z1 setpt1	Setpoint ‘Normal’, zone 1		20.0°C	
D112	Z1 setpt2	Setpoint ‘Reduced’, zone 1	Timer or digital input	15.0°C	
D113	Z1 setpt3	Setpoint ‘Frost protection’, zone 1	Main switch	5.0°C	
D121	Z2 setpt1	Setpoint ‘Normal’, zone 2		20.0°C	
D122	Z2 setpt2	Setpoint ‘Reduced’, zone 2	Timer or digital input	15.0°C	
D123	Z2 setpt3	Setpoint ‘Frost protection’, zone 2	Main switch	5.0°C	
D131	Z3 setpt1	Setpoint ‘Normal’, zone 3		20.0°C	
D132	Z3 setpt2	Setpoint ‘Reduced’, zone 3	Timer or digital input	15.0°C	
D133	Z3 setpt3	Setpoint ‘Frost protection’, zone 3	Main switch	5.0°C	
D141	Z4 setpt1	Setpoint ‘Normal’, zone 4		20.0°C	
D142	Z4 setpt2	Setpoint ‘Reduced’, zone 4	Timer or digital input	15.0°C	
D143	Z4 setpt3	Setpoint ‘Frost protection’, zone 4	Main switch	5.0°C	
D151	Z5 setpt1	Setpoint ‘Normal’, zone 5		20.0°C	
D152	Z5 setpt2	Setpoint ‘Reduced’, zone 5	Timer or digital input	15.0°C	
D153	Z5 setpt3	Setpoint ‘Frost protection’, zone 5	Main switch	5.0°C	
D161	Z6 setpt1	Setpoint ‘Normal’, zone 6		20.0°C	
D162	Z6 setpt2	Setpoint ‘Reduced’, zone 6	Timer or digital input	15.0°C	
D163	Z6 setpt3	Setpoint ‘Frost protection’, zone 6	Main switch	5.0°C	
Basic configuration					
A001	Application	Flow - HC	Flow - heating, 1-6 zones	101	
A002	Zones	Number of zones	1..6	1	
Zone 1					
A002	Zones	Number of zones	1..6	1	

Number	Display	Function	Additional information	Factory setting	Setting
Options					
	Reduced mode, setpoint 2				
A010	Z1 red.mod	Selection of setpoint 2, zone 1	0=off 1=timer ch. 1 or digital input 2 2=timer ch. 2 or digital input 3 3=timer ch. 3 or digital input 4	1	
D400	Timer channel 1	Timer channel 1		1	
D500	Timer channel 2	Timer channel 2		1	
D600	Timer channel 3	Timer channel 3		1	
	Shift				
A011	Z1 shift	Selection of outside temp., zone 1	0=off 1=input E7 2=input E8	1	
	Setpoints Zone 1				
D116	Activ Setpoint 1				
D117	Main Setpoint				
	Display Zone 1				
D201	Display Input E1				
D211	Display Output Y1				
D228	Display Output R1				
I/O configuration					
	Analogue inputs				
A110	E1 Function	Flow temp. sensor, zone 1	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication, zone 1	Off	0	
A117	E1 Cal.temp.	Temperature calibration, zone 1	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value, zone 1	In case of sensor error	22.0°C	
A120	E2 Function	Flow temp. sensor, zone 2	Not used	0	
A130	E3 Function	Flow temp. sensor, zone 3	Not used	0	
A140	E4 Function	Flow temp. sensor, zone 4	Not used	0	
A150	E5 Function	Flow temp. sensor, zone 5	Not used	0	
A160	E6 Function	Flow temp. sensor, zone 6	Not used	0	
	A170-A188 are dependent on the shift				
A170	E7 Function	Outside temperature sensor 1	Temp. Ni1000	3	
A177	E7 Cal.temp.	Temperature calib., outside sensor 1	Input: meas. val.	°C	
A178	E7 Sim.val.	Simulation value, outside sensor 1	In case of sensor error	0.0°C	
A180	E8 Function	Outside temperature sensor 2	Not used	0	
A187	E8 Cal.temp.	Temperature calib., outside sensor 2	Input: meas. val.	°C	
A188	E8 Sim.val.	Simulation value, outside sensor 2	In case of sensor error	0.0°C	
	Digital inputs				
A210	D1 Function	Main switch (‘Frost’ setpoint is active)	Active if low	101	
	A220-A240 are dependent on reduced mode				
A220	D2 Function	Setp. change-over switch 1	Not used	0	
A230	D3 Function	Setp. change-over switch 2	Not used	0	
A240	D4 Function	Setp. change-over switch 3	Not used	0	
	Analogue outputs				
A310	Y1 Function	Three-way valve, zone 1	Analogue output	1	
A311	Y1 action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking			
A320	Y2 Function	Three-way valve, zone 2	Not used	0	
A330	Y3 Function	Three-way valve, zone 3	Not used	0	
E340	Y4 Function	Three-way valve, zone 4	Not used	0	
E350	Y5 Function	Three-way valve, zone 5	Not used	0	
E360	Y6 Function	Three-way valve, zone 6	Not used	0	

Description

Number	Display	Function	Additional information	Factory setting	Setting
	Digital outputs				
A410	R1 Function	Circul. pump, zone 1	Digital (On)	2	
A411	R1 action	Directional control	Normal NO	0	
A414	R1 Td on	Switch-on delay		0s	
A415	R1 Td off	Switch-off delay		1800s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 Blocking	Blocking	None	0	
A420	R2 Function	Circul. pump, zone 2	Not used	0	
A430	R3 Function	Circul. pump, zone 3	Not used	0	
E440	R4 Function	Circul. pump, zone 4	Not used	0	
E450	R5 Function	Circul. pump, zone 5	Not used	0	
E460	R6 Function	Circul. pump, zone 6	Not used	0	
Limitations					
P500	SP1 Max	Maximum setpoint, zone 1	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint, zone 1	Room setpoint	5.0°C	
P520	LIM1 Max	Maximum limitation, zone 1	Flow temperature	80.0°C	
P521	LIM1 Min	Minimum limitation, zone 1	Flow temperature	5.0°C	
Shift parameters					
P541	SPS1 pt wi	Winter cut-in point		20°C	
P542	SPS1 inf wi	Winter influence		1.0	
PID controller(s)					
P632	PID1 Tn	PID1 I-term, zone 1	Output Y1	160s	
P633	PID1 Tv	PID1 D-term, zone 1	Output Y1	0.0s	
Sequence					
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	20.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	10.0K	
Zone 2					
A002	Zones	Number of zones	1..6	2	
Options					
	Reduced mode, setpoint 2				
A020	Z2 Red.mod	Selection of setpoint 2, zone 2	0=off 1=timer ch. 1 or digital input 2 2=timer ch. 2 or digital input 3 3=timer ch. 3 or digital input 4	1	
D400	Timer channel 1	Timer channel 1		1	
D500	Timer channel 2	Timer channel 2		1	
D600	Timer channel 3	Timer channel 3		1	
	Shift				
A021	Z2 Shift	Selection of outside temp., zone 2	0=off 1=input E7 2=input E8	1	
	Setpoints Zone 2				
D126	Activ Setpoint 2				
D127	Main Setpoint				
	Display Zone 2				
D202	Display Input E2				
D212	Display Output Y2				
D228	Display Output R2				
I/O configuration					
	Analogue inputs				
A120	E2 Function	Flow temp. sensor, zone 2	Temp. Ni1000	3	
A121	E2 Scheme	Sensor multiplication, zone 2	Off	0	
A127	E2 Cal.temp.	Temperature calibration, zone 2	Input: meas. val.	°C	
A128	E2 Sim.val.	Simulation value, zone 2	In case of sensor error	22.0°C	

Number	Display	Function	Additional information	Factory setting	Setting
	Analogue outputs				
A320	Y2 Function	Three-way valve, zone 2	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A328	Y2 Blocking	Blocking			
	Digital outputs				
A420	R2 Function	Circul. pump, zone 2	Digital (On)	2	
A421	R2 Action	Directional control	Normal NO	0	
A424	R2 Td on	Switch-on delay		0s	
A425	R2 Td off	Switch-off delay		1800s	
A426	R2 min on	Minimum operating time		0s	
A427	R2 min off	Minimum idle time		0s	
A428	R2 Blocking	Blocking	None	0	
Limitations					
P502	SW2 Max	Maximum setpoint, zone 2	Room setpoint	30.0°C	
P503	SW2 Min	Minimum setpoint, zone 2	Room setpoint	5.0°C	
P522	LIM2 Max	Maximum limitation, zone 2	Flow temperature	80.0°C	
P523	LIM2 Min	Minimum limitation, zone 2	Flow temperature	5.0°C	
Shift parameters					
P551	SPS2 pt wi	Winter cut-in point	Fixed point 22.0°C	22.0°C	
P552	SPS2 inf wi	Winter influence	Slope (factor)	1.0	
PID controller(s)					
P642	PID2 Tn	PID2 I-term, zone 2	Output Y2	160s	
P643	PID2 Tv	PID2 D-term, zone 2	Output Y2	0.0s	
Sequence					
P702	SEQ2 P-band	Proportional band (Xp)	Output Y2	20.0K	
P703	SEQ2 Offset	Offset (Of)	Output Y2	10.0K	
Zone 3					
A002	Zones	Number of zones	1..6	3	
Options					
	Reduced mode, setpoint 2				
A030	Z3 Red.mod	Selection of setpoint 2, zone 3	0=off 1=timer ch. 1 or digital input 2 2=timer ch. 2 or digital input 3 3=timer ch. 3 or digital input 4	1	
D400	Timer channel 1	Timer channel 1		1	
D500	Timer channel 2	Timer channel 2		1	
D600	Timer channel 3	Timer channel 3		1	
	Shift				
A031	Z3 shift	Selection of outside temp., zone 3	0=off 1=input E7 2=input E8	1	
	Setpoints Zone 3				
D136	Activ Setpoint 3				
D137	Main Setpoint				
	Display Zone 3				
D203	Display Input E3				
D213	Display Output Y3				
D228	Display Output R3				
I/O configuration					
	Analogue inputs				
A130	E3 Function	Flow temp. sensor, zone 3	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication, zone 3	Off	0	
A137	E3 Cal.temp.	Temperature calibration, zone 3	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value, zone 3	In case of sensor error	22.0°C	

Number	Display	Function	Additional information	Factory setting	Setting
	Analogue outputs				
A330	Y3 Function	Three-way valve, zone 3	Analogue output	1	
A331	Y3 Action	Directional control	Normal 0-10VDC	0	
A332	Y3 Max	Maximum value	Output Y3	100.0%	
A333	Y3 Min	Minimum value	Output Y3	0.0%	
A338	Y3 Blocking	Blocking			
	Digital outputs				
A430	R3 Function	Circul. pump, zone 3	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		1800s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking	None	0	
Limitations					
P504	SP3 Max	Maximum setpoint, zone 3	Room setpoint	30.0°C	
P505	SP3 Min	Minimum setpoint, zone 3	Room setpoint	5.0°C	
P524	LIM3 Max	Maximum limitation, zone 3	Flow temperature	80.0°C	
P525	LIM3 Min	Minimum limitation, zone 3	Flow temperature	5.0°C	
Shift parameters					
P561	SPS3 pt wi	Winter cut-in point	Fixed point	22.0°C	
P562	SPS3 inf wi	Winter influence	Slope (factor)	1.0	
PID controller(s)					
P652	PID3 Tn	PID3 I-term, zone 3	Output Y3	160s	
P653	PID3 Tv	PID3 D-term, zone 3	Output Y3	0.0s	
Sequences					
P704	SEQ3 P-band	Proportional band (Xp)	Output Y3	20.0K	
P705	SEQ3 Offset	Offset (Of)	Output Y3	10.0K	
Zone 4					
A002	Zones	Number of zones	1..6	4	
Options					
	Reduced mode, setpoint 2				
A040	Z4 Red.mod	Selection of setpoint 2, zone 4	0=off 1=timer ch. 1 or digital input 2 2=timer ch. 2 or digital input 3 3=timer ch. 3 or digital input 4	1	
D400	Timer channel 1	Timer channel 1		1	
D500	Timer channel 2	Timer channel 2		1	
D600	Timer channel 3	Timer channel 3		1	
	Shift				
A041	Z4 shift	Selection of outside temp., zone 4	0=off 1=input E7 2=input E8	1	
	Setpoints Zone 4				
D146	Activ Setpoint 4				
D147	Main Setpoint				
	Display Zone 4				
D204	Display Input E4				
D214	Display Output Y4				
D228	Display Output R4				
I/O configuration					
	Analogue inputs				
A140	E4 Function	Flow temp. sensor, zone 4	Temp. Ni1000	3	
A141	E4 Action	Sensor multiplication, zone 4	Off	0	
A147	E4 Cal.temp.	Temperature calibration, zone 4	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value, zone 4	In case of sensor error	22.0°C	

Number	Display	Function	Additional information	Factory setting	Setting
	Analogue outputs				
E340	Y4 Function	Three-way valve, zone 4	Analogue output (Measuring point 1)	61	
E341	Y4 Action	Directional control	Normal 0-10VDC	0	
E342	Y4 Max	Maximum value	Output Y4	100.0%	
E343	Y4 Min	Minimum value	Output Y4	0.0%	
E348	Y4 Blocking	Blocking			
	Digital outputs				
E440	R4 Function	Circul. pump, zone 4	Digital (On) (Measuring point 2)	62	
E441	R4 Action	Directional control	Normal NO	0	
E444	R4 Td on	Switch-on delay		0s	
E445	R4 Td off	Switch-off delay		1800s	
E446	R4 min on	Minimum operating time		0s	
E447	R4 min off	Minimum idle time		0s	
E448	R4 Blocking	Blocking	None	0	
Limitations					
P506	SP4 Max	Maximum setpoint, zone 4	Room setpoint	30.0°C	
P507	SP4 Min	Minimum setpoint, zone 4	Room setpoint	5.0°C	
P526	LIM4 Max	Maximum limitation, zone 4	Flow temperature	80.0°C	
P527	LIM4 Min	Minimum limitation, zone 4	Flow temperature	5.0°C	
Shift parameters					
P571	SPS4 pt wi	Winter cut-in point	Fixed point	22.0°C	
P572	SPS4 inf wi	Winter influence	Slope (factor)	1.0	
PID controller(s)					
P662	PID4 Tn	PID4 I-term, zone 4	Output Y4	160s	
P663	PID4 Tv	PID4 D-term, zone 4	Output Y4	0.0s	
Sequence					
P706	SEQ4 P-band	Proportional band (Xp)	Output Y4	20.0K	
P707	SEQ4 Offset	Offset (Of)	Output Y4	10.0K	
Zone 5					
A002	Zones	Number of zones	1..6	5	
Options					
	Reduced mode, setpoint 2				
A050	Z5 Red.mod	Selection of setpoint 2, zone 5	0=off 1=timer ch. 1 or digital input 2 2=timer ch. 2 or digital input 3 3=timer ch. 3 or digital input 4	1	
D400	Timer channel 1	Timer channel 1		1	
D500	Timer channel 2	Timer channel 2		1	
D600	Timer channel 3	Timer channel 3		1	
	Shift				
A051	Z5 shift	Selection of outside temp., zone 5	0=off 1=input E7 2=input E8	1	
	Setpoints Zone 5				
D156	Activ Setpoint 5				
D157	Main Setpoint				
	Display Zone 5				
D205	Display Input E5				
D215	Display Output Y5				
D229	Display Output R5				

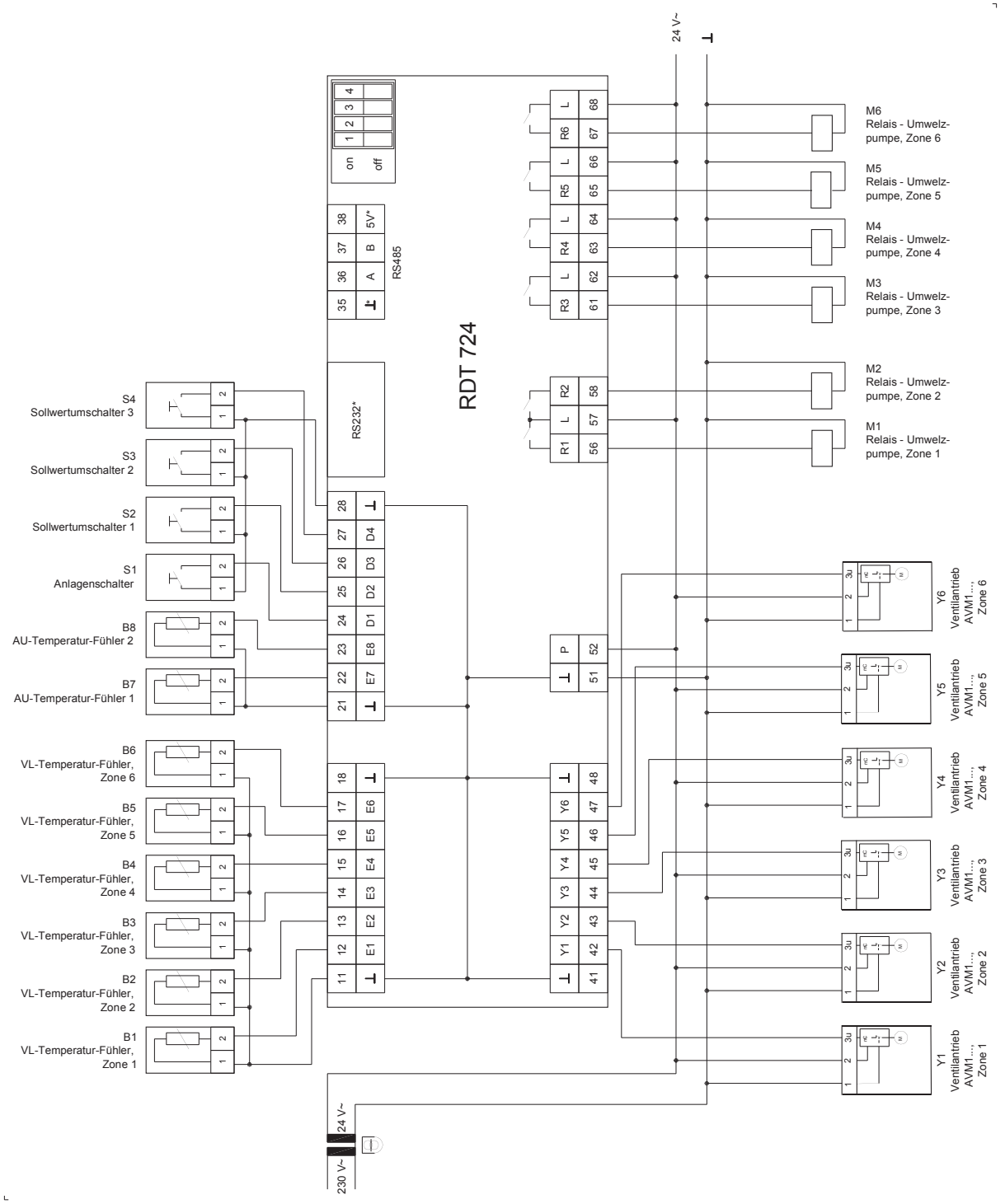
Description

Number	Display	Function	Additional information	Factory setting	Setting
I/O configuration					
	Analogue inputs				
A150	E5 Function	Flow temp. sensor, zone 5	Temp. Ni1000	3	
A157	E5 Cal.temp.	Temperature calibration, zone 5	Input: meas. val.	°C	
A158	E5 Sim.val.	Simulation value, zone 5	In case of sensor error	22.0°C	
	Analogue outputs				
E350	Y5 Function	Three-way valve, zone 5	Analogue output (Measuring point 3)	63	
E351	Y5 Action	Directional control	Normal 0-10VDC	0	
E352	Y5 Max	Maximum value	Output Y5	100.0%	
E353	Y5 Min	Minimum value	Output Y5	0.0%	
E358	Y5 Blocking	Block			
	Digital outputs				
E450	R5 Function	Circul. pump, zone 5	Digital (On) (Measuring point 4)	64	
E451	R5 Action	Directional control	Normal NO	0	
E454	R5 Td on	Switch-on delay		0s	
E455	R5 Td off	Switch-off delay		1800s	
E456	R5 min on	Minimum operating time		0s	
E457	R5 min off	Minimum idle time		0s	
E458	R5 Block	Block	None	0	
Limitations					
P508	SP5 Max	Maximum setpoint, zone 5	Room setpoint	30.0°C	
P509	SP5 Min	Minimum setpoint, zone 5	Room setpoint	5.0°C	
P528	LIM5 Max	Maximum limitation, zone 5	Flow temperature	80.0°C	
P529	LIM5 Min	Minimum limitation, zone 5	Flow temperature	5.0°C	
Shift parameters					
P581	SPS5 pt wi	Winter cut-in point	Fixed point	22.0°C	
P582	SPS5 inf wi	Winter influence	Slope (factor)	1.0	
PID controller(s)					
P672	PID5 Tn	PID5 I-term, zone 5	Output Y5	160s	
P673	PID5 Tv	PID5 D-term, zone 5	Output Y5	0.0s	
Sequence					
P708	SEQ5 P-band	Proportional band (Xp)	Output Y5	20.0K	
P709	SEQ5 Offset	Offset (Of)	Output Y5	10.0K	
Zone 6					
A002	Zones	Number of zones	1..6	6	
Options					
	Reduced mode, setpoint 2				
A060	Z6 Red.mod	Selection of setpoint 2, zone 6	0=off 1=timer ch. 1 or digital input 2 2=timer ch. 2 or digital input 3 3=timer ch. 3 or digital input 4	1	
D400	Timer channel 1	Timer channel 1		1	
D500	Timer channel 2	Timer channel 2		1	
D600	Timer channel 3	Timer channel 3		1	
	Shift				
A061	Z6 shift	Selection of outside temp., zone 6	0=off 1=input E7 2=input E8	1	

Number	Display	Function	Additional information	Factory setting	Setting
	Setpoints Zone 6				
D166	Activ Setpoint 6				
D167	Main Setpoint				
	Display Zone 6				
D206	Display Input E6				
D216	Display Output Y6				
D229	Display Output R6				
I/O configuration					
	Analogue inputs				
A160	E6 Function	Flow temp. sensor, zone 6	Temp. Ni1000	3	
A167	E6 Cal.temp.	Temperature calibration, zone 6	Input: meas. val.	°C	
A168	E6 Sim.val.	Simulation value, zone 6	In case of sensor error	22.0°C	
	Analogue outputs				
E360	Y6 Function	Three-way valve, zone 6	Analogue output (Measuring point 5)	65	
E361	Y6 Action	Directional control	Normal 0-10VDC	0	
E362	Y6 Max	Maximum value	Output Y6	100.0%	
E363	Y6 Min	Minimum value	Output Y6	0.0%	
E368	Y6 Blocking	Block			
	Digital outputs				
E460	R6 Function	Circul. pump, zone 6	Digital (On) (Measuring point 6)	66	
E461	R6 Action	Directional control	Normal NO	0	
E464	R6 Td on	Switch-on delay		0s	
E465	R6 Td off	Switch-off delay		1800s	
E466	R6 min on	Minimum operating time		0s	
E467	R6 min off	Minimum idle time		0s	
E468	R6 Blocking	Block	None	0	
Limitations					
P510	SP6 Max	Maximum setpoint, zone 6	Room setpoint	30.0°C	
P511	SP6 Min	Minimum setpoint, zone 6	Room setpoint	5.0°C	
P530	LIM6 Max	Maximum limitation, zone 6	Flow temperature	80.0°C	
P531	LIM6 Min	Minimum limitation, zone 6	Flow temperature	5.0°C	
Shift parameters					
P591	SPS6 pt wi	Winter cut-in point	Fixed point	22.0°C	
P592	SPS6 inf wi	Winter influence	Slope (factor)	1.0	
PID controller(s)					
P682	PID6 Tn	PID6 I-term, zone 6	Output Y6	160s	
P683	PID6 Tv	PID6 D-term, zone 6	Output Y6	0.0s	
Sequence					
P710	SEQ6 P-band	Proportional band (Xp)	Output Y6	20.0K	
P711	SEQ6 Offset	Offset (Of)	Output Y6	10.0K	
Measuring points					
MP1		Output Valve Zone 4			
MP2		Output Pump Zone 4			
MP3		Output Valve Zone 5			
MP4		Output Pump Zone 5			
MP5		Output Valve Zone 6			
MP6		Output Pump Zone 6			

3.1.1.3 Wiring diagramm

ta-led flow-temperature control, 1 to 6 zones (TF H 6Z)



3.1.2 Application 112

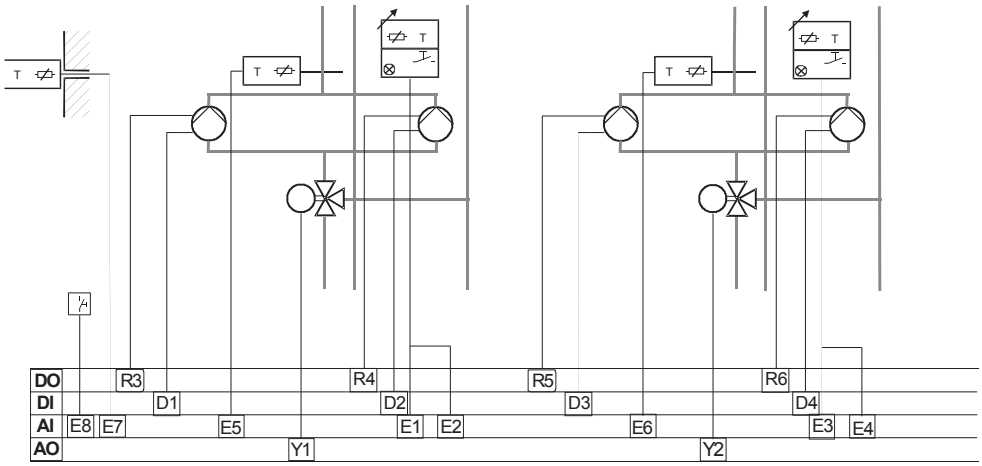
ta-led flow-temperature control, 2 zones (TF H 2Z 2P)

Plant design:
- 2 static heaters

Control functions:
- 2 ta-led heating control loops with room connection

Control functions:
- 2 zones
- Timer with 2 (3) channels (channels can be assigned freely).
- Automatic pump change-over
- Pump change-over in case of a fault

Plant schematic:



Functions

The temperature control compares the flow temperature with the flow setpoint and controls the heating valve according to the control deviation.
The change to the flow setpoint is dependent on the outside temperature, in accordance with the adjusted influence (see the diagram). The fixed point and influence can be adjusted for each zone.
Automatic pump switching compensates the operating hours of the two pumps and in addition, the pumps are switched over in case of a fault.
When the plant is switched off from the main switch, the frost protection setpoint is active.

Options

External setpoint

The setpoint can be corrected via the XPESF001 room remote control.

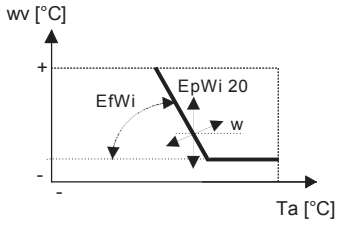
Reduced mode (timer / room remote control)

One timer channel is available per zone for reduced mode. The timer programme switches the room setpoint over to the reduced setpoint.
In addition, with a room remote control, the plant can be switched over from automatic to continuous mode, normal or reduced.

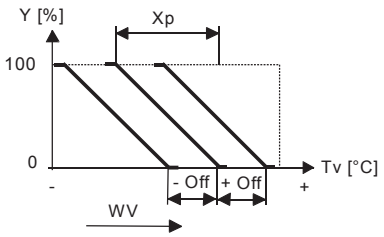
Description

A room temperature sensor can be connected for each zone. This sensor corrects the flow setpoint in accordance with the deviation. The influence can be adjusted.

3.1.2.1 Functional diagrams



Setpoint shift acc. to outside temperature



Heating sequence

3.1.2.2 Parameter list

ta-led flow-temperature control, 2 zones (TF H 2Z 2P)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Z1 Setp	20.0°C	Room setpoint	Zone 1		
Val	20.8°C	Actual room value	Zone 1		
Z1 Fsetp	28.0°C	Flow setpoint	Zone 1		
Fval	30.8°C	Actual flow value	Zone 1		
Z2 Setp	20.0°C	Room setpoint	Zone 2		
Val	20.8°C	Actual room value	Zone 2		
Z2 Fsetp	28.0°C	Flow setpoint	Zone 2		
Fval	30.8°C	Actual flow value	Zone 2		
Setpoints					
	Shown according to parameter A002. zones				
D111	Z1 setpt 1	Room setpoint ‘Normal’, zone 1		20.0°C	
D112	Z1 setpt 2	Room setpoint ‘Reduced’, zone 1	Timer / room remote control	15.0°C	
D113	Z1 setpt 3	Room setpoint ‘Frost protection’, zone 1	Main switch	5.0°C	
D121	Z2 setpt 1	Room setpoint ‘Normal’, zone 2		20.0°C	
D122	Z2 setpt 2	Room setpoint ‘Reduced’, zone 2	Timer / room remote control	15.0°C	
D123	Z2 setpt 3	Room setpoint ‘Frost protection’, zone 2	Main switch	5.0°C	
Basic configuration					
A001	Application	Flow - HC	TF H 2Z 2P	112	
A002	Zones	Number of zones	1..2	1	
	Options (described on the next page)				
A010	Z1 Ext.setp	External setpoint, zone 1	Off	0	
A012	Z1 Roomctr.	Room connection, zone 1	Off	0	
A014	Z1 Red.mod.	Reduced mode, zone 1 (timer K1)	Stand-by mode	1	
A020	Z2 Ext.setp	External setpoint, zone 2	Off	0	
A022	Z2 Roomctr.	Room connection, zone 2	Off	0	
A024	Z2 Red.mod.	Reduced mode, zone 2 (timer K2)	Off	0	

Number	Display	Function	Additional information	Factory setting	Setting
I/O configuration					
	Analogue inputs				
A170	E7 Function	Outside temp. sensor	Temp. Ni1000	3	
A177	E7 Cal.temp.	Temperature calibration	Input: meas. val.	°C	
A178	E7 Sim.value	Simulation value	In case of sensor error	0.0°C	
A180	E8 Function	Main switch	Active if low	101	
Zone 1					
I/O configuration					
	Analogue inputs				
A110	E1 Function	Room remote control, zone 1	Not used	0	
A120	E2 Function	Room temperature sensor, zone 1	Not used	0	
A150	E5 Function	Flow temp. sensor, zone 1	Temp. Ni1000	3	
A157	E5 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Digital inputs				
A210	D1 Function	Fault, pump 1, zone 1	Active if low	101	
A220	D2 Function	Fault, pump 2, zone 1	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve, zone 1	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
	Digital outputs				
A430	R3 Function	Pump 1, zone 1	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking	None	0	
A440	R4 Function	Pump 2, zone 1	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint, zone 1	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint, zone 1	Room setpoint	5.0°C	
P520	LIM1 Max	Maximum limitation, zone 1	Flow setpoint	80.0°C	
P521	LIM1 Min	Minimum limitation, zone 1	Flow setpoint	5.0°C	
Shift parameters					
P541	SPS1 pt wi	Winter cut-in point, zone 1	Fixed point	22.0°C	
P542	SPS1 inf wi	Winter influence, zone 1	Slope (factor)	1.0	
PID controller(s)					
P632	PID1 Tn	PID1 I-term, zone 1	Output Y1	160s	
P633	PID1 Tv	PID1 D-term, zone 1	Output Y1	0.0s	
Sequence					
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	20.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	10.0K	
Pump run-on					
P801	TM1 time	Pump run-on, zone 1	Output R3 / R4	1800s	
Operating hours compensation					
P811	Variable 1	Limit value for operating hours, zone 1	Output R3 / R4	100h	

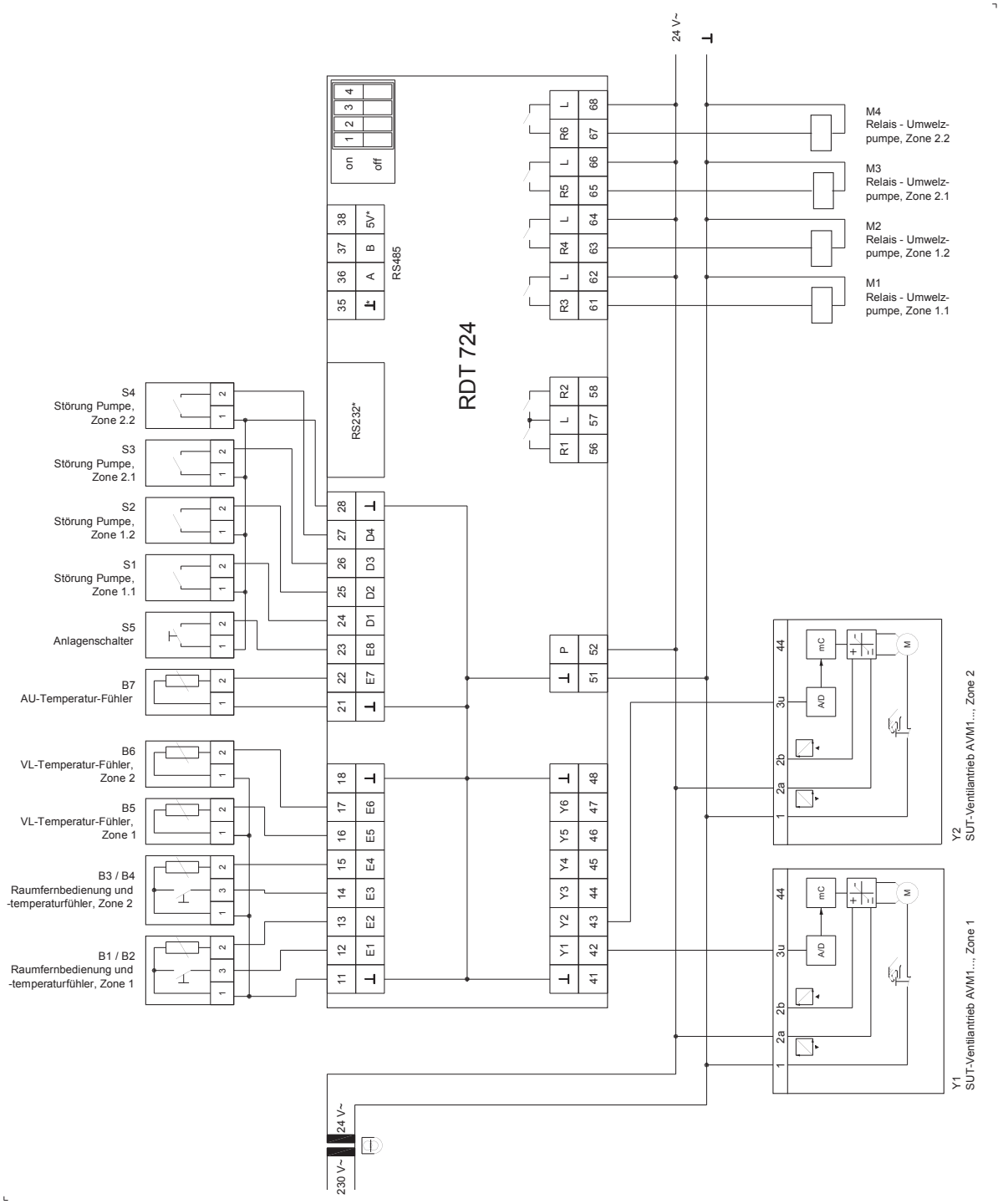
Description

Number	Display	Function	Additional information	Factory setting	Setting
Options					
External setpoint					
A010	Z1 Ext.setp	External setpoint, zone 1	On	1	
	Input E1 setpoint adjuster				
A110	E1 Function	Room remote control, zone 1		14	
A112	E1 Set max	Range maximum		3.0 K	
A113	E1 Set min	Range minimum		-3.0 K	
A114	E1 Cal.max	Calibration of range maximum		K	
A115	E1 Cal.midd	Calibration of range midpoint	Possible only on device	K	
A116	E1 Cal.min	Calibration of range minimum		K	
A118	E1 Sim.val.	Simulation value	In case of sensor error	0.0 K	
Room connection					
A012	Z1 Roomctr	Room connection Zone 1	On	1	
	Input E2 room temperature sensor				
A120	E2 Function	Room temperature sensor, zone 1		6	
A127	E2 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A128	E2 Sim.val.	Simulation value	In case of sensor error	22.0°C	
P641	PID2 P-band	PID2 P-band, zone 1	Room connection	10K	
P642	PID2 Tn	PID2 I-term, zone 1	Room connection	160s	
P643	PID2 Tv	PID2 D-term, zone 1	Room connection	0.0s	
Reduced mode					
A014	Z1 Red.mod	Reduced mode, zone 1	On	1	
	Reduced mode				
D112	Z1setpt 2	Setpoint ‘Reduced’, zone 1	Timer / room remote control	15.0°C	
D400	Timer channel 1	Timer channel 1 Zone 1		1	
Zone 2					
I/O configuration					
	Analogue inputs				
A130	E3 Function	Room remote control, zone 2	Not used	0	
A140	E4 Function	Room temperature sensor, zone 2	Not used	0	
A160	E6 Function	Flow temp. sensor, zone 2	Temp. Ni1000	3	
A167	E6 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A168	E6 Sim.val.	Simulation value	In case of sensor error	22.0°C	
	Digital inputs				
A230	D3 Function	Fault, pump 1, zone 2	Active if low	101	
A240	D4 Function	Fault, pump 2, zone 2	Active if low	101	
	Analogue outputs				
A320	Y2 Function	Three-way valve, zone 2	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A328	Y2 Blocking	Blocking		0	
	Digital outputs				
A450	R5 Function	Pump 1, zone 2	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
A460	R6 Function	Pump 2, zone 2	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking	None	0	

Number	Display	Function	Additional information	Factory setting	Setting
Limitations					
P502	SP2 Max	Maximum setpoint, zone 2	Room setpoint	30.0°C	
P503	SP2 Min	Minimum setpoint, zone 2	Room setpoint	5.0°C	
P522	LIM2 Max	Maximum limitation, zone 2	Flow setpoint	80.0°C	
P523	LIM2 Min	Minimum limitation, zone 2	Flow setpoint	5.0°C	
Shift parameters					
P551	SPS2 pt wi	Winter cut-in point, zone 2	Fixed point	22.0°C	
P552	SPS2 inf wi	Winter influence, zone 2	Slope (factor)	1.0	
PID controller(s)					
P652	PID3 Tn	PID3 I-term, zone 2	Output Y2	160s	
P653	PID3 Tv	PID3 D-term, zone 2	Output Y2	0.0s	
Sequence					
P702	SEQ2 P-band	Proportional band (Xp)	Output Y2	20.0K	
P703	SEQ2 Offset	Offset (Of)	Output Y2	10.0K	
Pump run-on					
P802	TM2 time	Pump run-on, zone 2	Output R5 / R6	1800s	
Operating hours compensation					
P812	Variable 2	Limit value for operating hours, zone 2	Output R5 / R6	100h	
Options					
External setpoint					
A020	Z2 Ext.setp	External setpoint, zone 2	On	1	
	Input E3 setpoint adjuster				
A130	E3 Function	Room remote control, zone 2		14	
A132	E3 Set max	Range maximum		3.0 K	
A133	E3 Set min	Range minimum		-3.0 K	
A134	E3 Cal.max	Calibration of range maximum		K	
A135	E3 Cal.midd	Calibration of range midpoint	Possible only on device	K	
A136	E3 Cal.min	Calibration of range minimum		K	
A138	E3 Sim.val.	Simulation value	In case of sensor error	0.0 K	
Room connection					
A022	Z2 Roomctr	Room connection Zone 2	On	1	
	Input E4 room temperature sensor				
A140	E4 Function	Room temperature sensor, zone 2		6	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	20.0°C	
P661	PID4 P-band	PID4 P-band, zone 2	Room connection	10K	
P662	PID4 Tn	PID4 I-term, zone 2	Room connection	160s	
P663	PID4 Tv	PID4 D-term, zone 2	Room connection	0.0s	
Reduced mode					
A024	Z2 Red.mod.	Reduced mode, zone 2	On	1	
	Reduced mode				
D122	Z2 setpt 2	Setpoint 'Reduced', zone 2	Timer / room remote control	15.0°C	
D500	Timer channel 2	Timer channel 2, zone 2		1	
Measuring points					
MP1		Room setpoint, zone 1 (D116)			
MP2		Flow setpoint, zone 1 (D117)			
MP3		Positioning signal, main controller, zone 1			
MP4		Reduced mode, zone 1			
MP5		Room setpoint, zone 2 (D126)			
MP6		Flow setpoint, zone 2 (D127)			
MP7		Positioning signal, main controller, zone 2			
MP8		Reduced mode, zone 2			

3.1.2.3 Wiring diagramm

ta-led flow-temperature control, 2 zones (TF H 2Z 2P)



3.1.3 Application 201

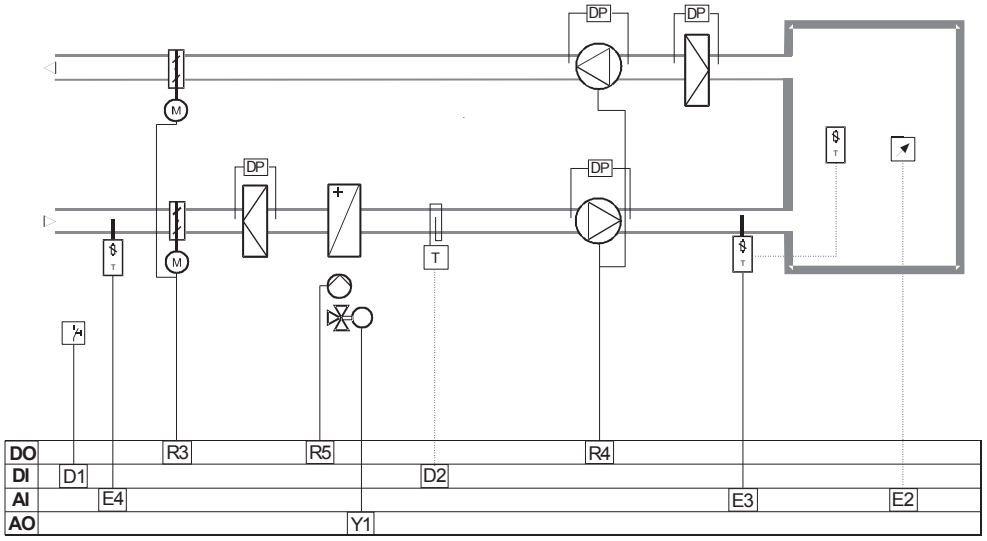
Constant supply air control, air heater (TS H)

Plant design:
- Outside and exhaust air damper
- Supply and return air fan
- Air heater with control valve and pump
- Supply air or room temperature sensor
- Outside temperature sensor

Control functions:
- Temperature control for supply air: constant with ta shift (optional)

Control functions:
- Enable dampers
- Delay fan cut-in
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode

Plant schematic:



Description:

Function

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the supply air or room temperature with the setpoint, and controls the heating valve according to the control deviation. The supply air temperature is limited.

When the plant is switched off from the main switch, the fans are switched off, and the heating valve and dampers are closed.

Options

External setpoint

According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via the setpoint adjuster, XPESF001.

In addition, a room operating unit can be used to switch the plant over from automatic to continuous or stand-by mode.

Setpoint shift

The setpoint is changed in relation to the outside temperature, according to the adjusted influence.

Frost protection

The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. The heating valve is opened fully and the air heater pump is switched on. The frost protection is still active when the plant is switched off.

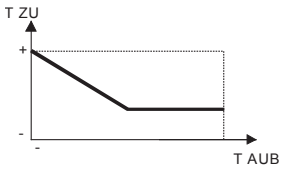
Overheating protection

The overheating protection switches the heating off, the fans are switched on and the dampers are opened. The overheating protection is still active when the plant is switched off.

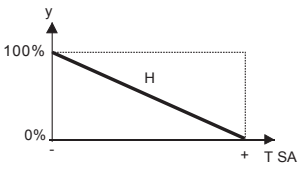
Reduced mode (timer)

The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, the plant is switched on and off at the reduced setpoint (2-point).

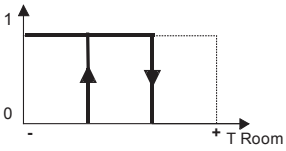
3.1.3.1 Functional diagrams



Setpoint shift acc. to outside temperature



Heating sequence



Stand-by mode with reduced setpoint

3.1.3.2 Parameter list

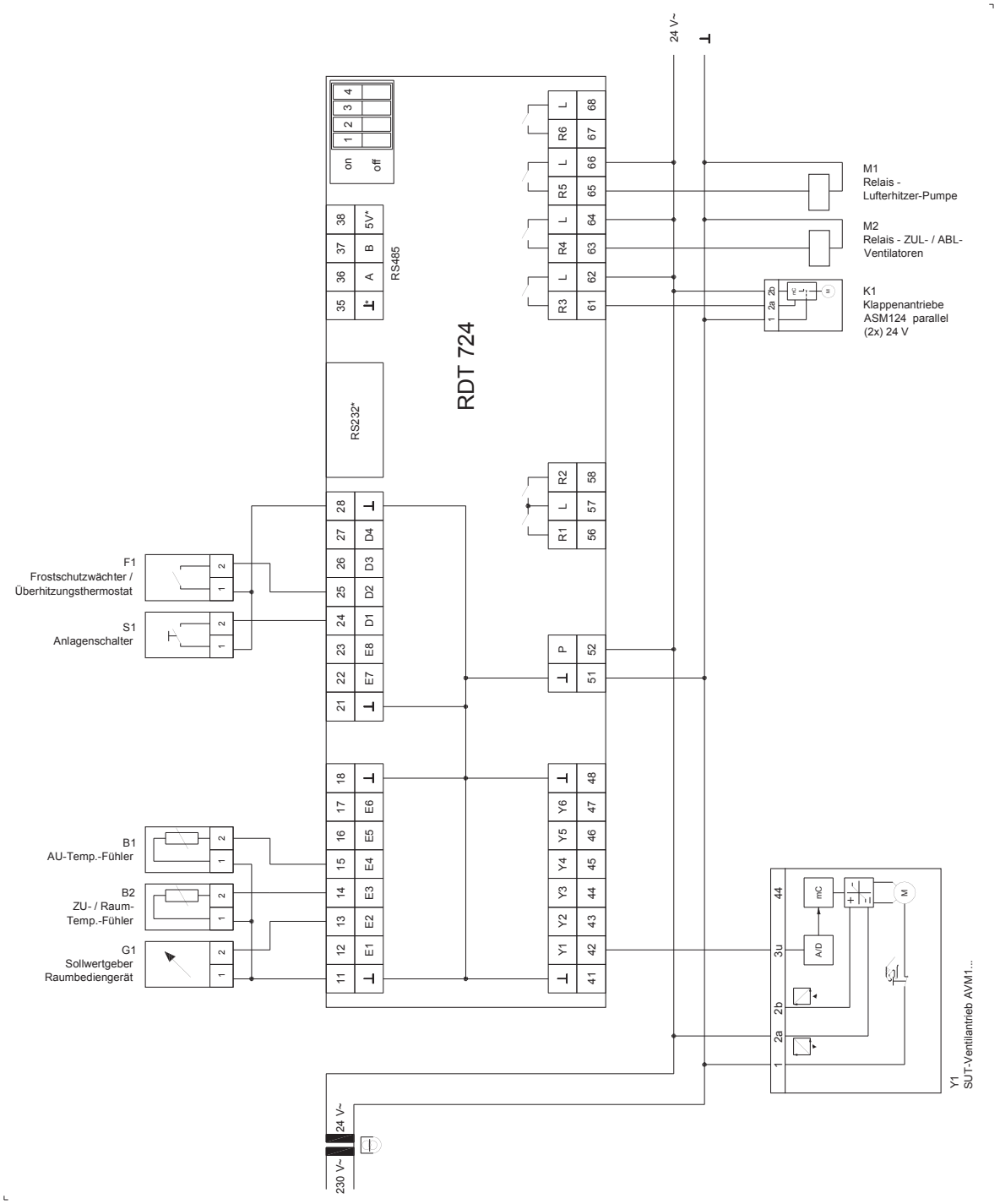
Constant supply air control, air heater (TS H)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room setpoint			
Actual value	20.2°C	Actual room value			
Setpoints					
D111	Setpoint 1	Setpoint 'Normal'		20.0°C	
D112	Setpoint 2	Setpoint 'Reduced'	Timer / room remote control	15.0°C	
Basic configuration					
A001	Application	Application	TS H	201	
	Options (described on the next page)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A013	Protection	Frost protection/overheating protection	Frost protection	1	
A014	Red. mode	Reduced mode (timer)	Stand-by mode	1	
I/O configuration					
	Analogue inputs				
A120	E2 Function	Setpoint adjuster	Not used	0	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (Off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Outside temp. sensor	Not used	0	
	Digital inputs				
A210	D1 Function	Main switch	Active if low	101	
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
	Digital outputs				
A430	R3 Function	Damper actuator	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking	None	0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking	None	0	
A450	R5 Function	Air heater pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint		30.0°C	
P501	SP1 Min	Minimum setpoint		15.0°C	

Number	Display	Function	Additional information	Factory setting	Setting
Controller(s)					
P632	PID1 Tn	PID1 I-term	Output Y1	160s	
P633	PID1 Tv	PID1 D-term	Output Y1	0.0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	2.0K	
Switching points					
P780	2P1 sw.pt	Switching point for pump	Relay R5	5.0%	
P781	2P1 sw.diff	Switching difference for pump	Relay R5	2.0%	
Delays					
P801	TM1 time	Switch-on delay, fans	Relay R4	30s	
Options					
External setpoint					
A010	Ext.setp.	External setpoint	On	1	
	Input E2 setpoint adjuster				
A120	E2 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A122	E2 Set max	Range maximum		40.0°C	
A123	E2 Set min	Range minimum		0.0°C	
A124	E2 Cal.max	Calibration of range maximum		°C	
A125	E2 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A126	E2 Cal.min	Calibration of range minimum		°C	
A128	E2 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Input E4 outside air temperature				
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
A141	E4 Scheme	Sensor multiplication	Normal input (Off)	0	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 Lim Wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 lim su	Summer limitation		26.0°C	
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating protection	Frost protection	1	
			Overheating protection	2	
	Input D2				
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
Reduced mode (stand-by mode with timer)					
A014	Red. mode	Reduced mode	Stand-by mode on	1	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
Measuring points					
MP1		Active setpoint (D116)			
MP2		Main setpoint (D117)			
MP3		Positioning signal, main controller			
MP4		Stand-by mode (0/1)			
MP5		Control mode (0/1)			

3.1.3.3 Wiring diagramm

Constant supply air control, air heater (TS H)



3.1.4 Application 202

Supply-return air cascade control, air heater/air cooler (CTR HC)

Plant design:

- Outside and exhaust air damper
- Supply and return air fan
- Air heater, air cooler with control valve and pump
- Supply air, return air or room temperature sensor
- Outside temperature sensor

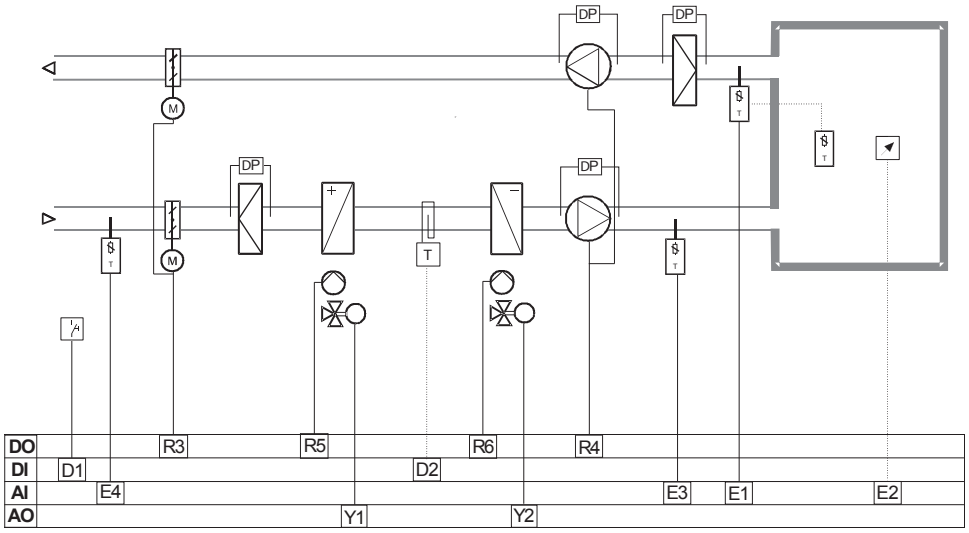
Control functions:

- Temperature control, return air-supply air, cascade with ta shift (optional)

Control functions:

- Enable dampers
- Delay fan cut-in
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode
- Free night cooling

Plant schematic:



Description:

Functions

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1 or cooling valve Y2 according to the control deviation. The supply air temperature is limited.

When the plant is switched off from the main switch, the fans are switched off, and the heating valve and dampers are closed.

Options

External setpoint

According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via the setpoint adjuster, XPESF001.
In addition, a room operating unit can be used to switch the plant over from automatic to continuous or stand-by mode.

Setpoint shift

The setpoint is changed in relation to the outside temperature, according to the adjusted influence.

Frost protection

The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. The heating valve is opened fully and the air heater pump is switched on. The frost protection is still active when the plant is switched off.

Overheating protection

The overheating protection switches the heating off, the fans are switched on and the dampers are opened. The overheating protection is still active when the plant is switched off.

Reduced mode (timer)

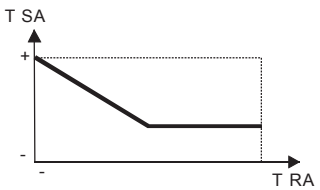
Channel 1

The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, the plant is switched on and off at the reduced setpoint (2-point).

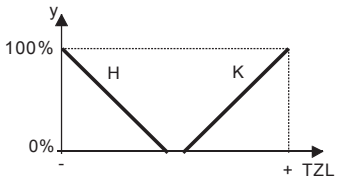
Channel 2

If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2, provided that the conditions are met, i.e. the room temperature is above the setpoint and the outside temperature is lower than the room temperature. The dampers are opened and the fans are switched on after a delay.

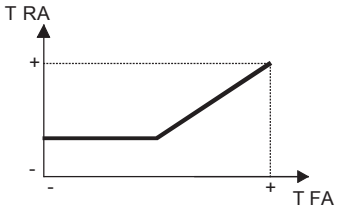
3.1.4.1 Functional diagrams



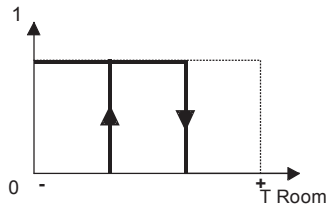
Return-supply air cascade



Heating-cooling sequence



Setpoint shift acc. to outside temperature



Stand-by mode with reduced setpoint

Description

3.1.4.2 Parameter list

Supply-return air cascade control, air heater/air cooler (CTR HC)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room setpoint			
Act. val.	20.2°C	Actual room value			
Setp sup	38.0°C	Supply air setpoint			
A.val su	27.2°C	Supply air - actual value			
Setpoints					
D111	Setpoint 1	Setpoint 'Normal'		20.0°C	
D112	Setpoint 2	Setpoint 'Reduced'	Timer / room remote control	15.0°C	
Basic configuration					
A001	Application	Application	CTR HC	202	
	Options (described on the next page)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour	Cascade	2	
A013	Protection	Frost protection/overheating protection	Frost protection	1	
A014	Red. mode	Reduced mode (timer)	Stand-by mode	1	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Return air temperature sensor	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication	Normal input (Off)	0	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A120	E2 Function	Setpoint adjuster	Not used	0	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (Off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Outside temp. sensor	Not used	0	
	Digital inputs				
A210	D1 Function	Main switch	Active if low	101	
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve 'heating'	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
A320	Y2 Function	Three-way valve 'cooling'	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A328	Y2 Blocking	Blocking		0	
	Digital outputs				
A430	R3 Function	Damper actuator	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking	None	0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking	None	0	
A450	R5 Function	Air heater pump	Digital (On)	2	

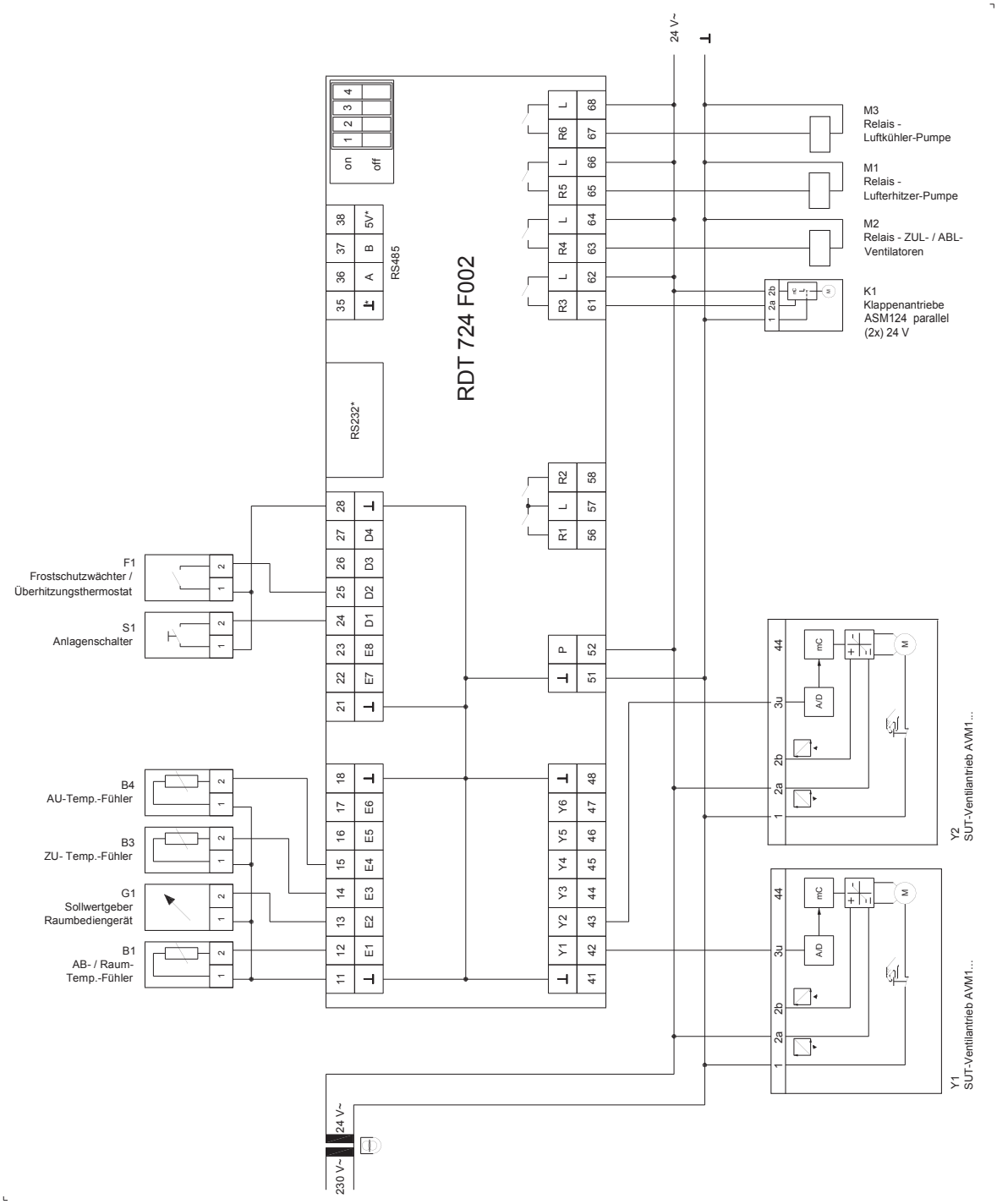
Number	Display	Function	Additional information	Factory setting	Setting
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
A460	R6 Function	Air cooler pump	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room setpoint	15.0°C	
Cascade controller(s)					
P601	K1 Offset	Setpoint offset (OfK)	Supply air at room setpoint	5.0K	
P602	K1 P-band	P-band (XpK)		2.0K	
P603	K1 Tn	I-term		0s	
P604	K1 Max	Maximum supply air setpoint		30.0°C	
P605	K1 Min	Minimum supply air setpoint		15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term	Outputs Y1 and Y2	160s	
P633	PID1 Tv	PID1 D-term	Outputs Y1 and Y2	0.0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	-2.0K	
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	2.0K	
Switching points					
P780	2P1 sw.pt	Switching point, air heater pump	Relay R5	5%	
P781	2P1 sw.diff	Switching difference, air heater pump	Relay R5	2%	
P782	2P2 sw.pt	Switching point, air cooler pump	Relay R6	5%	
P783	2P2 sw.diff	Switching difference, air cooler pump	Relay R6	2%	
Delays					
P801	TM1 time	Switch-on delay, fans	Relay R4	30s	
Options					
External setpoint					
A010	Ext.setp.	External setpoint	On	1	
	Input E2 setpoint adjuster				
A120	E2 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A122	E2 Set max	Range maximum		40.0°C	
A123	E2 Set min	Range minimum		0.0°C	
A124	E2 Cal.max	Calibration of range maximum		°C	
A125	E2 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A126	E2 Cal.min	Calibration of range minimum		°C	
A128	E2 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Input E4 outside air temperature				
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
A141	E4 Schem	Sensor multiplication	Normal input (Off)	0	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	0.0°C	

Description

Number	Display	Function	Additional information	Factory setting	Setting
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 Lim Wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Controller					
A012	Controller	Control behaviour	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating protection	Frost protection	1	
			Overheating protection	2	
	Input D2				
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Stand-by mode + night cooling	2	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling				
D500	Clk chan 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
Measuring points					
MP1		Active setpoint (D116)			
MP2		Main setpoint (D117)			
MP3		Positioning signal, main controller			
MP4		Stand-by mode (0/1)			
MP5		Control mode (0/1)			

3.1.4.3 Wiring diagramm

Supply-return air cascade control, air heater/air cooler (CTR HC)



3.1.5 Application 203

Supply-return air cascade control, air heater/air cooler/mixing chamber (CTR HCO)

Plant design:

- Outside, recirculation and exhaust air damper
- Supply and return air fan
- Air heater, air cooler with control valve and pump
- Supply air, return air or room temperature sensor
- Outside temperature sensor

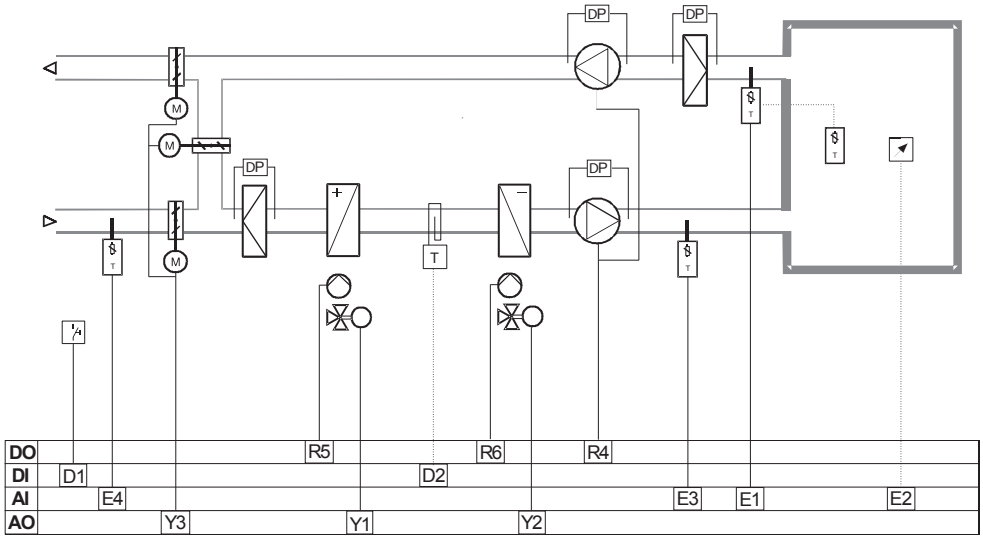
Control functions:

- Temperature control, return air-supply air cascade with ta shift (optional)

Control functions:

- Enable control
- Delay fan cut-in
- Enable damper sequence
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode
- Free night cooling

Plant schematic:



Description:

Functions

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint, and controls heating valve Y1 or cooling valve Y2 according to the control deviation. The supply air temperature is limited.

When the plant is switched off from the main switch, the fans are switched off, and the heating and cooling valve and the dampers are closed.

Options

External setpoint

According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via the setpoint adjuster, XPESF001.
In addition, a room operating unit can be used to switch the plant over from automatic to continuous or stand-by mode.

Setpoint shift

The setpoint is changed in relation to the outside temperature according to the adjusted influence.

Frost protection

The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. The heating valve is opened fully and the air heater pump is switched on. The frost protection is still active when the plant is switched off.

Overheating protection

The overheating protection switches the heating off, the fans are switched on and the dampers are opened. The overheating protection is still active when the plant is switched off.

Reduced mode (timer)

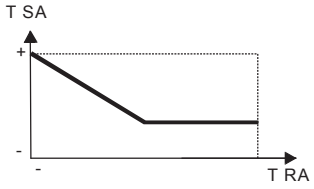
Channel 1

The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, the plant is switched on and off at the reduced setpoint (2-point).

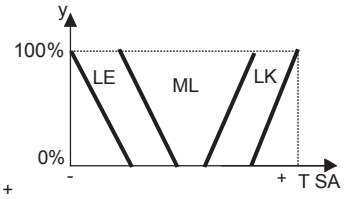
Channel 2

If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2, provided that the conditions are met, i.e. the room temperature is above the setpoint and the outside temperature is lower than the room temperature. The dampers are opened and the fans are switched on after a delay.

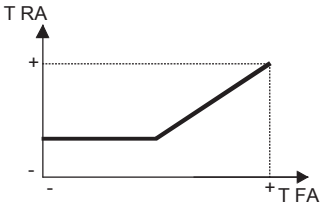
3.1.5.1 Functional diagrams



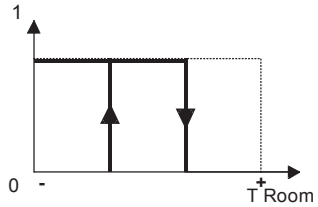
Return-supply air cascade



Heating-cooling damper sequence



Setpoint shift acc. to outside temperature



Stand-by mode with reduced setpoint

3.1.5.2 Parameter list

Supply-return air cascade control, air heater/air cooler/mixing chamber (CTR HCO)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room setpoint			
Act. val.	20.2°C	Actual room value			
Setp sup	38.0°C	Supply air setpoint			
A. val su	27.2°C	Supply air - actual value			
Setpoints					
D111	Setpoint 1	Setpoint 'Normal'		20.0°C	
D112	Setpoint 2	Setpoint 'Reduced'	Timer / room remote control	15.0°C	
Basic configuration					
A001	Application	Application	CTR HCO	203	
	Options (described on the next page)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour	Cascade	2	
A013	Protection	Frost protection/overheating protection	Frost protection	1	
A014	Red. mode	Reduced mode (timer)	Stand-by mode	1	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Return air temperature sensor	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication	Normal input (Off)	0	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A120	E2 Function	Setpoint adjuster	Not used	0	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (Off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
	Digital inputs				
A210	D1 Function	Main switch	Active if low	101	
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	

Number	Display	Function	Additional information	Factory setting	Setting
	Analogue outputs				
A310	Y1 Function	Three-way valve 'heating'	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
A320	Y2 Function	Three-way valve 'cooling'	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A328	Y2 Blocking	Blocking		0	
	Digital outputs				
A430	R3 Function	Damper actuator	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking		0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking	None	0	
A450	R5 Function	Air heater pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
A460	R6 Function	Air cooler pump	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room setpoint	15.0°C	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK)	Supply air at room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint		30.0°C	
P605	C1 Min	Minimum supply air setpoint		15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term	Outputs Y1 and Y2	160s	
P633	PID1 Tv	PID1 D-term	Outputs Y1 and Y2	0.0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	-2.0K	
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	2.0K	
	Damper sequence, heat recovery, 'heating'				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y3	10.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y3	-2.0K	
	Damper sequence, heat recovery, 'cooling'				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y3	10.0K	
P707	SEQ4 Offset	Offset (Of4)	Output Y3	2.0K	

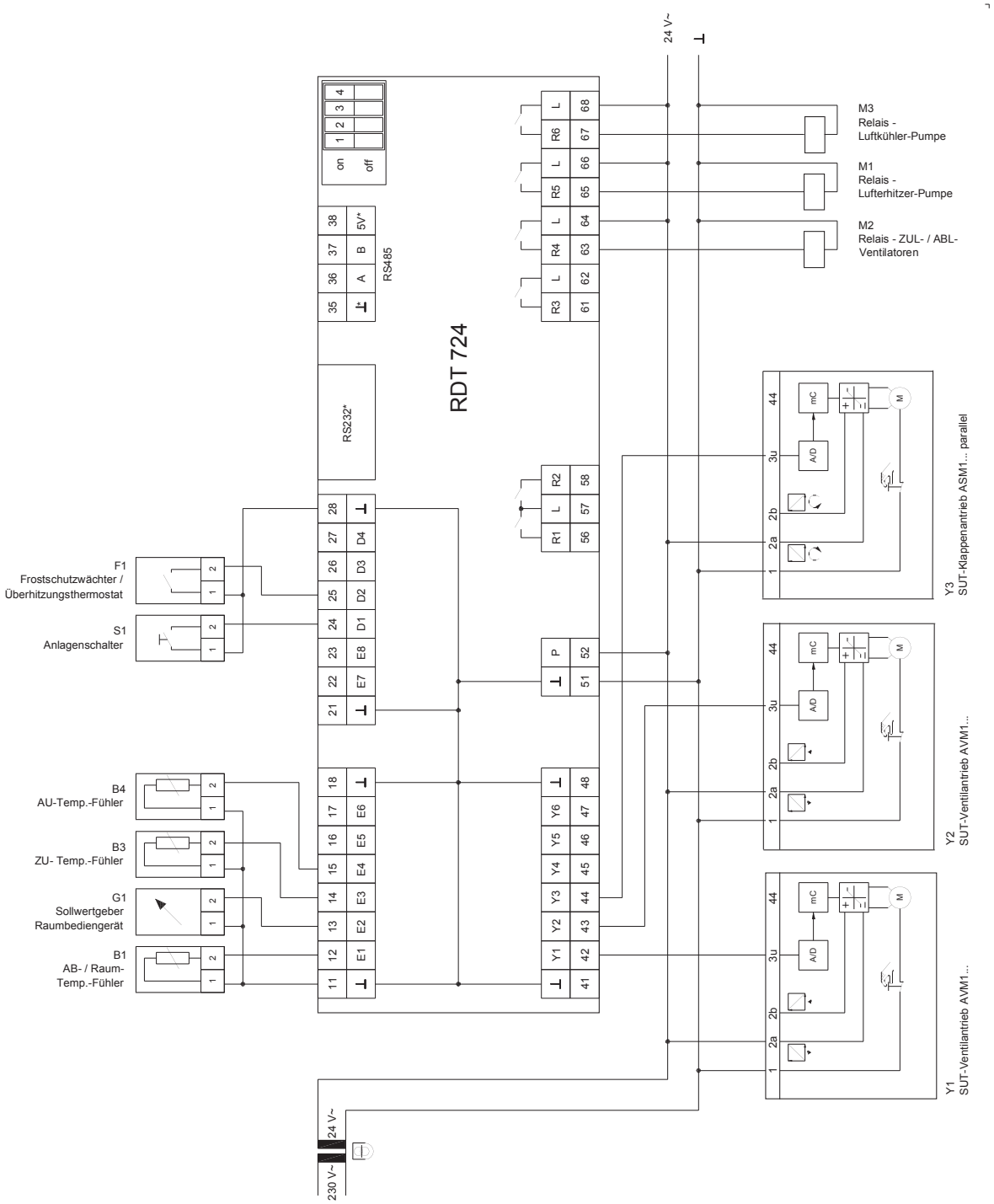
Description

Number	Display	Function	Additional information	Factory setting	Setting
Energy recovery					
P741	ER1 exh.±	Correction - return air		0.0K	
P742	ER1 room.±	Correction - room air		0.0K	
P743	ER1 sw.diff	Switching difference - energy supply		1.0K	
P744	ER1 Neutral	Neutral zone - energy supply		3.0K	
Switching points					
P780	2P1 sw.pt	Switching point, air heater pump	Relay R5	5.0%	
P781	2P1 sw.diff	Switching difference, air heater pump	Relay R5	2.0%	
P782	2P2 sw.pt	Switching point, air cooler pump	Relay R6	5.0%	
P783	2P2 sw.diff	Switching difference, air cooler pump	Relay R6	2.0%	
Delays					
P801	ZM1 time	Switch-on delay, fans	Relay R4	30s	
Options					
External setpoint					
A010	Ext.setp.	External setpoint	On	1	
	Input E2 setpoint adjuster				
A120	E2 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A122	E2 Set max	Range maximum		40.0°C	
A123	E2 Set min	Range minimum		0.0°C	
A124	E2 Cal.max	Calibration of range maximum		°C	
A125	E2 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A126	E2 Cal.min	Calibration of range minimum		°C	
A128	E2 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Input E4 outside air temperature				
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
A141	E4 Scheme	Sensor multiplication	Normal input (off)	0	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 Lim wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Controller					
A012	Control	Control behaviour	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating protection	Frost protection	1	
			Overheating protection	2	
	Input D2				
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Stand-by mode + night cooling	2	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling				
D500	Clk chan. 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	

Number	Display	Function	Additional information	Factory setting	Setting
Measuring points					
MP1		Active setpoint (D116)			
MP2		Main setpoint (D117)			
MP3		Positioning signal, main controller			
MP4		Stand-by mode (0/1)			
MP5		Control mode (0/1)			

3.1.5.3 Wiring diagramm

Supply-return air cascade control, air heater/air cooler/mixing chamber (CTR HCO)



3.1.6 Application 204

Supply-return air cascade control, air heater/air cooler/heat recovery (CTR HCE)

Plant design:

- Outside and exhaust air damper
- Heat recovery
- Supply and return air fan
- Air heater, air cooler with control valve and pump
- Supply air, return air or room temperature sensor
- Outside temperature sensor

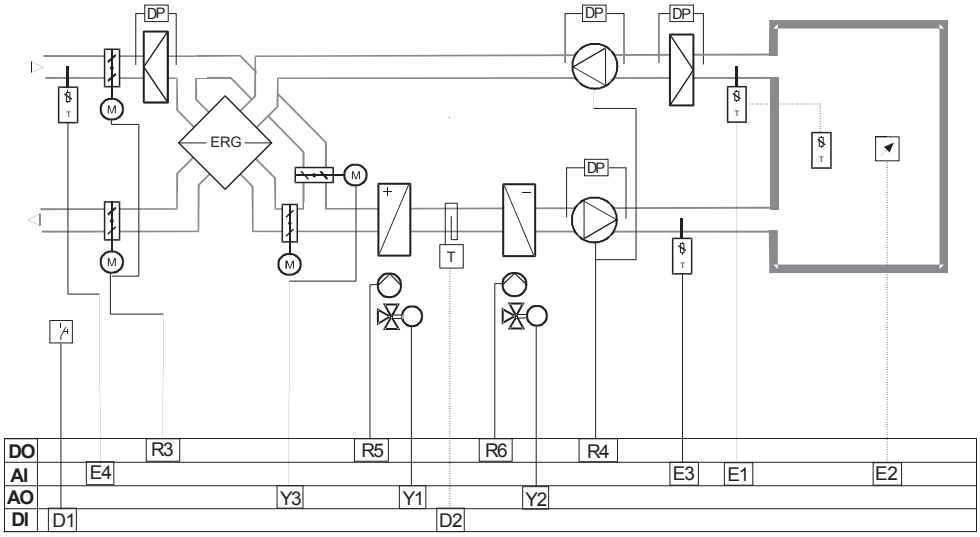
Control functions:

- Temperature control, return air-supply air cascade with ta shift

Control functions:

- Enable control
- Delay fan cut-in
- Enable heat recovery
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode
- Free night cooling

Plant schematic:



Description:

Functions

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1, cooling valve Y2 or dampers Y3 according to the control deviation. The supply air temperature is limited.

The heat recovery acts on Y3 and is enabled when the outside temperature in cooling mode is higher than the room temperature, and is lower than the room temperature in heating mode.
If the plant is switched off from the main (plant) switch, the fans are switched off and the valves and dampers are closed.

Options
External setpoint
According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via the setpoint adjuster, XPESF001.
In addition, a room operating unit can be used to switch the plant over from automatic to continuous or stand-by mode.

Setpoint shift
The setpoint is changed in relation to the outside temperature according to the adjusted influence.

Frost protection
The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. The heating valve is opened fully and the air heater pump is switched on. The frost protection is still active when the plant is switched off.

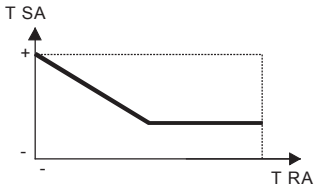
Overheating protection
The overheating protection switches the heating off, the fans are switched on and the dampers are opened. The overheating protection is still active when the plant is switched off.

Reduced mode (timer)
Channel 1
The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, the plant is switched on and off at the reduced setpoint (2-point).

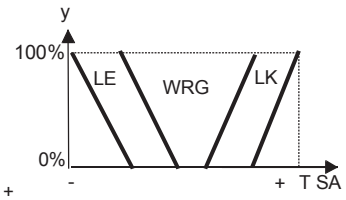
Channel 2
If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2, provided that the conditions are met, i.e. the room temperature is above the setpoint and the outside temperature is lower than the room temperature.
The fans are switched on and the outside air dampers are opened.

Description

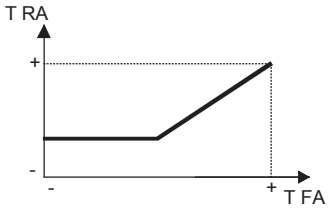
3.1.6.1 Functional diagrams



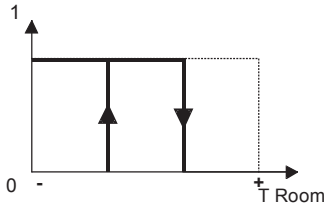
Return-supply air cascade



Heating-cooling-heat recovery sequence



Setpoint shift acc. to outside temperature



Stand-by mode with reduced setpoint

3.1.6.2 Parameter list

Supply-return air cascade control, air heater/air cooler/heat recovery (CTR HCE)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room setpoint			
Act. val	20.2°C	Actual room value			
Setp. sup	38.0°C	Supply air setpoint			
A.val.sup	27.2°C	Supply air - actual value			
Setpoints					
D111	Setpoint 1	Setpoint 'Normal'		20.0°C	
D112	Setpoint 2	Setpoint 'Reduced'	Timer / room remote control	15.0°C	
Basic configuration					
A001	Application	Application	CTR HCE	204	
	Options (described on the next page)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour	Cascade	2	
A013	Protection	Frost protection/overheating protection	Frost protection	1	
A014	Red. mode	Reduced mode (timer)	Stand-by mode	1	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Return air temperature sensor	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication	Normal input (Off)	0	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A120	E2 Function	Setpoint adjuster	Not used	0	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (Off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
A141	E4 Scheme	Sensor multiplication	Normal input (Off)	0	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	0.0°C	

Number	Display	Function	Additional information	Factory setting	Setting
	Digital inputs				
A210	D1 Function	Main switch	Active if low	101	
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve 'heating'	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
A320	Y2 Function	Three-way valve 'cooling'	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A328	Y2 Blocking	Blocking		0	
A330	Y3 Function	Damper actuator	Analogue output	1	
A331	Y3 Action	Directional control	Normal 0-10VDC	0	
A332	Y3 Max	Maximum value	Output Y3	100.0%	
A333	Y3 Min	Minimum value	Output Y3	0.0%	
A338	Y3 Blocking	Blocking		0	
	Digital outputs				
A430	R3 Function	Air damper actuator	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking	None	0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking	None	0	
A450	R5 Function	Air heater pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
A460	R6 Function	Air cooler pump	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room setpoint	15.0°C	
P531	LIM6 Min	Minimum energy recovery component	Dampers Y3	0.0%	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK)	Supply air at room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint		30.0°C	
P605	C1 Min	Minimum supply air setpoint		15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term	Outputs Y1, Y2 and Y3	160s	
P633	PID1 Tv	PID1 D-term	Outputs Y1, Y2 and Y3	0.0s	

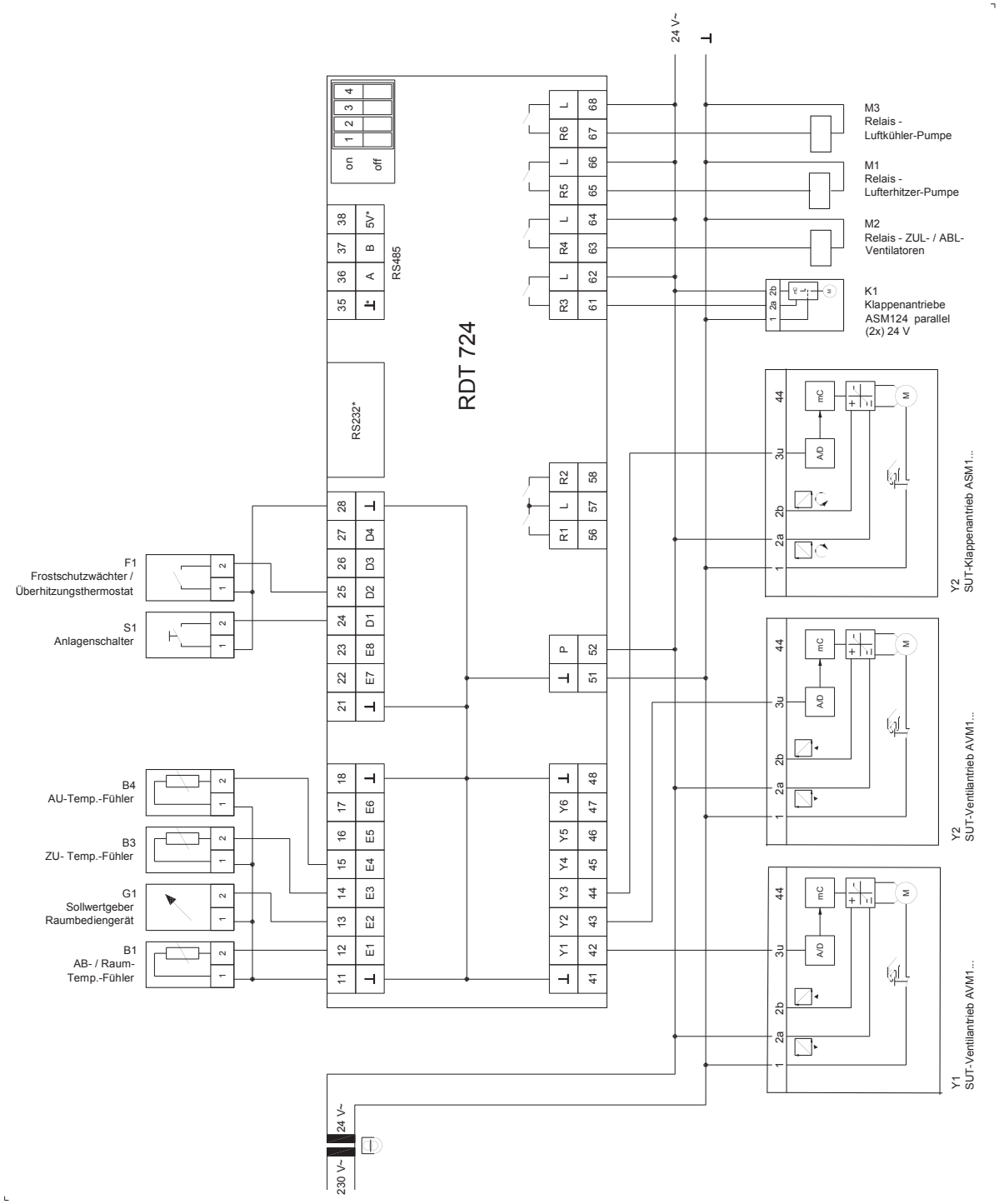
Description

Number	Display	Function	Additional information	Factory setting	Setting
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	-2.0K	
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	2.0K	
	Damper sequence, heat recovery, 'heating'				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y3	10.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y3	-2.0K	
	Damper sequence, heat recovery, 'cooling'				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y3	10.0K	
P707	SEQ4 Offset	Offset (Of4)	Output Y3	2.0K	
Energy recovery					
P741	ER1 exh.±	Correction - return air		0.0K	
P742	ER1 room.±	Correction - room air		0.0K	
P743	ER1 sw.diff	Switching difference - energy supply		1.0K	
P744	ER1 Neutral	Neutral zone - energy supply		3.0K	
Switching points					
P780	2P1 sw.pt	Switching point, air heater pump	Relay R5	5.0%	
P781	2P1 sw.diff	Switching difference, air heater pump	Relay R5	2.0%	
P782	2P2 sw.pt	Switching point, air cooler pump	Relay R6	5.0%	
P783	2P2 sw.diff	Switching difference, air cooler pump	Relay R6	2.0%	
Delays					
P801	TM1 time	Switch-on delay, fans	Relay 4	30s	
Options					
External setpoint					
A010	Ext.setp.	External setpoint	On	1	
	Input E2 setpoint adjuster				
A120	E2 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A122	E2 Set max	Range maximum		40.0°C	
A123	E2 Set min	Range minimum		00.0°C	
A124	E2 Cal.max	Calibration of range maximum		°C	
A125	E2 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A126	E2 Cal.min	Calibration of range minimum		°C	
A128	E2 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 Lim Wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Controller					
A012	Control	Control behaviour	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating protection	Frost protection	1	
			Overheating protection	2	
	Input D2				
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	

Number	Display	Function	Additional information	Factory setting	Setting
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Standby mode + night cooling	2	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling				
D500	Clk chan. 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
Measuring points					
MP1		Active setpoint (D116)			
MP2		Main setpoint (D117)			
MP3		Auxiliary setpoint (D118)			
MP4		Positioning signal, aux. controller			
MP5		Stand-by mode (0/1)			
MP6		FNC mode (0/1)			
MP7		Control mode (0/1)			

3.1.6.3 Wiring diagramm

Supply-return air cascade control, air heater/air cooler/heat recovery (CTR HCE)



3.1.7 Application 205

Constant supply air control, air heater (TS H 2Z)

Plant design, 2 zones:

- Outside and exhaust air damper
- Supply and return air fan
- Air heater with control valve and pump
- Supply air or room temperature sensor
- Outside temperature sensor

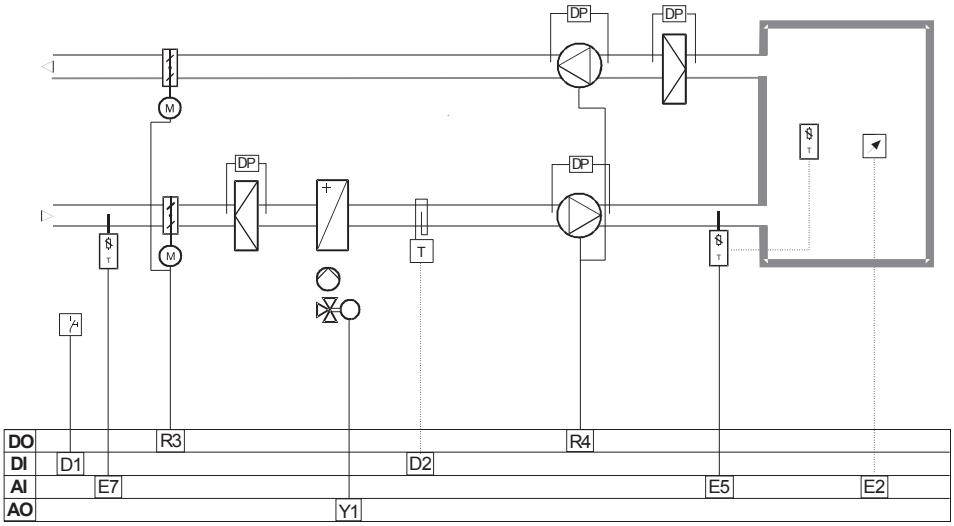
Control functions:

- Temperature control, supply air, constant with ta shift (optional)

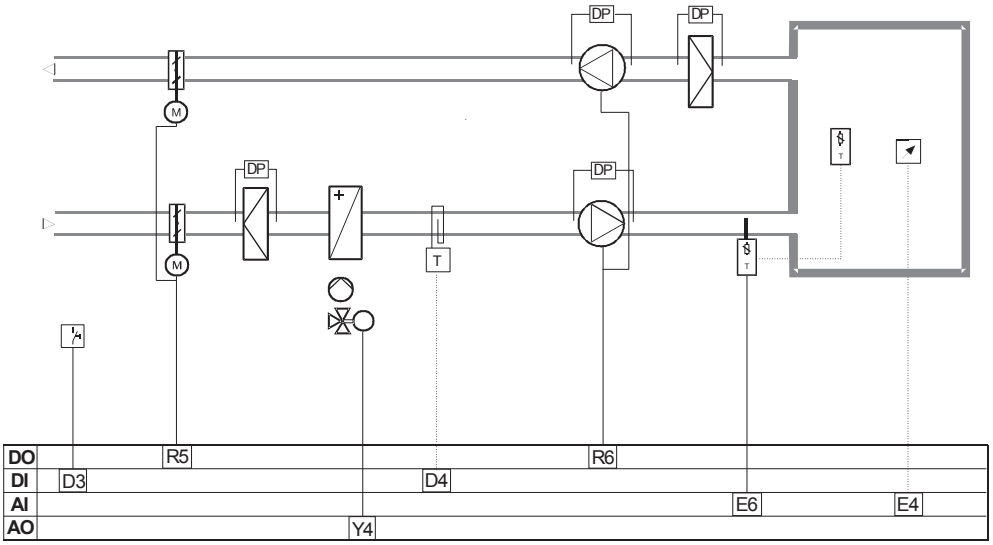
Control functions:

- Enable dampers
- Delay fan cut-in
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode

Plant schematic, zone 1:



Plant schematic, zone 2:



Description (2 zones):

Function

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the supply air or room temperature with the setpoint and controls the heating valve according to the control deviation. The supply air temperature is limited.

When the plant is switched off from the main switch, the fans are switched off, and the heating valve and dampers are closed.

Options

External setpoint

According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via the setpoint adjuster, XPESF001.

With a room operating unit, the plant can also be switched over from automatic to continuous or stand-by mode.

Setpoint shift

The setpoint is changed in relation to the outside temperature according to the adjusted influence.

Frost protection

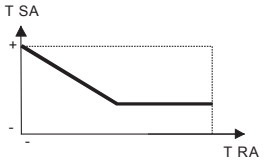
The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. The heating valve is opened fully and the air heater pump is switched on. The frost protection is still active when the plant is switched off.

Overheating protection

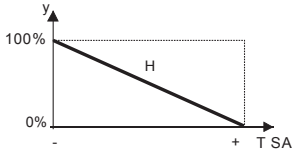
The overheating protection switches the heating off, the fans are switched on and the dampers are opened. The overheating protection is still active when the plant is switched off.

Reduced mode (timer)
The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, the plant is switched on and off at the reduced setpoint (2-point).

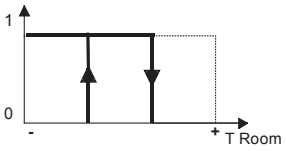
3.1.7.1 Functional diagrams



Setpoint shift acc. to outside temperature



Heating sequence



Stand-by mode with reduced setpoint

3.1.7.2 Parameter list

Constant supply air control, air heater (TS H 2Z)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room setpoint	Zone 1		
Act. val	20.2°C	Actual room value	Zone 1		
Z2 setp.	20.0°C	Room setpoint	Zone 2		
Z2 Val	20.2°C	Actual room value	Zone 2		
Setpoints					
D111	Setpoint 1	Setpoint 'Normal', zone 1		20.0°C	
D112	Setpoint 2	Setpoint 'Reduced', zone 1	Timer / room remote control	15.0°C	
D121	Z2 setpt 1	Setpoint 'Normal', zone 2		20.0°C	
D122	Z2 setpt 2	Setpoint 'Reduced', zone 2	Timer / room remote control	15.0°C	
Basic configuration					
A001	Application	Application	TS H 2Z	205	
	Options (described on the following pages)				
A010	Ext.setp.	External setpoint, Z1	Off	0	
A011	Shift	Setpoint shift, Z1	Off	0	
A013	Protection	Frost protection/overheating prot., Z1	Frost protection	1	
A014	Red. mode	Reduced mode (timer), Z1	Stand-by mode	1	
A020	Z2 Ext.setp.	External setpoint, Z2	Off	0	
A021	Z2 Shift	Setpoint shift, Z2	Off	0	
A023	Z2 Protect.	Frost protection/overheating prot., Z2	Frost protection	1	
A024	Z2 Red.mod.	Reduced mode (timer), Z2	Stand-by mode	1	
I/O configuration					
	Analogue inputs				
A120	E2 Function	Setpoint adjuster, zone 1	Not used	0	
A140	E4 Function	Setpoint adjuster, zone 2	Not used	0	
A150	E5 Function	Supply air temperature sensor, zone 1	Temp. Ni1000	3	
A157	E5 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A160	E6 Function	Supply air temperature sensor, zone 2	Temp. Ni1000	3	
A167	E6 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A168	E6 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A170	E7 Function	Outside temp. sensor	Not used	0	

Description

Number	Display	Function	Additional information	Factory setting	Setting
	Digital inputs				
A210	D1 Function	Main switch, zone 1	Active if low	101	
A220	D2 Function	Frost protection monitor/over-heating th. Z1	Active if low	101	
A230	D3 Function	Main switch, zone 2	Active if low	101	
A240	D4 Function	Frost protection monitor/over-heating th. Z2	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve 'heating', zone 1	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
A340	Y4 Function	Three-way valve 'heating', zone 2	Analogue output	1	
A341	Y4 Action	Directional control	Normal 0-10VDC	0	
A342	Y4 Max	Maximum value	Output Y4	100.0%	
A343	Y4 Min	Minimum value	Output Y4	0.0%	
A348	Y4 Blocking	Blocking		0	
	Digital outputs				
A430	R3 Function	Damper actuator, zone 1	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking	None	0	
A440	R4 Function	Fan, zone 1	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking	None	0	
A450	R5 Function	Damper actuator, zone 2	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
A460	R6 Function	Fan, zone 2	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint, zone 1	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint, zone 1	Room setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint, zone 2	Room setpoint	30.0°C	
P503	SP2 Min	Minimum setpoint, zone 2	Room setpoint	15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term, zone 1	Output Y1	160s	
P633	PID1 Tv	PID1 D-term, zone 1	Output Y1	0.0s	
P642	PID2 Tn	PID2 I-term, zone 2	Output Y4	160s	
P643	PID2 Tv	PID2 D-term, zone 2	Output Y4	0.0s	
Sequences					
	Heating sequence, zone 1				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	2.0K	
	Heating sequence, zone 2				
P702	SEQ2 P-band	Proportional band (Xp)	Output Y4	10.0K	
P703	SEQ2 Offset	Offset (Of)	Output Y4	2.0K	

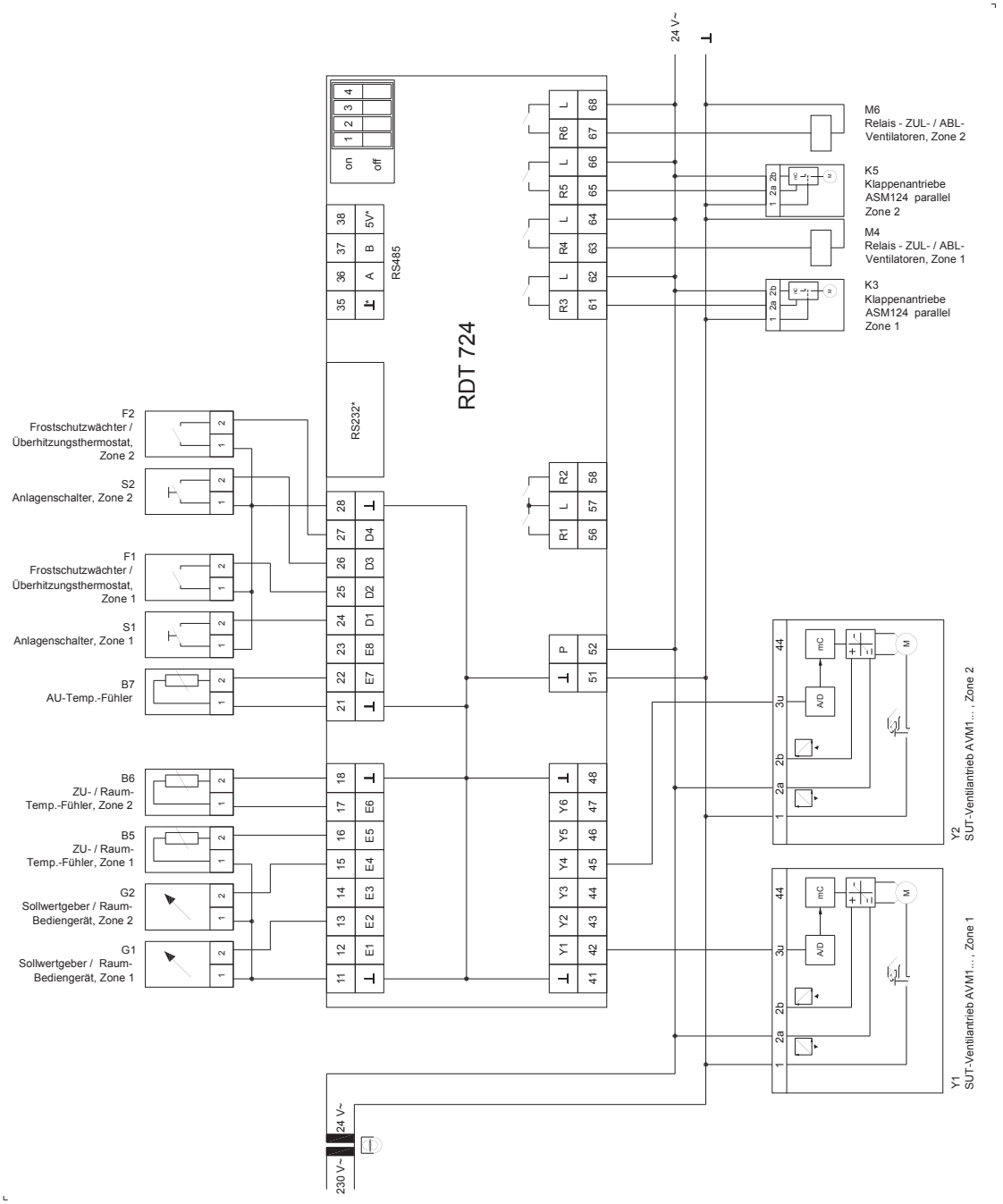
Number	Display	Function	Additional information	Factory setting	Setting
Delays					
P801	TM1 time	Switch-on delay for fans, Z1	Relay R4	30s	
P802	TM2 time	Switch-on delay for fans, Z2	Relay R6	30s	
Options					
External setpoint					
A010	Ext.setp.	External setpoint, zone 1	On	1	
A020	Z2 Ext.setp	External setpoint, zone 2	On	1	
	Input E2 setpoint adjuster, zone1				
A120	E2 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A122	E2 Set max	Range maximum		40.0°C	
A123	E2 Set min	Range minimum		0.0°C	
A124	E2 Cal.max	Calibration of range maximum		°C	
A125	E2 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A126	E2 Cal.min	Calibration of range minimum		°C	
A128	E2 Sim.val.	Simulation value	In case of sensor error	22.0°C	
	Input E4 setpoint adjuster, zone 2				
A140	E4 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A142	E4 Set max	Range maximum		40.0°C	
A143	E4 Set min	Range minimum		0.0°C	
A144	E4 Cal.max	Calibration of range maximum		°C	
A145	E4 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A146	E4 Cal.min	Calibration of range minimum		°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Shift	Setpoint shift, zone 1	Winter	1	
			Summer	2	
			Winter + summer	3	
A021	Z2 Shift	Setpoint shift, zone 2	Winter	1	
			Summer	2	
			Winter + summer	3	
	Input E7 outside air temperature				
A170	E7 Function	Outside temp. sensor	Temp. Ni1000	1	
A177	E7 Cal.temp	Temperature calibration		°C	
A178	E7 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Shift parameters, zone 1				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 Lim Wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
	Shift parameters, zone 2				
P551	SPS2 pt wi	Winter cut-in point		15.0°C	
P552	SPS2 inf wi	Winter influence		0.0	
P553	SPS2 Lim Wi	Winter limitation		30.0°C	
P554	SPS2 pt su	Summer cut-in point		24.0°C	
P555	SPS2 inf su	Summer influence		0.5	
P556	SPS2 Lim su	Summer limitation		26.0°C	
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating prot., Z1	Frost protection	1	
			Overheating protection	2	
A023	Z2 Protect.	Frost protection/overheating prot., Z2	Frost protection	1	
			Overheating protection	2	
	Input D2				
A220	D2 Function	Frost protection monitor/over-heating th. Z1	Active if low	101	
	Input D4				
A240	D4 Function	Frost protection monitor/over-heating th. Z2	Active if low	101	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Options					
Reduced mode (stand-by mode with timer)					
A014	Red. mode	Reduced mode, zone 1	Stand-by mode on	1	
A024	Z2 Red.mod.	Reduced mode, zone 2	Stand-by mode on	1	
	Stand-by mode, zone 1				
D112	Setpt 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Stand-by mode, zone 2				
D122	Z2 setpt2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D500	Clk chan. 2	Timer channel 2		1	
P773	FC2 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
Measuring points					
MP1		Active setpoint, zone 1 (D116)			
MP2		Main setpoint, zone 1 (D117)			
MP3		Positioning signal, main controller, zone 1			
MP4		Control mode, zone 1 (0/1)			
MP5		Active setpoint, zone 2 (D126)			
MP6		Main setpoint, zone 2 (D127)			
MP7		Positioning signal, main controller, zone 2			
MP8		Control mode, zone 2 (0/1)			

3.1.7.3 Wiring diagramm

Constant supply air control, air heater (TS H 2Z)



3.1.8 Application 206

Supply-return air cascade control, 2 zones, air heater/air cooler (CTR HC 2Z)

Plant design (2 zones):

- Outside and exhaust air damper
- Supply and return air fan
- Air heater, air cooler with control valve and pump
- Supply air, return air or room temperature sensor
- Outside temperature sensor

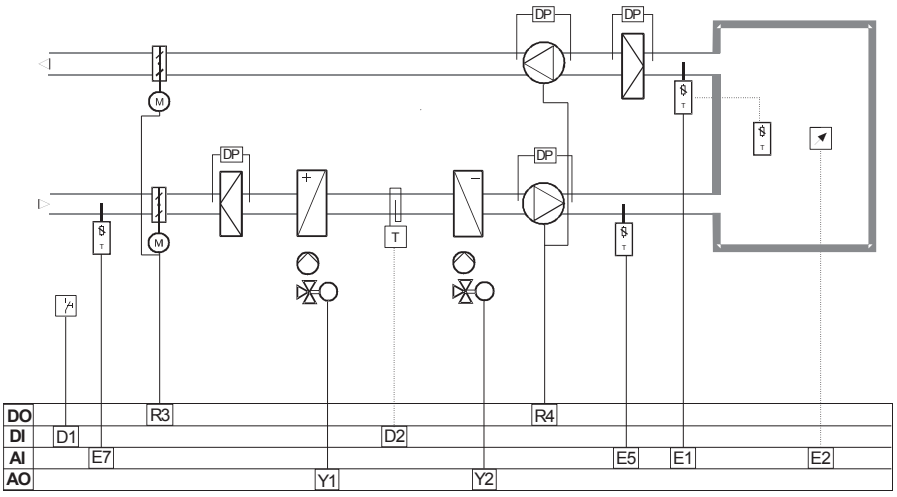
Control functions:

- Temperature control - return air-supply air cascade with ta shift (optional)

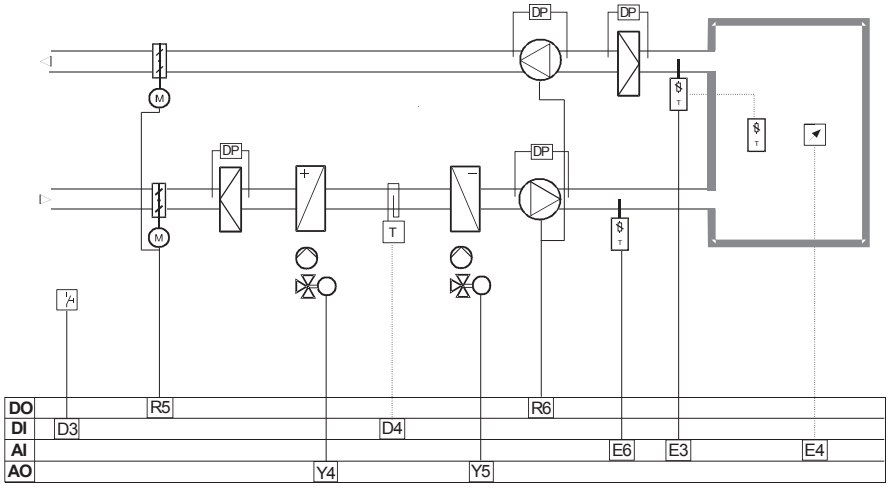
Control functions:

- Enable dampers
- Delay fan cut-in
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode
- Free night cooling

Plant schematic, zone 1:



Plant schematic, zone 2:



Description (2 zones):

Functions

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1 or cooling valve Y2 according to the control deviation. The supply air temperature is limited.

When the plant is switched off from the main switch, the fans are switched off, and the heating valve and dampers are closed.

Options

External setpoint

According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via the setpoint adjuster, XPESF001.

In addition, a room operating unit can be used to switch the plant over from automatic to continuous or stand-by mode.

Setpoint shift

The setpoint is changed in relation to the outside temperature according to the adjusted influence.

Frost protection

The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. The heating valve is opened fully and the air heater pump is switched on. The frost protection is still active when the plant is switched off.

Overheating protection

The overheating protection switches the heating off, the fans are switched on and the dampers are opened. The overheating protection is still active when the plant is switched off.

Reduced mode (timer)

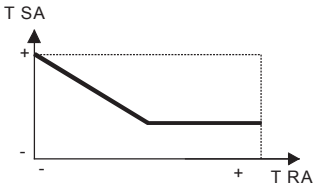
Channel 1

The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, the plant is switched on and off at the reduced setpoint (2-point).

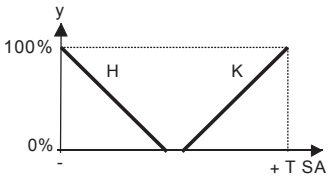
Channel 2

If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2, provided that the conditions are met, i.e. the room temperature is above the setpoint and the outside temperature is lower than the room temperature. The dampers are opened and the fans are switched on after a delay.

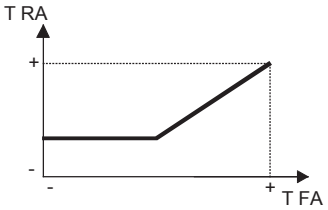
3.1.8.1 Functional diagrams



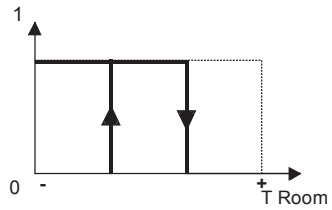
Return-supply air cascade



Heating-cooling sequence



Setpoint shift acc. to outside temperature



Stand-by mode with reduced setpoint

3.1.8.2 Parameter list

Supply-return air cascade control, air heater/air cooler, 2 zones (CTR HC 2Z)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room setpoint	Zone 1		
Act. val	20.2°C	Actual room value	Zone 1		
Setp sup	29.0°C	Supply air setpoint	Zone 1		
A.val su	28.2°C	Supply air - actual value	Zone 1		
Z2 setp	20.0°C	Room setpoint	Zone 2		
Z2 val	28.2°C	Supply air - actual value	Zone 2		
Z2 setp	29.0°C	Supply air setpoint	Zone 2		
Sup val	28.2°C	Supply air - actual value	Zone 2		
Setpoints					
D111	Setpoint 1	Setpoint ‘Normal’, zone 1		20.0°C	
D112	Setpoint 2	Setpoint ‘Reduced’, zone 1	Timer / room remote control	15.0°C	
D121	Z2 setpt 1	Setpoint ‘Normal’, zone 2		20.0°C	
D122	Z2 setpt 2	Setpoint ‘Reduced’, zone 2	Timer / room remote control	15.0°C	

Number	Display	Function	Additional information	Factory setting	Setting
Basic configuration					
A001	Application	Application	CTR HC 2Z	206	
	Options (described on the following pages)				
A010	Ext.setp	External setpoint, zone 1	Off	0	
A011	Shift	Setpoint shift, zone 1	Off	0	
A012	Control	Control behaviour	Cascade	2	
A013	Protection	Frost protection/overheating prot., Z1	Frost protection	1	
A014	Red. mod.	Reduced mode (timer), Z1	Stand-by mode	1	
A020	Z2 Ext.setp	External setpoint, zone 2	Off	0	
A021	Z2 Shift	Setpoint shift, zone 2	Off	0	
A022	Z2 Control	Control behaviour, zone 2	Cascade	2	
A023	Z2 Protection	Frost protection/overheating prot., Z2	Frost protection	1	
A024	Z2 Red.mod.	Reduced mode (timer), Z2	Stand-by mode	1	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Return air temperature sensor, zone 1	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication	Normal input (Off)	0	
A117	E1 Cal.temp.	Temperature calibration	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A120	E2 Function	Setpoint adjuster, zone 1	Not used	0	
A130	E3 Function	Return air temperature sensor, zone 2	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (Off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Setpoint adjuster, zone 2	Not used	0	
A150	E5 Function	Supply air temperature sensor, zone 1	Temp. Ni1000	3	
A157	E5 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A160	E6 Function	Supply air temperature sensor, zone 2	Temp. Ni1000	3	
A167	E6 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A168	E6 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A170	E7 Function	Outside temp. sensor	Not used	0	
	Digital inputs				
A210	D1 Function	Main switch, zone 1	Active if low	101	
A220	D2 Function	Frost protection monitor/over-heating th. Z1	Active if low	101	
A230	D3 Function	Main switch, zone 2	Active if low	101	
A240	D4 Function	Frost protection monitor/over-heating th. Z2	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve ‘heating’, zone 1	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
A320	Y2 Function	Three-way valve ‘cooling’, zone 1	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A328	Y2 Blocking	Blocking		0	
A340	Y4 Function	Three-way valve ‘heating’, zone 2	Analogue output	1	
A341	Y4 Action	Directional control	Normal 0-10VDC	0	
A342	Y4 Max	Maximum value	Output Y4	100.0%	
A343	Y4 Min	Minimum value	Output Y4	0.0%	
A348	Y4 Blocking	Blocking		0	
A350	Y5 Function	Three-way valve ‘cooling’, zone 2	Analogue output	1	
A351	Y5 Action	Directional control	Normal 0-10VDC	0	
A352	Y5 Max	Maximum value	Output Y5	100.0%	
A353	Y5 Min	Minimum value	Output Y5	0.0%	
A358	Y5 Blocking	Blocking		0	
	Digital outputs				
A430	R3 Function	Damper actuator, zone 1	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	

Description

Number	Display	Function	Additional information	Factory setting	Setting
A438	R3 Blocking	Blocking	None	0	
A440	R4 Function	Fan, zone 1	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking	None	0	
A450	R5 Function	Damper actuator, zone 2	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
A460	R6 Function	Fan, zone 2	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint, zone 1	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint, zone 1	Room setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint, zone 2	Room setpoint	30.0°C	
P503	SP2 Min	Minimum setpoint, zone 2	Room setpoint	15.0°C	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK), zone 1	Supply air at room setpoint	5.0K	
P602	C1 P-band	P-band (XpK), zone 1		2.0K	
P603	C1 Tn	I-term, zone 1		0s	
P604	C1 Max	Maximum supply air setpoint, zone 1		30.0°C	
P605	C1 Min	Minimum supply air setpoint, zone 1		15.0°C	
P611	C2 Offset	Setpoint offset (OfK), zone 2	Supply air at room setpoint	5.0K	
P612	C2 P-band	P-band (XpK), zone 2		2.0K	
P613	C2 Tn	I-term, zone 2		0s	
P614	C2 Max	Maximum supply air setpoint, zone 2		30.0°C	
P615	C2 Min	Minimum supply air setpoint, zone 2		15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term, zone 1	Outputs Y1 and Y2	160s	
P633	PID1 Tv	PID1 D-term, zone 1	Outputs Y1 and Y2	0.0s	
P642	PID2 Tn	PID2 I-term, zone 2	Output Y4 and Y5	160s	
P643	PID2 Tv	PID2 D-term, zone 2	Output Y4 and Y5	0.0s	
Sequences					
	Heating sequence, zone 1				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	-2.0K	
	Cooling sequence, zone 1				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	2.0K	
	Heating sequence, zone 2				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y4	10.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y4	-2.0K	
	Cooling sequence, zone 2				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y5	10.0K	
P707	SEQ4 Offset	Offset (Of4)	Output Y5	2.0K	
Delays					
P801	TM1 time	Switch-on delay for fans, zone 1	Relay R4	30s	
P802	TM2 time	Switch-on delay for fans, zone 2	Relay R6	30s	

Number	Display	Function	Additional information	Factory setting	Setting
Options					
External setpoint					
A010	Ext.setp	External setpoint, zone 1	On	1	
A020	Z2 Ext.setp	External setpoint, zone 2	On	1	
	Input E2 setpoint adjuster, zone1				
A120	E2 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A122	E2 Set max	Range maximum		40.0°C	
A123	E2 Set min	Range minimum		0.0°C	
A124	E2 Cal.max	Calibration of range maximum		°C	
A125	E2 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A126	E2 Cal.min	Calibration of range minimum		°C	
A128	E2 Sim.val.	Simulation value	In case of sensor error	22.0°C	
	Input E4 setpoint adjuster, zone 2				
A140	E4 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A142	E4 Set max	Range maximum		40.0°C	
A143	E4 Set min	Range minimum		0.0°C	
A144	E4 Cal.maxd	Calibration of range maximum		°C	
A145	E4 Cal.mid	Calibration of range midpoint	Possible only on device	°C	
A146	E4 Cal.min	Calibration of range minimum		°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Shift	Setpoint shift, zone 1	Winter	1	
			Summer	2	
			Winter + summer	3	
A021	Z2 Shift	Setpoint shift, zone 2	Winter	1	
			Summer	2	
			Winter + summer	3	
	Input E7 outside air temperature				
A170	E7 Function	Outside temp. sensor	Temp. Ni1000	3	
A177	E7 Cal.temp	Temperature calibration		°C	
A178	E7 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Shift parameters, zone 1				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 Lim Wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		36.0°C	
	Shift parameters, zone 2				
P551	SPS2 pt wi	Winter cut-in point		15.0°C	
P552	SPS2 inf wi	Winter influence		0.0	
P553	SPS2 Lim Wi	Winter limitation		30.0°C	
P554	SPS2 pt su	Summer cut-in point		24.0°C	
P555	SPS2 inf su	Summer influence		0.5	
P556	SPS2 Lim su	Summer limitation		26.0°C	
Controller					
A012	Control	Control behaviour, zone 1	Fixed value (supply air control)	1	
			Cascade (room control)	2	
A022	Z2 Control	Control behaviour, zone 2	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating prot., Z1	Frost protection	1	
			Overheating protection	2	
A023	Z2 Protect.	Frost protection/overheating prot., Z2	Frost protection	1	
			Overheating protection	2	
	Input D2				
A220	D2 Function	Frost protection monitor/over-heating th. Z1	Active if low	101	
	Input D4				
A240	D4 Function	Frost protection monitor/over-heating th. Z2	Active if low	101	

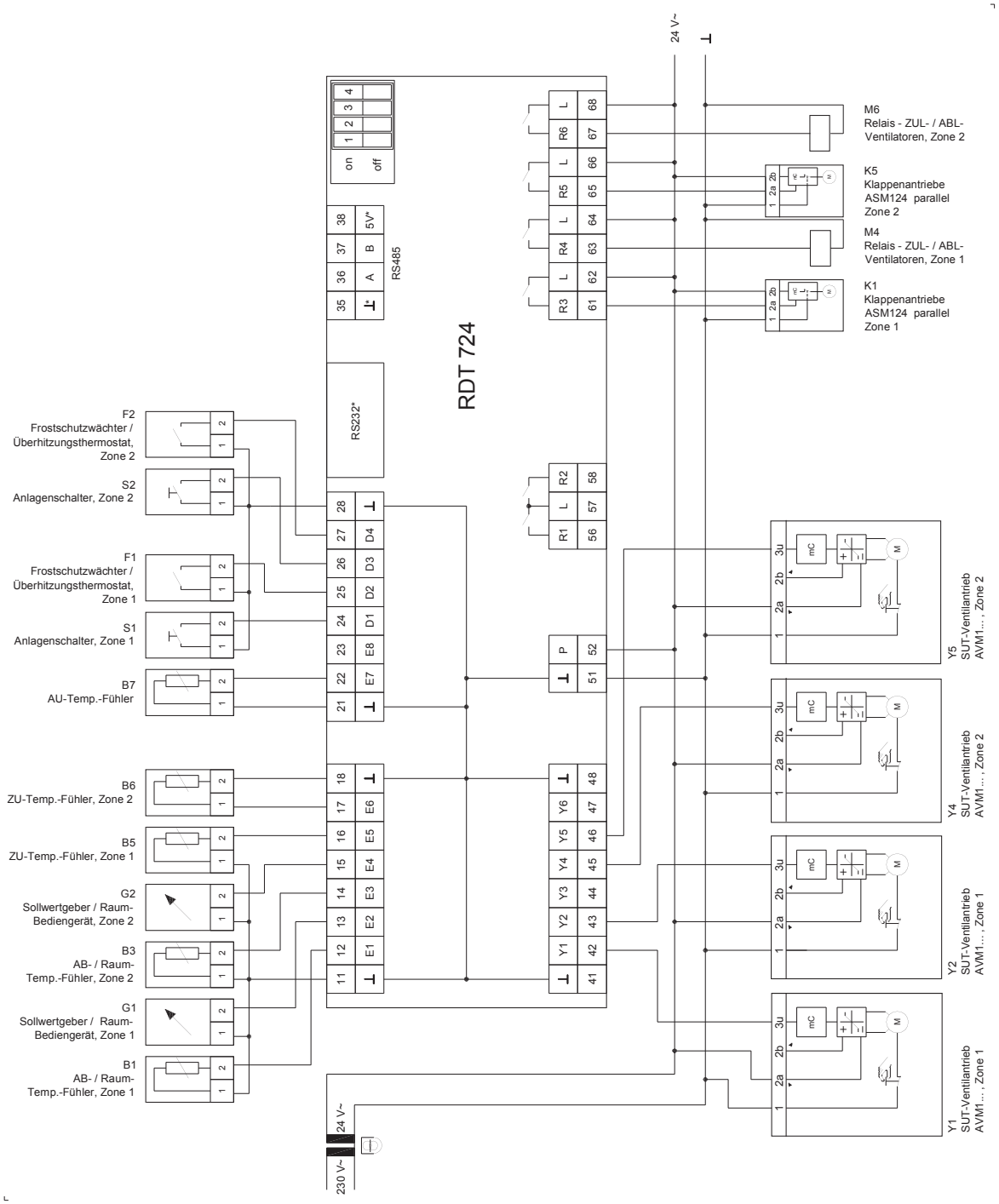
Description

Number	Display	Function	Additional information	Factory setting	Setting
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode, zone 1	Stand-by mode	1	
			Free night cooling	2	
A024	Z2 Red.mod.	Reduced mode, zone 2	Stand-by mode on	1	
			Free night cooling	2	
	Stand-by mode, zone 1				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling, zone 1				
D600	Clk chan. 3	Timer channel 3		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
	Stand-by mode, zone2				
D122	Z2 setpoint2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D500	Clk chan. 2	Timer channel 2		1	
P773	FC2 sw diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling, zone 2				
D600	Clk chan. 3	Timer channel 3		1	
P774	FC2 Neutral	Neutral range, night		5.0K	
P775	FC2 on offs	Cut-in point, FNC/setpoint		2.0K	
P776	FC2 te min	Minimum outside temperature	Enable night cooling	10.0°C	

Measuring points	
MP1	Active setpoint, zone 1 (D116)
MP2	Main setpoint, zone 1 (D117)
MP3	Positioning signal, main controller, zone 1
MP4	Control mode, zone 1 (0/1)
MP5	Active setpoint, zone 2 (D126)
MP6	Main setpoint, zone 2 (D127)
MP7	Positioning signal, main controller, zone 2
MP8	Control mode, zone 2 (0/1)

3.1.8.3 Wiring diagramm

Supply-return air cascade control, air heater/air cooler, 2 zones (CTR HC 2Z)



3.1.9 Application 211

Supply-return air cascade control, air heater/air cooler with change-over (CTR c)

Plant design:

- Outside and exhaust air damper
- Supply and return air fan
- Heat exchanger, heating/cooling with control valve and pump
- Supply air, return air or room temperature sensor
- Outside temperature sensor

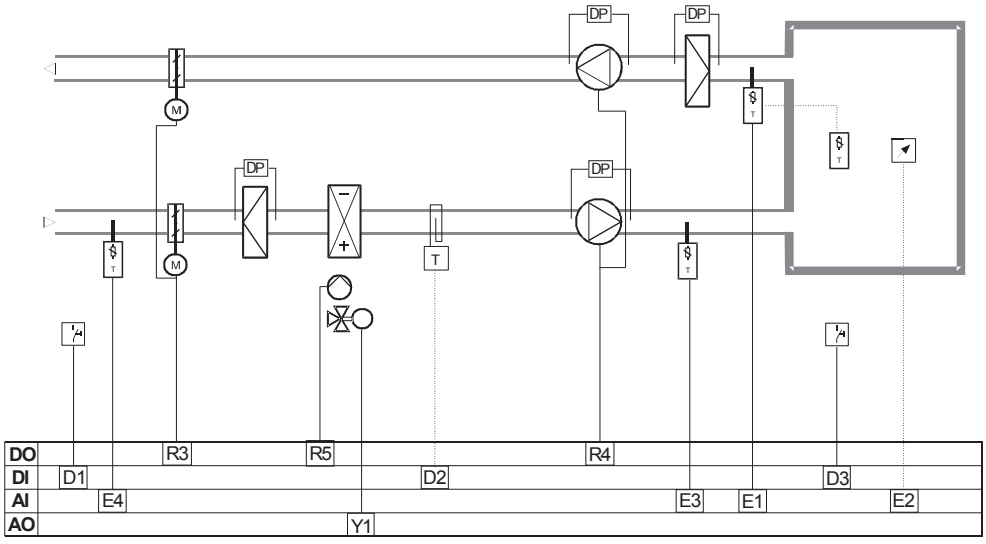
Control functions:

- Temperature control, return air-supply air cascade, with ta shift (optional)

Control functions:

- Enable dampers
- Delay fan cut-in
- Change-over function
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode
- Free night cooling

Plant schematic:



Description:

Functions

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1 according to the control deviation. If the change-over digital input is enabled, sequence Y1 heating changes to Y1 cooling.

The supply air temperature is limited.

When the plant is switched off from the main switch, the fans are switched off, and the valve and dampers are closed.

Options

External setpoint

According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via the setpoint adjuster, XPESF001.
In addition, a room operating unit can be used to switch the plant over from automatic to continuous or stand-by mode.

Setpoint shift

The setpoint is changed in relation to the outside temperature according to the adjusted influence (see the diagram).

Frost protection

The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. Valve Y1 is opened fully and the heat exchanger pump is switched on. The frost protection is still active when the plant is switched off, but in case of change-over cooling, the frost protection is not effective.

Overheating protection

The overheating protection switches the heating off, the fans are switched on and the dampers are opened. The overheating protection is still active when the plant is switched off, but in case of change-over cooling, the overheating protection is not effective.

Reduced mode (timer)

Channel 1

The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, the plant is switched on and off at the reduced setpoint (2-point).

Channel 2

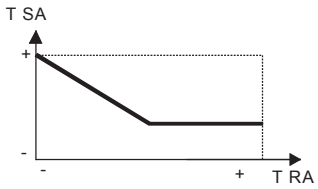
If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2, provided that the conditions are met, i.e. the room temperature is above the setpoint and the outside temperature is lower than the room temperature. The dampers are opened and the fans are switched on after a delay.

Enable change-over

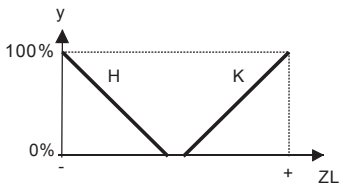
Change-over cooling mode is enabled when the outside temperature exceeds the cut-in point.

Description

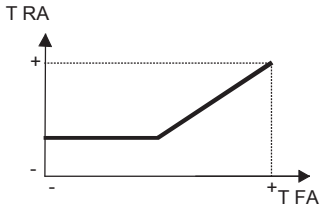
3.1.9.1 Functional diagrams



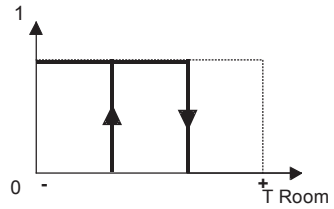
Return-supply air cascade



Heating-cooling sequence



ta setpoint shift



Stand-by mode with reduced setpoint

3.1.9.2 Parameter list

Supply-return air cascade control, air heater/air cooler with change-over (CTR c)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room setpoint			
Act. val.	20.2°C	Actual room value			
Setp sup	38.0°C	Supply air setpoint			
A.val su	27.2°C	Supply air - actual value			
Setpoints					
D111	Setpoint 1	Setpoint 'Normal'		20.0°C	
D112	Setpoint 2	Setpoint 'Reduced'	Timer / room remote control	15.0°C	
Basic configuration					
A001	Application	Application	CTR c	211	
	Options (described on the next page)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour	Cascade	2	
A013	Protection	Frost protection/overheating protection	Frost protection	1	
A014	Red. mode	Reduced mode (timer)	Stand-by mode	1	
A015	Release C	Enable change-over	Off	0	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Return air temperature sensor	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication	Normal input (Off)	0	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A120	E2 Function	Setpoint adjuster	Not used	0	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (Off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Outside temp. sensor	Not used	0	
	Digital inputs				
A210	D1 Function	Main switch	Active if low	101	
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
A230	D3 Function	Change-over	Active if low	101	

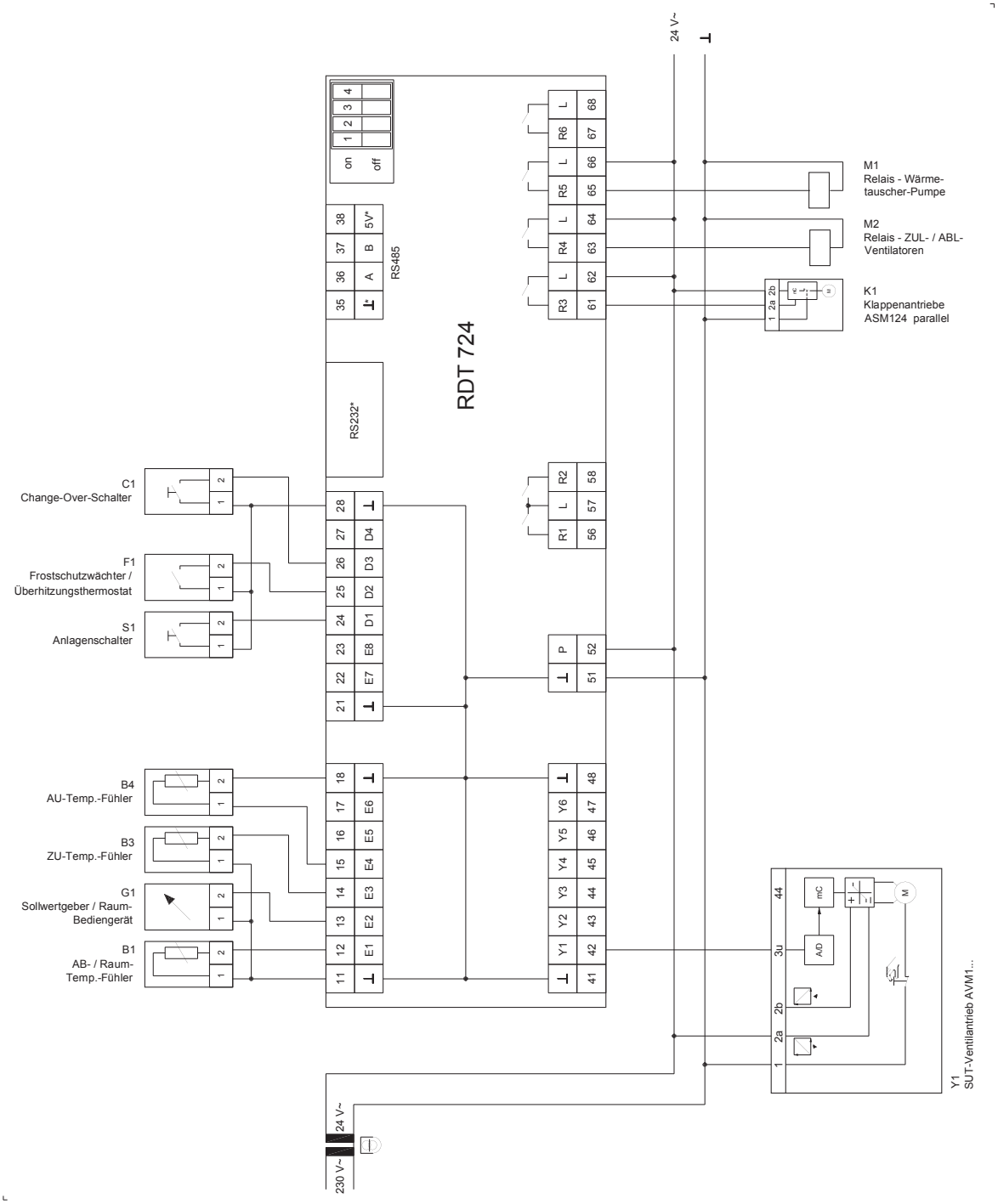
Number	Display	Function	Additional information	Factory setting	Setting
	Analogue outputs				
A310	Y1 Function	Three-way valve 'heating' / 'cooling'	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
	Digital outputs				
A430	R3 Function	Damper actuator	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking	None	0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking	None	0	
A450	R5 Function	Heat exchanger pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R3 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room setpoint	15.0°C	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK)	Supply air at room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint		30.0°C	
P605	C1 Min	Minimum supply air setpoint		15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term	Output Y1	160s	
P633	PID1 Tv	PID1 D-term	Output Y1	0.0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp1)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of1)	Output Y1	-2.0K	
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y1	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y1	2.0K	
Switching points					
P780	2P1 sw.pt	Switching point for pump	Relay R5	5.0%	
P781	2P1 sw.diff	Switching difference for pump	Relay R5	2.0%	
Delays					
P801	TM1 time	Switch-on delay, fans	Relay R4	30s	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Options					
External setpoint					
A010	Ext.setp	External setpoint	On	1	
	Input E2 setpoint adjuster				
A120	E2 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A122	E2 Set max	Range maximum		40.0°C	
A123	E2 Set min	Range minimum		0.0°C	
A124	E2 Cal.max	Calibration of range maximum		°C	
A125	E2 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A126	E2 Cal.min	Calibration of range minimum		°C	
A128	E2 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Input E4 outside air temperature				
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
A141	E4 Scheme	Sensor multiplication	Normal input (off)	0	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 Lim Wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Controller					
A012	Control	Control behaviour	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating protection	Frost protection	1	
			Overheating protection	2	
	Input D2 frost protection monitor/overheating thermostat				
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Stand-by mode + night cooling	2	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling				
D500	Clk chan. 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
Enable change-over					
A015	Release C	Enable change-over	On	1	
	Cut-in point				
P554	SPS2 pt su	Summer cut-in point	Enable cooling mode	25.0°C	
Measuring points					
MP1		Active setpoint (D116)			
MP2		Main setpoint (D117)			
MP3		Auxiliary setpoint (D118)			
MP4		Positioning signal, aux. controller			
MP5		Stand-by mode (0/1)			
MP6		FNC mode (0/1)			
MP7		Control mode (0/1)			

3.1.9.3 Wiring diagramm

Supply-return air cascade control, air heater/air cooler with change-over (CTR c)



3.1.10 Application 212

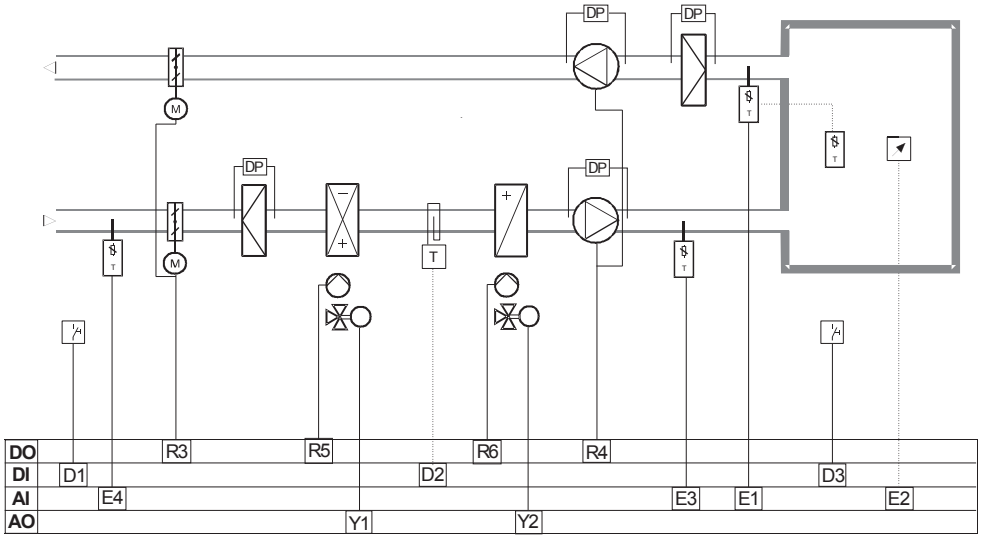
Supply-return air cascade control, air heater/air cooler with change-over, air heater (CTR cH)

Plant design:
- Outside and exhaust air damper
- Supply and return air fan
- Heat exchanger, heating/cooling with control valve and pump
- Air heater with pump
- Supply air, return air or room temperature sensor
- Outside temperature sensor

Control functions:
- Temperature control, return air-supply air cascade with ta shift (optional)

Control functions:
- Enable dampers
- Delay fan cut-in
- Change-over function
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode
- Free night cooling

Plant schematic:



Description:

Functions

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valves Y1 and Y2 according to the control deviation. If the change-over digital

input is enabled, sequence Y1 heating changes to Y1 cooling, and heating valve Y2 then remains closed.
The supply air temperature is limited.
When the plant is switched off from the main switch, the fans are switched off, and the valve and dampers are closed.

Options
External setpoint
According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via the setpoint adjuster, XPESF001.
In addition, a room operating unit can be used to switch the plant over from automatic to continuous or stand-by mode.

Setpoint shift
The setpoint is changed in relation to the outside temperature according to the adjusted influence (see the diagram).

Frost protection
The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. Heating valve Y1 is opened fully and the air heater pump is switched on, but heating valve Y2 remains closed. The frost protection is still active when the plant is switched off, but for change-over cooling, the frost protection is not effective.

Overheating protection
The overheating protection switches the heating off, the fans are switched on and the dampers are opened. The overheating protection is still active when the plant is switched off, but for change-over cooling, the overheating protection is not effective.

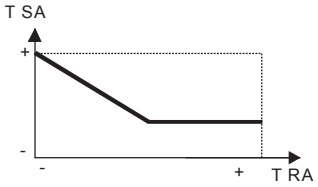
Reduced mode (timer)
Channel 1
The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, the plant is switched on and off at the reduced setpoint (2-point), and heating valve Y2 can be switched in if necessary.

Channel 2
If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2, provided that the conditions are met, i.e. the room temperature is above the setpoint and the outside temperature is lower than the room temperature. The dampers are opened and the fans are switched on after a delay.

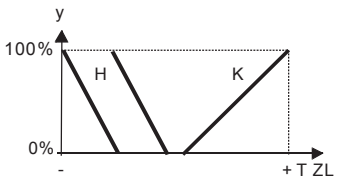
Enable change-over
Change-over cooling mode is enabled when the outside temperature exceeds the cut-in point.

Description

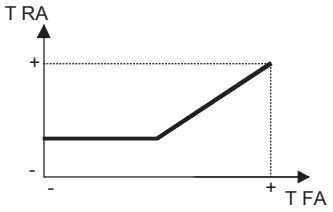
3.1.10.1 Functional diagrams



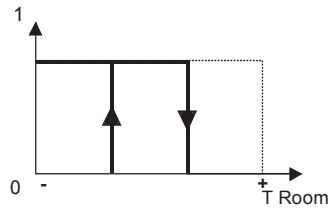
Return-supply air cascade



Heating-cooling sequence



ta setpoint shift



Stand-by mode with reduced setpoint

3.1.10.2 Parameter list

Supply-return air cascade control, air heater/air cooler with change-over (CTR cH)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room setpoint			
Actual value	20.2°C	Actual room value			
Setp sup	38.0°C	Supply air setpoint			
A.val su	27.2°C	Supply air - actual value			
Setpoints					
D111	Setpoint 1	Setpoint 'Normal'		20.0°C	
D112	Setpoint 2	Setpoint 'Reduced'	Timer / room remote control	15.0°C	
Basic configuration					
A001	Application	Application	CTR cH	212	
	Options (described on the next page)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Fixed value/cascade	Cascade	2	
A013	Protection	Frost protection/overheating protection	Frost protection	1	
A014	Red. mode	Reduced mode (timer)	Stand-by mode	1	
A015	Release C	Enable change-over	Off	0	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Return air temperature sensor	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication	Normal input (Off)	0	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A120	E2 Function	Setpoint adjuster	Not used	0	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (Off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Outside temp. sensor	Not used	0	
	Digital inputs				
A210	D1 Function	Main switch	Active if low	101	
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
A230	D3 Function	Change-over	Active if low	101	

Number	Display	Function	Additional information	Factory setting	Setting
	Analogue outputs				
A310	Y1 Function	Three-way valve 'heating 1 / cooling'	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
A320	Y2 Function	Three-way valve 'heating 2'	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A328	Y2 Blocking	Blocking		0	
	Digital outputs				
A430	R3 Function	Damper actuator	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking	None	0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Block	Blocking	None	0	
A450	R5 Function	Air heater pump 1 / air cooler pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
A460	R6 Function	Air heater pump 2	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room setpoint	15.0°C	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK)	Supply air at room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint		30.0°C	
P605	C1 Min	Minimum supply air setpoint		15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term	Outputs Y1 and Y2	160s	
P633	PID1 Tv	PID1 D-term	Outputs Y1 and Y2	0.0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp1)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of1)	Output Y1	-2.0K	
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y2	10.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y2	-2.0K	
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y1	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y1	2.0K	

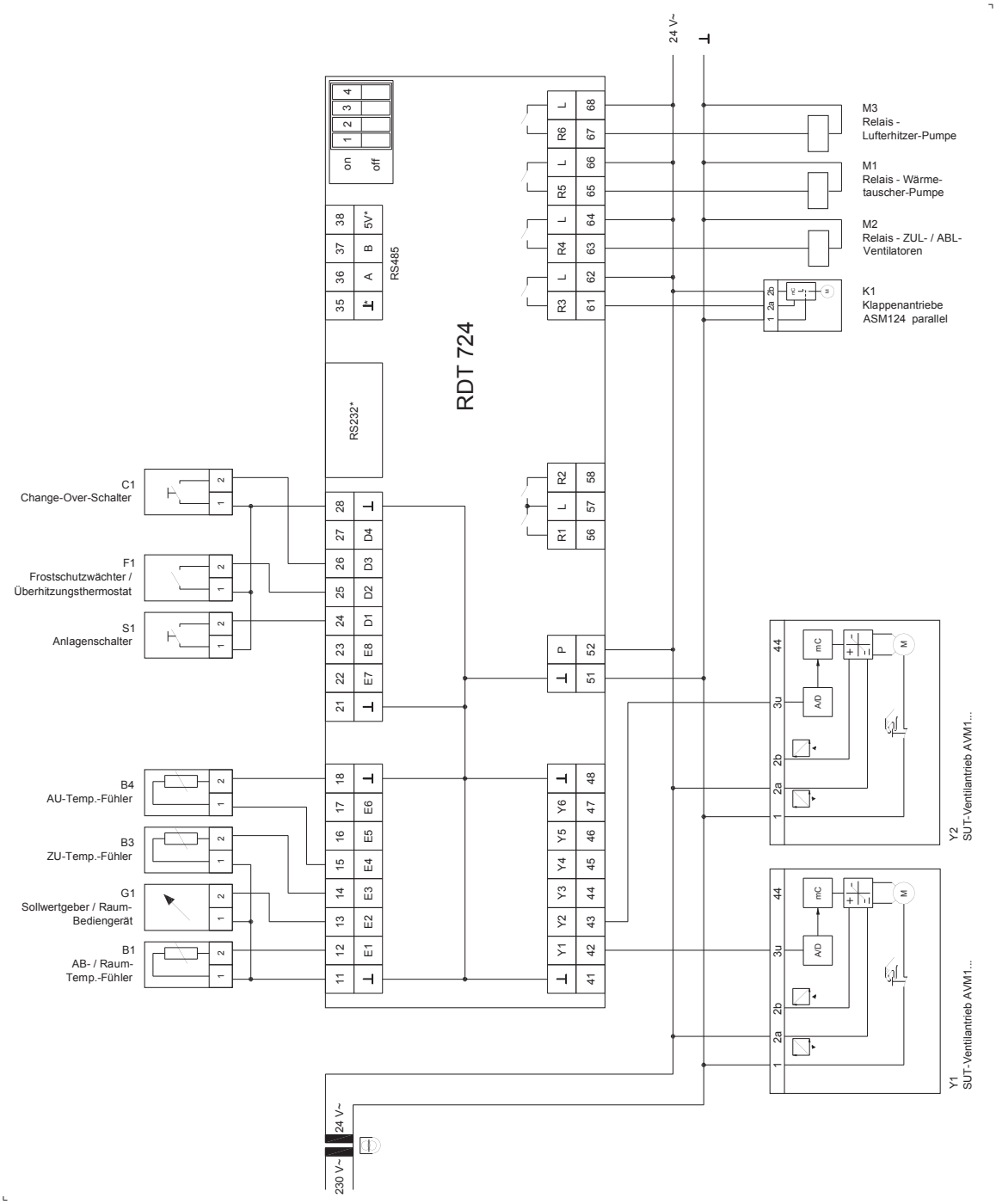
Description

Number	Display	Function	Additional information	Factory setting	Setting
Switching points					
P780	2P1 sw.pt	Switching point, air heater/cooler pump	Relay R5	5.0%	
P781	2P1 sw.diff	Switching diff., air heater/cooler pump	Relay R5	2.0%	
P782	2P2 sw.pt	Switching point, air heater pump 2	Relay R6	5.0%	
P783	2P2 sw.diff	Switching difference, air heater pump 2	Relay R6	2.0%	
Delays					
P801	TM1 time	Switch-on delay, fans	Relay R4	30s	
Options					
External setpoint					
A010	Ext.setp.	External setpoint	On	1	
	Input E2 setpoint adjuster				
A120	E2 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A122	E2 Set max	Range maximum		40.0°C	
A123	E2 Set min	Range minimum		0.0°C	
A124	E2 Cal.max	Calibration of range maximum		°C	
A125	E2 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A126	E2 Cal.min	Calibration of range minimum		°C	
A128	E2 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Input E4 outside air temperature				
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
A141	E4 Scheme	Sensor multiplication	Normal input (off)	0	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 Lim Wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Controller					
A012	Control	Control behaviour	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating protection	Frost protection	1	
			Overheating protection	2	
	Input D2				
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Stand-by mode + night cooling	2	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling				
D500	Clk chan. 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
Enable change-over					
A015	Release C	Enable change-over	On	1	
	Cut-in point				
P554	SPS2 pt su	Summer cut-in point	Enable cooling mode	25.0°C	

Number	Display	Function	Additional information	Factory setting	Setting
Measuring points					
MP1		Active setpoint (D116)	MP7	Control mode (0/1)	
MP2		Main setpoint (D117)			
MP3		Auxiliary setpoint (D118)			
MP4		Positioning signal, aux. controller			
MP5		Stand-by mode (0/1)			
MP6		FNC mode (0/1)			

3.1.10.3 Wiring diagramm

Supply-return air cascade control, air heater/air cooler with change-over (CTR cH)



3.1.11 Application 213

Supply-return air cascade control, air heater/air cooler with change-over, mixing chamber, air heater (CTR cHO)

Plant design:

- Mixing chamber
- Supply and return air fan
- Heat exchanger, heating/cooling with control valve and pump
- Air heater with pump
- Supply air, return air or room temperature sensor
- Outside temperature sensor

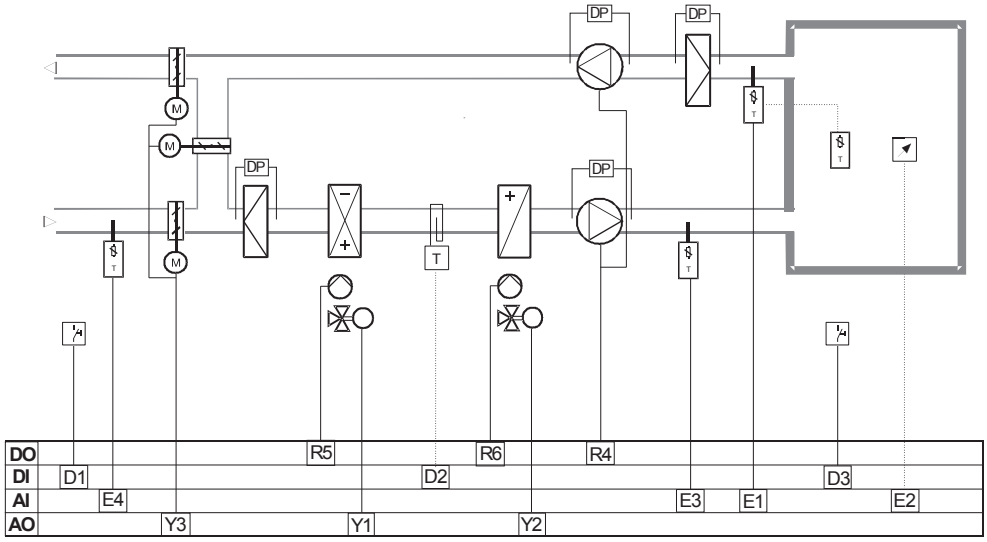
Control functions:

- Temperature control, return air-supply air cascade with ta shift (optional)

Control functions:

- Enable mixing chamber
- Delay fan cut-in
- Change-over function
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode
- Free night cooling

Plant schematic:



Description:

Functions

When the plant is switched on, the control is enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1, heating valve Y2 or outside air dampers Y3 according to the control deviation. If the change-over digital input is enabled,

sequence Y1 heating changes to Y1 cooling, and heating valve Y2 then remains closed. The supply air temperature is limited.
Damper sequence Y3 is released if the outside temperature in cooling mode is lower than the room or return air temperature, and if it is higher than the room or return air temperature in heating mode.
When the plant is switched off from the main switch, the fans are switched off, and the valves and dampers are closed..

Options
External setpoint
According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via the setpoint adjuster, XPESF001.
In addition, a room operating unit can be used to switch the plant over from automatic to continuous or stand-by mode.

Setpoint shift
The setpoint is changed in relation to the outside temperature according to the adjusted influence (see the diagram).

Frost protection
The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. Heating valve Y1 is opened fully and the air heater pump is switched on, but heating valve Y2 remains closed. The frost protection is still active when the plant is switched off, but for change-over cooling, the frost protection is not effective.

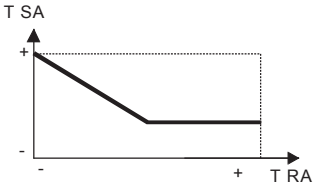
Overheating protection
The overheating protection switches the heating off and the fans are switched on. The overheating protection is still active when the plant is switched off, but for change-over cooling, the overheating protection is not effective.

Reduced mode (timer)
Channel 1
The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, heating valve Y1 is switched on and off at the reduced setpoint (2-point), and heating valve Y2 can be switched in if necessary.

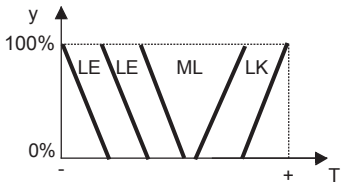
Channel 2
If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2, provided that the conditions are met, i.e. the room temperature is above the setpoint and the outside temperature is lower than the room temperature. The fans are switched on and the outside air dampers are opened.

Enable change-over
Change-over cooling mode is enabled when the outside temperature exceeds the cut-in point.

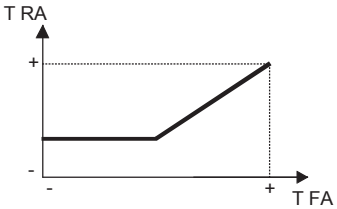
3.1.11.1 Functional diagrams



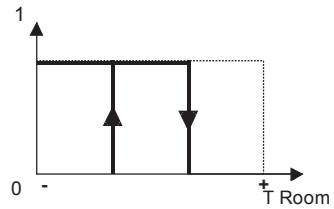
Return-supply air cascade



Heating-cooling damper sequence



ta setpoint shift



Stand-by mode with reduced setpoint

3.1.11.2 Parameter list

Supply-return air cascade control, air heater/air cooler with change-over, mixing chamber, air heater (CTR cHO)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room setpoint			
Actual value	20.2°C	Actual room value			
Setp sup	38.0°C	Supply air setpoint			
A.val su	27.2°C	Supply air - actual value			
Setpoints					
D111	Setpoint 1	Setpoint 'Normal'		20.0°C	
D112	Setpoint 2	Setpoint 'Reduced'	Timer / room remote control	15.0°C	
Basic configuration					
A001	Application	Application	CTR cHO	213	
	Options (described on the next page)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour	Cascade	2	
A013	Protection	Frost protection/overheating protection	Frost protection	1	
A014	Red. mode	Reduced mode (timer)	Stand-by mode	1	
A015	Release C	Enable change-over	Off	0	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Return air temperature sensor	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication	Normal input (Off)	0	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A120	E2 Function	Setpoint adjuster	Not used	0	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (Off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
A141	E4 Scheme	Sensor multiplication	Normal input (Off)	0	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	0.0°C	

Number	Display	Function	Additional information	Factory setting	Setting
	Digital inputs				
A210	D1 Function	Main switch	Active if low	101	
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
A230	D3 Function	Change-over	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve 'heating 1' / 'cooling'	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
A320	Y2 Function	Three-way valve 'heating 2'	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A328	Y2 Blocking	Blocking		0	
A330	Y3 Function	Dampers	Analogue output	1	
A331	Y3 Action	Directional control	Normal 0-10VDC	0	
A332	Y3 Max	Maximum value	Output Y3	100.0%	
A333	Y3 Min	Minimum value	Output Y3	0.0%	
A338	Y3 Blocking	Blocking		0	
	Digital outputs				
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking	None	0	
A450	R5 Function	Air heater pump 1 / air cooler pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
A460	R6 Function	Air heater pump 2	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room setpoint	15.0°C	
P531	LIM6 Min	Minimum outside air component	Dampers Y3	10.0%	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK)	Supply air at room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint		30.0°C	
P605	C1 Min	Minimum supply air setpoint		15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term	Outputs Y1, Y2 and Y3	160s	
P633	PID1 Tv	PID1 D-term	Outputs Y1, Y2 and Y3	0.0s	
Sequences					
	Heating sequences				
P700	SEQ1 P-band	Proportional band (Xp1)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of1)	Output Y1	-2.0K	
P708	SEQ5 P-band	Proportional band (Xp5)	Output Y2	10.0K	
P709	SEQ5 Offset	Offset (Of5)	Output Y2	-2.0K	

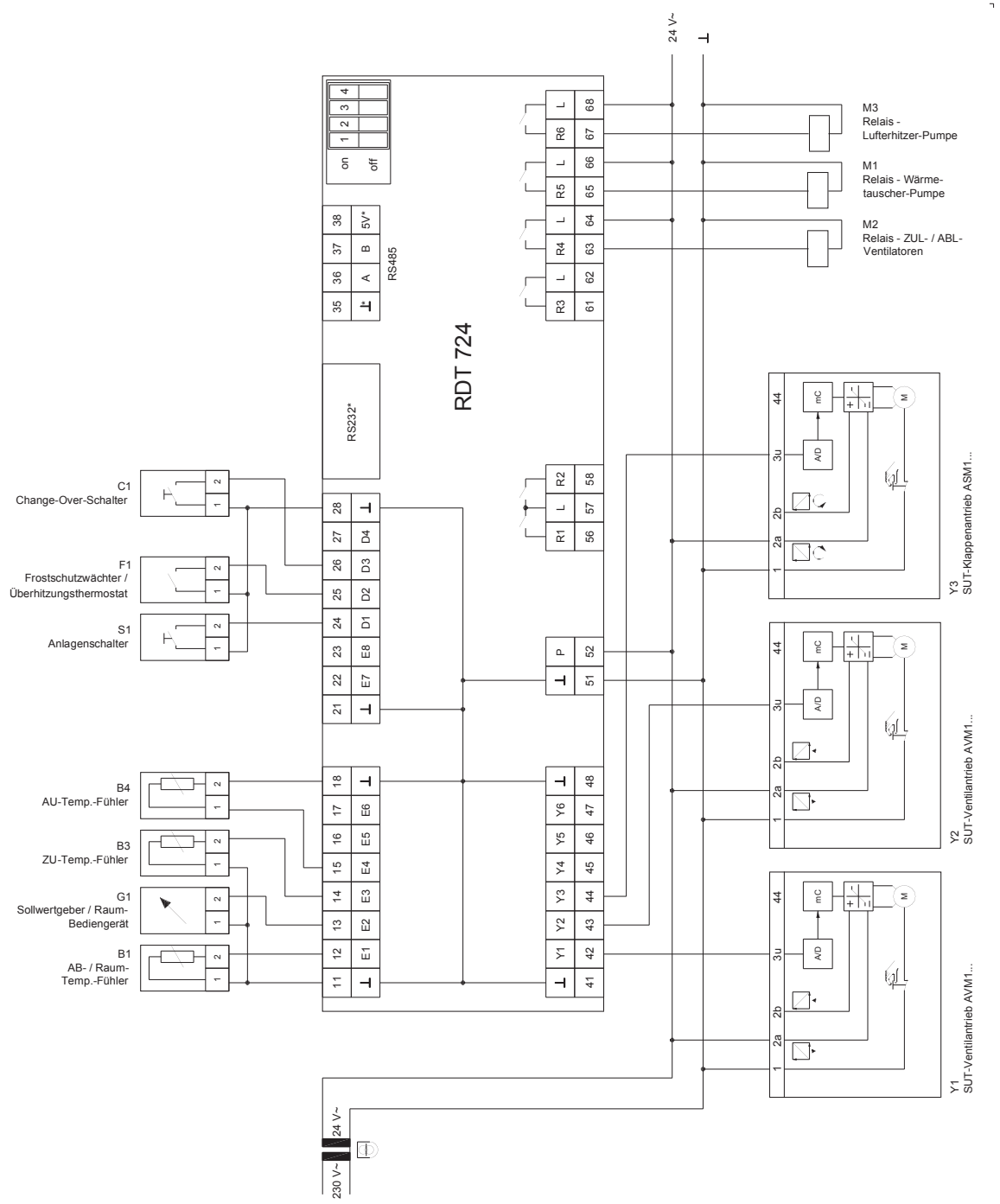
Description

Number	Display	Function	Additional information	Factory setting	Setting
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y1	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y1	2.0K	
	Damper sequence, heat recovery, 'heating'				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y3	10.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y3	-2.0K	
	Damper sequence, heat recovery, 'cooling'				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y3	10.0K	
P707	SEQ4 Offset	Offset (Of4)	Output Y3	2.0K	
Energy recovery					
P741	ER1 exh.±	Correction - return air		0.0K	
P742	ER1 room.±	Correction - room air		0.0K	
P743	ER1 sw.diff	Switching difference - energy supply		1.0K	
P744	ER1 Neutral	Neutral zone - energy supply		3.0K	
Switching points					
P780	2P1 sw.pt	Switching point, air heater/cooler pump	Relay R5	5.0%	
P781	2P1 sw.diff	Switching difference, air heater/cooler pump	Relay R5	2.0%	
P782	2P2 sw.pt	Switching point, air heater pump 2	Relay R6	5.0%	
P783	2P2 sw.diff	Switching difference, air heater pump 2	Relay R6	2.0%	
Options					
External setpoint					
A010	Ext.setp.	External setpoint	On	1	
	Input E2 setpoint adjuster				
A120	E2 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A122	E2 Set max	Range maximum		40.0°C	
A123	E2 Set min	Range minimum		0.0°C	
A124	E2 Cal.max	Calibration of range maximum		°C	
A125	E2 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A126	E2 Cal.min	Calibration of range minimum		°C	
A128	E2 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 Lim Wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Controller					
A012	Control	Control behaviour	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating protection	Frost protection	1	
			Overheating protection	2	
	Input D2				
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Stand-by mode + night cooling	2	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
P811	Variable 1	Valve position Y2	In stand-by mode	0 %	

Number	Display	Function	Additional information	Factory setting	Setting
	Free night cooling				
D500	Clk chan. 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
Enable change-over					
A015	Release C	Enable change-over	On	1	
	Cut-in point				
P554	SPS2 pt su	Summer cut-in point	Enable cooling mode	25.0°C	
Measuring points					
MP1		Active setpoint (D116)			
MP2		Main setpoint (D117)			
MP3		Auxiliary setpoint (D118)			
MP4		Positioning signal, aux. controller			
MP5		Stand-by mode (0/1)			
MP6		FNC mode (0/1)			
MP7		Control mode (0/1)			

3.1.11.3 Wiring diagramm

Supply-return air cascade control, air heater/air cooler with change-over, mixing chamber, air heater (CTR cHO)



3.1.12 Application 214

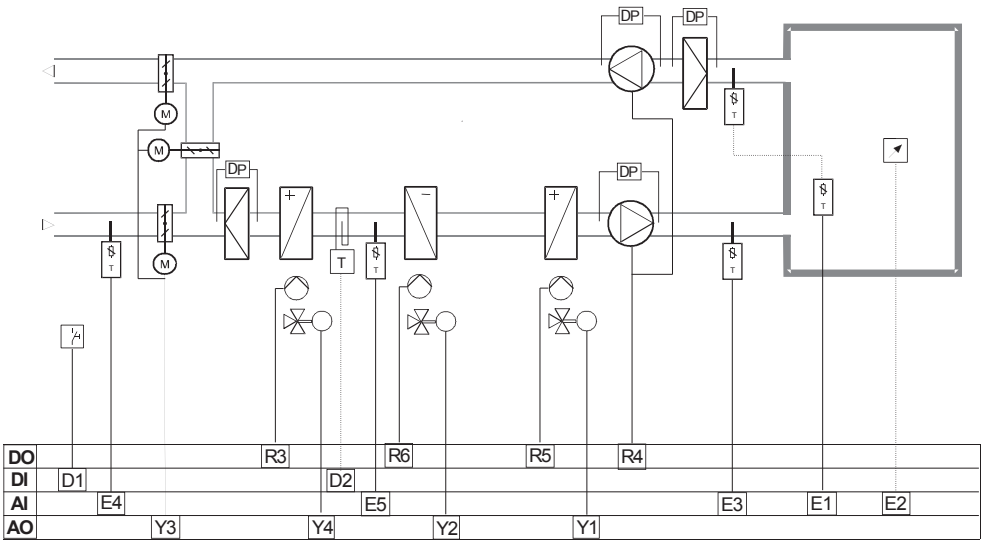
Supply-return air cascade control, pre-heater/air cooler/air heater, mixing chamber (CTR HCOH)

Plant design:
- Mixing chamber
- Supply and return air fan
- Pre-heater, air heater, air cooler with control valve and pump
- Supply air, return air or room temperature sensor
- Outside temperature sensor

Control functions:
- Temperature control, return air-supply air cascade with ta shift (optional)

Control functions:
- Enable dampers
- Delay fan cut-in
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode
- Free night cooling

Plant schematic:



Description:

Functions

When the plant is switched on, the control is enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1, cooling valve Y2 or outside air dampers Y3 according to the control deviation. In heating mode, heating valve Y4 controls a minimum supply air temperature. The supply air temperature is limited.

Damper sequence Y3 is enabled if the outside temperature in cooling mode is lower than the room or return air temperature, or is higher than the room or return air temperature in heating mode.
When the plant is switched off from the main switch, the fans are switched off, and the valves and dampers are closed.

Options
External setpoint
According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via setpoint adjuster XPESF001.
In addition, a room operating unit can be used to switch the plant over from automatic to continuous or stand-by mode.

Setpoint shift
The setpoint is changed in relation to the outside temperature according to the adjusted influence (see the diagram).

Frost protection
The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. Heating valve Y4 is opened fully and the air heater pump is switched on, but heating valve Y1 remains closed. The frost protection is still active when the plant is switched off.

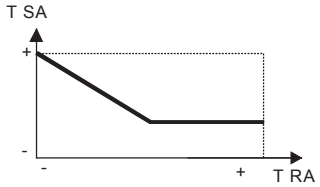
Overheating protection

The overheating protection switches the heating off and the fans are switched on. The overheating protection is still active when the plant is switched off.

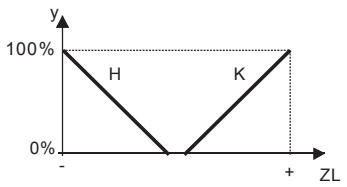
Reduced mode (timer)
Channel 1
The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, the plant is switched on and off at the reduced setpoint (2-point).

Channel 2
If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2, provided that the conditions are met, i.e. the room temperature is above the setpoint and the outside temperature is lower than the room temperature.
The fans are switched on and the outside air dampers are opened.

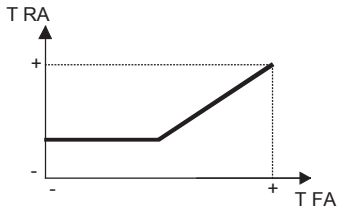
3.1.12.1 Functional diagrams



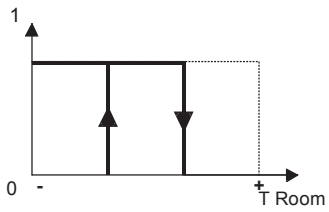
Return-supply air cascade



Heating-cooling sequence



ta setpoint shift



Stand-by mode with reduced setpoint

3.1.12.2 Parameter list

Supply-return air cascade control, pre-heater/air heater/air cooler, mixing chamber, air heater (CTR HCOH)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room setpoint			
Actual value	20.2°C	Actual room value			
SA setp.	38.0°C	Supply air setpoint			
SA act.	27.2°C	Supply air - actual value			
Preh. setp.	28.0°C	Preheating setpoint			
Preh. act.	26.2°C	Preheating actual value			
Setpoints					
D111	Setpoint 1	Setpoint 'Normal'		20.0°C	
D112	Setpoint 2	Setpoint 'Reduced'	Timer / room remote control	15.0°C	
Basic configuration					
A001	Application	Application	CTR HCOH	214	
	Options (described on the next page)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour	Cascade	2	
A013	Protection	Frost protection/overheating protection	Frost protection	1	
A014	Red. mode	Reduced mode (timer)	Stand-by mode	1	
I/O configuration					
	Analogue inputs				
A110	**E1 Function**	**Retur**n air temperature sensor	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication	Normal input (Off)	0	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A120	E2 Function	Setpoint adjuster	Not used	0	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (Off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
A141	E4 Scheme	Sensor multiplication	Normal input (Off)	0	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	0.0°C	

Description

Number	Display	Function	Additional information	Factory setting	Setting
A150	E5 Function	Supply air temperature sensor pre-heat.	Temp. Ni1000	3	
A157	E5 Cal.temp	Temperature calibration		°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	
	Digital inputs				
A210	D1 Function	Main switch	Active if low	101	
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve 'heating'	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
A320	Y2 Function	Three-way valve 'cooling'	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A328	Y2 Blocking	Blocking		0	
A330	Y3 Function	Dampers	Analogue output	1	
A331	Y3 Action	Directional control	Normal 0-10VDC	0	
A332	Y3 Max	Maximum value	Output Y3	100.0%	
A333	Y3 Min	Minimum value	Output Y3	0.0%	
A338	Y3 Blocking	Blocking		0	
A340	Y4 Function	Three-way valve 'pre-heating'	Analogue output	1	
A341	Y4 Action	Directional control	Normal 0-10VDC	0	
A342	Y4 Max	Maximum value	Output Y4	100.0%	
A343	Y4 Min	Minimum value	Output Y4	0.0%	
A348	Y4 Blocking	Blocking		0	
	Digital outputs				
A430	R3 Function	Air heater pump 'pre-heating'	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking	None	0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking	None	0	
A450	R5 Function	Air heater pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
A460	R6 Function	Air cooler pump	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room setpoint	15.0°C	
P531	LIM6 Min	Minimum outside air component	Dampers Y3	10.0%	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK)	Supply air at room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint		30.0°C	
P605	C1 Min	Minimum supply air setpoint		15.0°C	

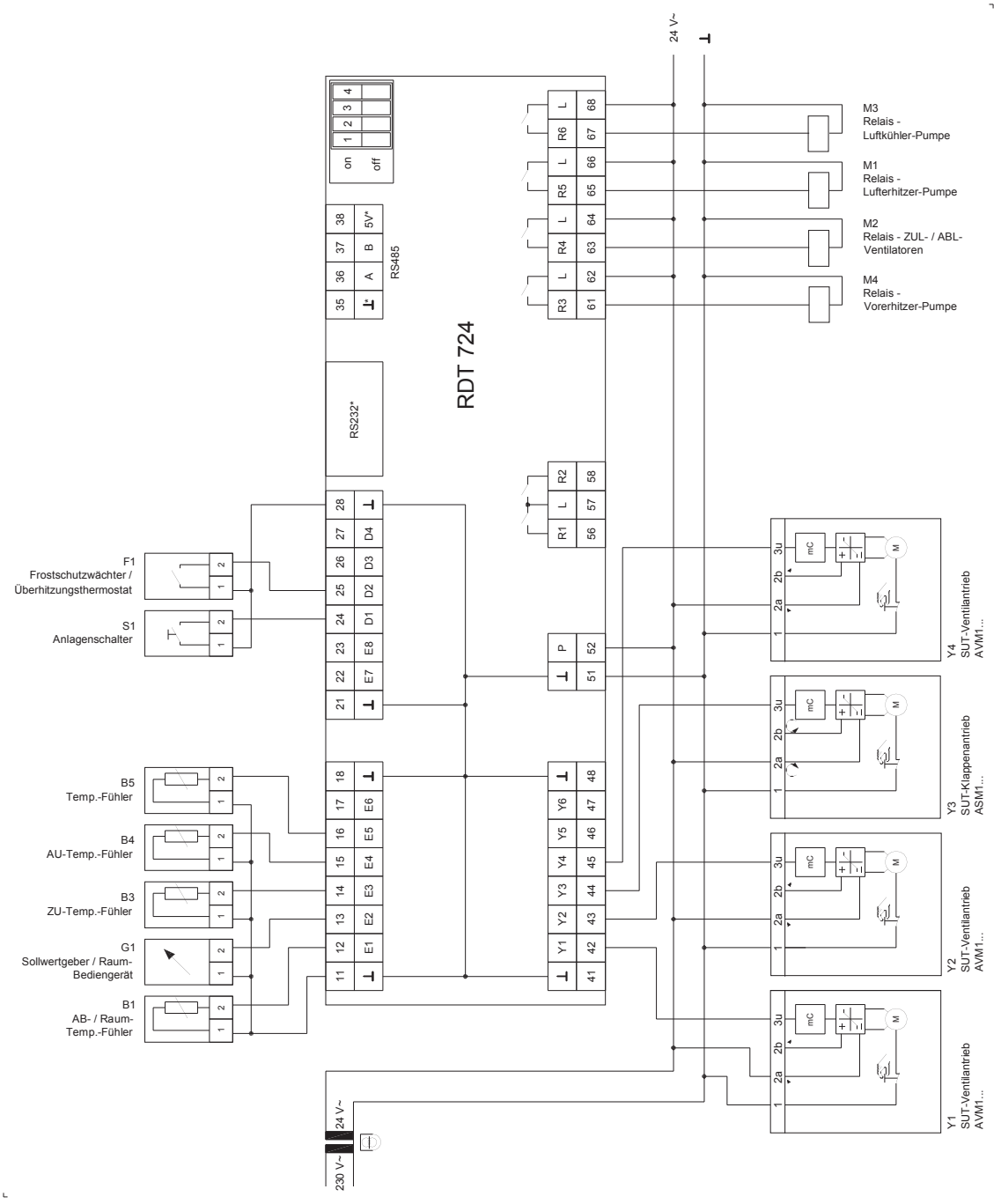
Number	Display	Function	Additional information	Factory setting	Setting
PID controller(s)					
P632	PID1 Tn	PID1 I-term, temperature controller,	Output Y1...Y3	160s	
P633	PID1 Tv	PID1 D-term, temperature controller,	Output Y1...Y3	0.0s	
P641	PID2 Xp	PID2 P-band, temperature controller, preh.	Output Y4	10K	
P642	PID2 Tn	PID2 I-term, temperature controller, preh.	Output Y4	160s	
P643	PID2 Tv	PID2 D-term, temperature controller, preh.	Output Y4	0.0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	-2.0K	
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	2.0K	
	Damper sequence, heat recovery, 'heating'				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y3	10.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y3	-2.0K	
	Damper sequence, heat recovery, 'cooling'				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y3	10.0K	
P707	SEQ4 Offset	Offset (Of4)	Output Y3	2.0K	
Energy recovery					
P741	ER1 exh.±	Correction - return air		0.0K	
P742	ER1 room air±	Correction - room air		0.0K	
P743	ER1 sw.diff	Switching difference - energy supply		1.0K	
P744	ER1 Neutral	Neutral zone - energy supply		3.0K	
Switching points					
P780	2P1 sw.pt	Switching point, air heater pump	Relay R5	5.0%	
P781	2P1 sw.diff	Switching difference, air heater pump	Relay R5	2.0%	
P782	2P2 sw.pt	Switching point, air cooler pump	Relay R6	5.0%	
P783	2P2 sw.diff	Switching difference, air cooler pump	Relay R6	2.0%	
P784	2P3 sw.pt	Switching point for pump - pre-heating	Relay R3	5.0%	
P785	2P3 sw.diff	Switching difference for pump - pre-ht.	Relay R3	2.0%	
pre-heating					
P811	Variable 1	Setpoint - pre-heating		10.0°C	
Options					
External setpoint					
A010	Ext.setp.	External setpoint	On	1	
	Input E2 setpoint adjuster				
A120	E2 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A122	E2 Set max	Range maximum		40.0°C	
A123	E2 Set min	Range minimum		0.0°C	
A124	E2 Cal.max	Calibration of range maximum		°C	
A125	E2 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A126	E2 Cal.min	Calibration of range minimum		°C	
A128	E2 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 Lim Wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Controller					
A012	Control	Control behaviour	Fixed value (supply air control)	1	
			Cascade (room control)	2	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating protection	Frost protection	1	
			Overheating protection	2	
	Input D2				
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Stand-by mode + night cooling	2	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling				
D500	Clk chan. 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
Measuring points					
MP1		Active setpoint (D116)			
MP2		Main setpoint (D117)			
MP3		Auxiliary setpoint (D118)			
MP4		Positioning signal, aux. controller			
MP5		Stand-by mode (0/1)			
MP6		FNC mode (0/1)			
MP7		Control mode (0/1)			

3.1.12.3 Wiring diagramm

Supply-return air cascade control, pre-heater/air heater/air cooler with change-over, mixing chamber, air heater (CTR HCOH)



3.1.13 Application 301

Supply-return air cascade control with humidification and dehumidification, air heater/air cooler/energy recovery/humidifier (CTHR HCEh)

Plant design:

- Outside and exhaust air damper
- Heat recovery (recuperative)

- Supply and return air fan
- Air heater, air cooler with control valve and pump
- Humidifier
- Supply air, return air or room temperature sensor
- Outside temperature sensor

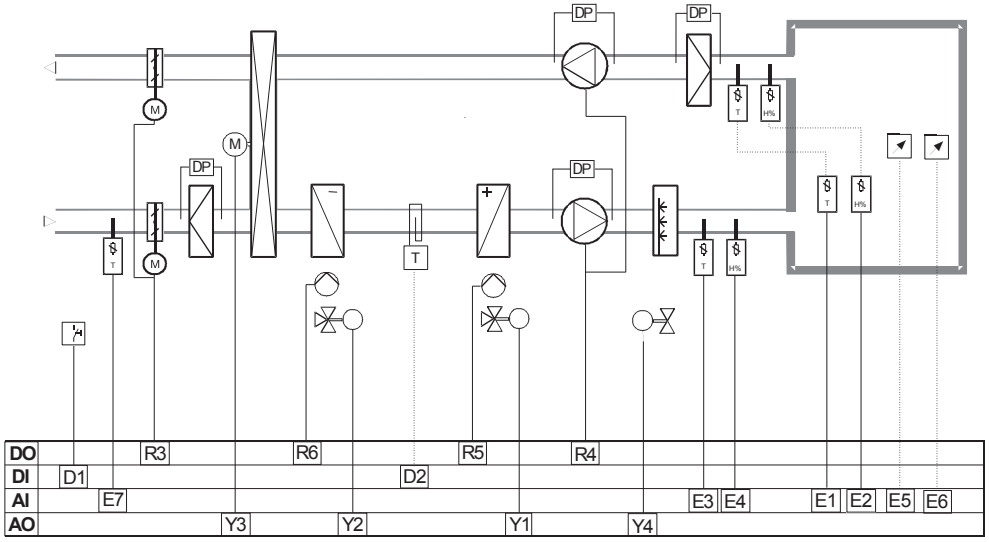
Control functions:

- Temperature control, return air-supply air cascade with ta shift
- Humidity control, return air-supply air cascade
- Air quality control

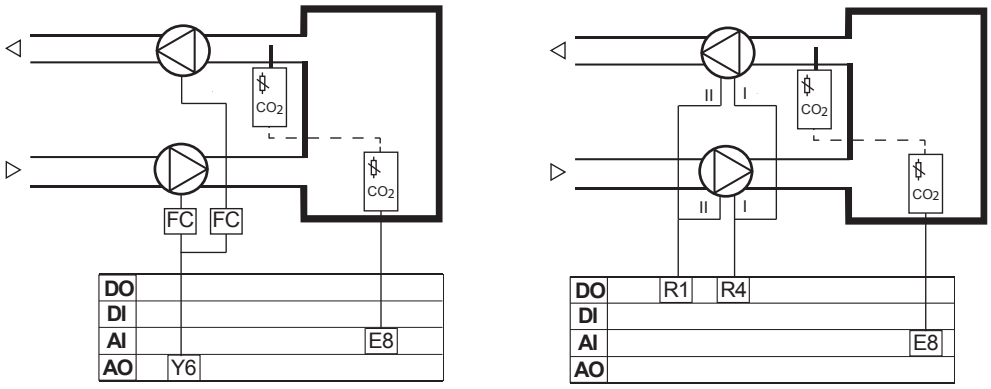
Control functions:

- Enable control
- Delay fan cut-in
- Enable energy recovery
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode
- Free night cooling

Plant schematic:



Plant schematic for Air quality control:



Description:

Functions

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1, cooling valve Y2 or rotary heat exchanger Y3 according to the control deviation. The supply air temperature is limited.

The energy recovery acts on Y3 and is enabled when the outside temperature in cooling mode is higher than the room temperature, and in heating mode when it is lower than the room temperature.

The humidity control compares the room or return air humidity with the setpoint and controls valve Y4 (humidification) or cooling valve Y2 (dehumidification) according to the control deviation. The supply air humidity is limited.

The fans are switched off, and the valves and dampers are closed via the main (plant) switch.

Options

External setpoint

According to choice, a setpoint adjuster (XPESF001) can be used to change or correct the setpoint for the temperature and/or the humidity.

Setpoint shift

The setpoint is changed in relation to the outside temperature according to the adjusted influence (see the diagram).

Frost protection

The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. The heating valve is opened fully and the air heater pump is switched on. The frost protection is still active when the plant is switched off.

Overheating protection

The overheating protection switches the heating off, the fans are switched on and the dampers are opened. The overheating protection is still active when the plant is switched off.

Air quality control

If air quality control is activated (parameter A015) the controller uses an air quality sensing signal from input E8. This signal is used to calculate a setpoint for a frequency converter to drive the fan (min. speed P533, min. AQ P812, max. AQ P811). This setpoint is available at analog output Y6.

Alternatively the sensor signal can be used to activate a second fan speed via relay R1.

Reduced mode (timer)

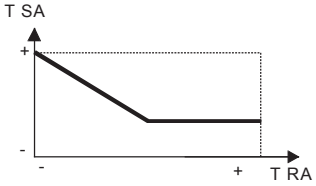
Channel 1

The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, the plant is switched on and off at the reduced setpoint (2-point).

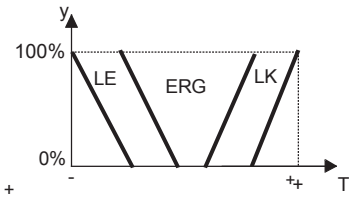
Channel 2

If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2 provided that the conditions are met, i.e. the room temperature is above the setpoint and the outside temperature is lower than the room temperature. The fans are switched on and the outside air dampers are opened.

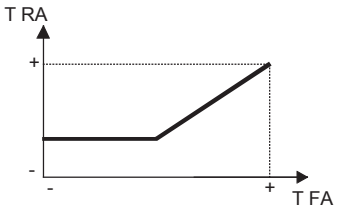
3.1.13.1 Functional diagrams



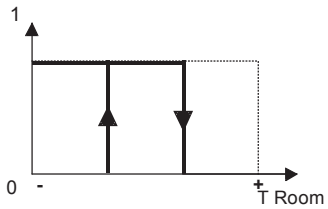
Return-supply air cascade



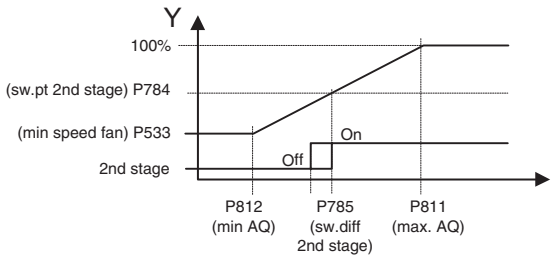
Heating-cooling-heat recovery sequence



Setpoint shift acc. to outside temperature



Stand-by mode with reduced setpoint



Air quality control

3.1.13.2 Parameter list

Supply-return air cascade control, humidification and dehumidification, air heater/air cooler/energy recovery/humidifier (CTHR HCEh)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0	Room temperature setpoint			
Act. val	20.2°C	Room temperature actual value			
Setp sup	38.0°C	Supply air temperature setpoint			
A.val sup	27.2°C	Supply air temperature actual value			
Setpoint	55.0% r.h.	Room humidity setpoint			
Act. val	40.2% r.h.	Room humidity actual value			
Setp sup	75.0% r.h.	Supply air humidity setpoint			
A.val sup	27.2% r.h.	Supply air humidity, actual value			

Number	Display	Function	Additional information	Factory setting	Setting
Setpoints					
D111	Setpoint 1	Temperature setpoint 'Normal'		20.0°C	
D112	Setpoint 2	Temperature setpoint 'Reduced'	Timer / room remote control	15.0°C	
D121	Setpoint 1	Humidity setpoint		55.0% r.h.	
Basic configuration					
A001	Application	Application	CTHR HCEh	301	
A002	Dehumidify	Dehumidification (cooling)	On	1	
	Options (described on the following pages)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour	Cascade	2	
A013	Protection	Frost protection/overheating protection	Frost protection	1	
A014	Red. mode	Reduced mode (timer)	Stand-by mode	1	
A015	AQ regul.	Air quality regulator	Off	0	
A020	Ext.setp.h	External setpoint, humidity	Off	0	
A021	Shift hum.	Setpoint shift, humidity, acc. to ta	Off	0	
A022	Control h	Control behaviour, humidity	Cascade	2	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Room temperature sensor	Temp. 0-10V	20	
A112	E1 Set max	Upper range limit	Active sensor at 10V	50.0°C	
A113	E1 Set min	Lower range limit	Active sensor at 0V	0.0°C	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A120	E2 Function	Room humidity sensor	Humidity 0-10V	21	
A122	E2 Set max	Upper range limit	Active sensor at 10V	100.0% r.h.	
A123	E2 Set min	Lower range limit	Active sensor at 0V	0.0% r.h.	
A130	E3 Function	Supply air temperature sensor	Temp. 0-10V	20	
A132	E3 Set max	Upper range limit	Active sensor at 10V	40.0°C	
A133	E3 Set min	Lower range limit	Active sensor at 0V	-10.0°C	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A140	E4 Function	Supply air humidity sensor	Humidity 0-10V	21	
A142	E4 Set max	Upper range limit	Active sensor at 10V	100.0% r.h.	
A143	E4 Set min	Lower range limit	Active sensor at 0V	0.0% r.h.	
A150	E5 Function	Setpoint adjuster, temperature	Not used	0	
A160	E6 Function	Setpoint adjuster, humidity	Not used	0	
A170	E7 Function	Outside temp. sensor	Temp. Ni1000	3	
A177	E7 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A178	E7 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Digital inputs				
A210	D1 Function	Main switch	Active if low	101	
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve 'heating'	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
A320	Y2 Function	Three-way valve 'cooling'	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A328	Y2 Blocking	Blocking		0	
A330	Y3 Function	Actuator, heat exchanger	Analogue output	1	
A331	Y3 Action	Directional control	Normal 0-10VDC	0	
A332	Y3 Max	Maximum value	Output Y3	100.0%	
A333	Y3 Min	Minimum value	Output Y3	0.0%	
A338	Y3 Blocking	Blocking		0	
A340	Y4 Function	Valve: 'humidification'	Analogue output	1	
A341	Y4 Action	Directional control	Normal 0-10VDC	0	
A342	Y4 Max	Maximum value	Output Y4	100.0%	
A343	Y4 Min	Minimum value	Output Y4	0.0%	
A348	Y4 Blocking	Blocking		0	

Description

Number	Display	Function	Additional information	Factory setting	Setting
	Digital outputs				
A430	R3 Function	Air damper actuator	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking	None	0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking	None	0	
A450	R5 Function	Air heater pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
A460	R6 Function	Air cooler pump	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room temperature setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room temperature setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint	Room humidity setpoint	80.0% r.h.	
P503	SP2 Min	Minimum setpoint	Room humidity setpoint	20.0% r.h.	
P531	LIM6 Min	Minimum speed	Output Y3	0.0%	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK) supply air temperature	At room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint	Temperature	30.0°C	
P605	C1 Min	Minimum supply air setpoint	Temperature	15.0°C	
P611	C2 Offset	Setpoint offset (OfK) supply air humidity	At room setpoint	0.0% r.h.	
P612	C2 P-band	P-band (XpK)		10.0% r.h.	
P613	C2 Tn	I-term		0s	
P614	C2 Max	Maximum supply air setpoint	Humidity	80.0% r.h.	
P615	C2 Min	Minimum supply air setpoint	Humidity	20.0% r.h.	
PID controller(s)					
P632	PID1 Tn	PID1 I-term, temperature cont.	Outputs Y1, Y2 and Y3	160s	
P633	PID1 Tv	PID1 D-term, temperature cont.	Outputs Y1, Y2 and Y3	0.0s	
P642	PID2 Tn	PID2 I-term, humidity controller	Output Y4	160s	
P643	PID2 Tv	PID2 D-term, humidity controller	Output Y4	0.0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	-2.0K	
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	2.0K	
	Energy recovery, 'heating' sequence				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y3	10.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y3	-2.0K	

Number	Display	Function	Additional information	Factory setting	Setting
	Energy recovery, 'cooling' sequence				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y3	10.0K	
P707	SEQ4 Offset	Offset (Of4)	Output Y3	2.0K	
	Humidification				
P710	SEQ6 P-band	Proportional band (Xp6)	Output Y4	5.0% r.h.	
P711	SEQ6 Offset	Offset (Of6)	Output Y4	-2.0% r.h.	
	Dehumidification				
P712	SEQ7 P-band	Proportional band (Xp7)	Output Y2	5.0% r.h.	
P713	SEQ7 Offset	Offset (Of7)	Output Y2	2.0% r.h.	
Energy recovery					
P741	ER1 exh. air±	Correction - return air		0.0K	
P742	ER1 room ±	Correction - room air		0.0K	
P743	ER1 sw.diff	Switching difference - energy supply		1.0K	
P744	ER1 Neutral	Neutral zone - energy supply		3.0K	
Switching points					
P780	2P1 sw.pt	Switching point, air heater pump	Relay R5	5.0%	
P781	2P1 sw.diff	Switching difference, air heater pump	Relay R5	2.0%	
P782	2P2 sw.pt	Switching point, air cooler pump	Relay R6	5.0%	
P783	2P2 sw.diff	Switching difference, air cooler pump	Relay R6	2.0%	
Delays					
P801	TM1 time	Switch-on delay, fans	Relay R4	30s	
Options					
External setpoint, temperature					
A010	Ext.setp.	External setpoint	Temperature on	1	
	Input E5 setpoint adjuster				
A150	E5 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A152	E5 Set max	Range maximum		40.0°C	
A153	E5 Set min	Range minimum		0.0°C	
A154	E5 Cal.max	Calibration of range maximum		°C	
A155	E5 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A156	E5 Cal.min	Calibration of range minimum		°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	
External setpoint, humidity					
A020	Ext.setp.h	External setpoint	Humidity on	1	
	Input E6 setpoint adjuster				
A160	E6 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	53	
A162	E6 Set max	Range maximum		100.0% r.h.	
A163	E6 Set min	Range minimum		0.0% r.h.	
A164	E6 Cal.max	Calibration of range maximum		% r.h.	
A165	E6 Cal.midd	Calibration of range midpoint	Possible only on device	% r.h.	
A166	E6 Cal.min	Calibration of range minimum		% r.h.	
A168	E6 Sim.val.	Simulation value	In case of sensor error	55.0% r.h.	
Shift, room temperature setpoint					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 Lim Wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Shift, room humidity setpoint					
A021	Shift hum.	Setpoint shift, humidity, acc. to ta	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P551	SPS2 pt wi	Winter cut-in point		15.0°C	
P552	SPS2 inf wi	Winter influence		0.0	
P553	SPS2 Lim Wi	Winter limitation		80.0% r.h.	

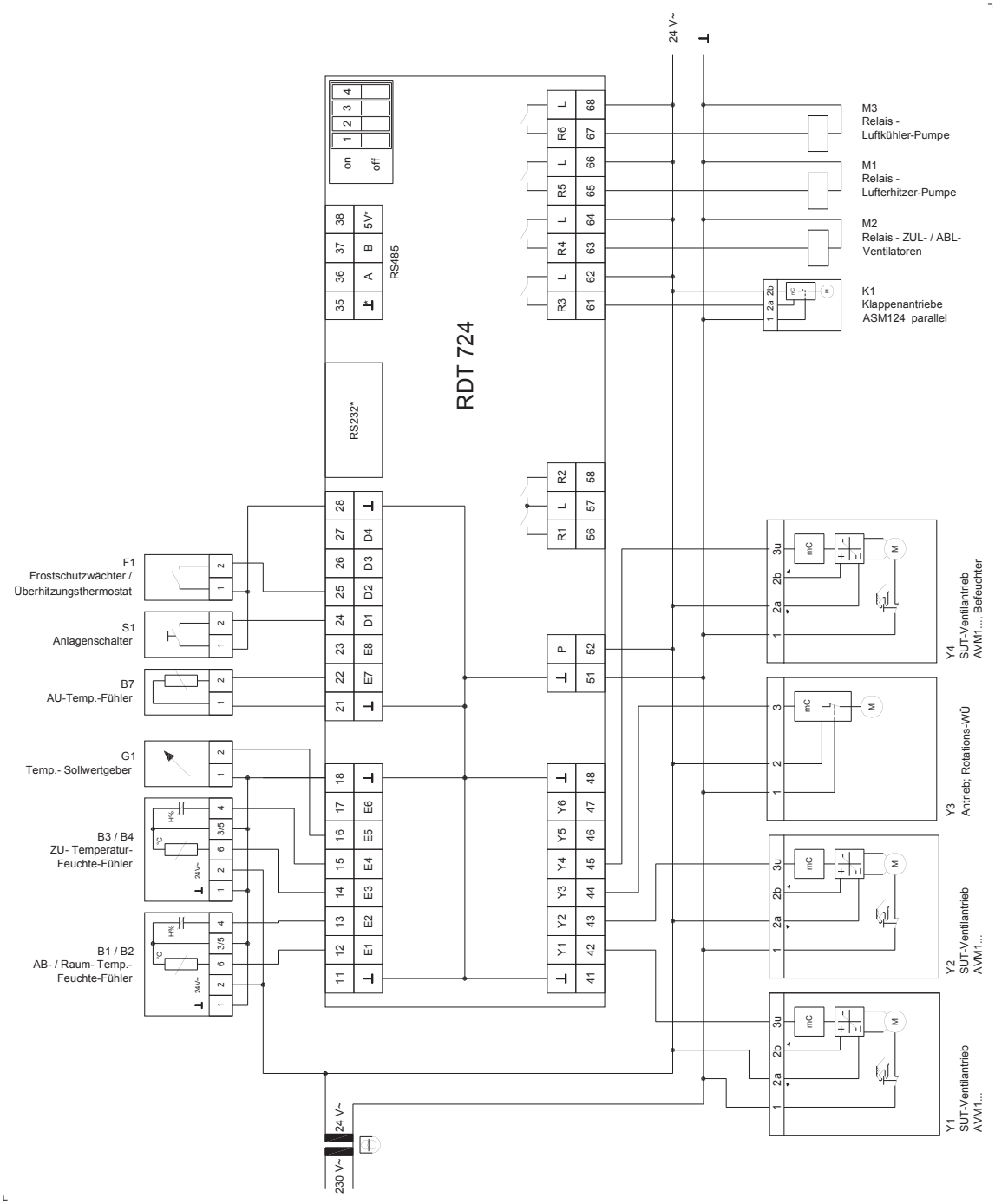
Description

Number	Display	Function	Additional information	Factory setting	Setting
P554	SPS2 pt su	Summer cut-in point		25.0°C	
P555	SPS2 inf su	Summer influence		0.0	
P556	SPS2 Lim su	Summer limitation		80.0% r.h.	
Controller, temperature					
A012	Control	Control behaviour, temperature	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Controller, humidity					
A022	Control h	Control behaviour, humidity	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating protection	Frost protection	1	
			Overheating protection	2	
	Input D2				
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
Reduced mode (stand-by mode/free night c. with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Stand-by mode + night cooling	2	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling				
D500	Clk chan. 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
Air quality control					
A015	AQ regul.	Air quality control	On	1	
	Input E8, sensor signal air quality				
A180	E8 function	Air quality sensor	AirQ 0 -10V	44	
A182	E8 set max	Upper range limit		2000ppm	
A183	E8 set min	Lower range limit		0ppm	
A188	E8 sim.val.	Simulation value	Value in case of error	1000ppm	
	Output Y6, Fan speed setpoint				
A360	Y6 function	Speed setpoint for frequency converter	Appl.analog	1	
A361	Y6 action	Directional control	Normal 0 -10	0	
A362	Y6 max	Maximum value	Output Y6	100%	
A363	Y6 min	Minimum value	Output Y6	0%	
	Output R1, Second fan speed				
A410	R1 function	Second fan speed	ApplDigital	2	
A411	R1 action	Directional control	Normal NO	0	
A414	R1 Td On	Switch-on delay		0s	
A415	R1 Td Off	Switch-off delay		0s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 blocking	Blocking none		0	
	Air quality				
P533	LIM7 min.	Minimum fan speed		30%	
P784	SP3 sw.pt	Switching point 2nd fan speed		50.0%	
P785	SP3 sw.diff	Switching difference 2nd fan speed		5.0%	
P811	Variable 1	Maximum value AQ		2000	
P812	Variable 2	Minimum value AQ		0	

Measuring points	
MP1	Active setpoint (D116)
MP2	Main setpoint (D117)
MP3	Auxiliary setpoint (D118)
MP4	Positioning signal, aux. controller
MP5	Active setpoint, humidity (D126)
MP6	Main setpoint, humidity (D127)
MP7	Auxiliary setpoint, humidity (D128)
MP8	Positioning signal, aux. controller, humidity
MP9	Control mode (0/1)

3.1.13.3 Wiring diagramm

Supply-return air cascade control, humidification and dehumidification, air heater/air cooler/energy recovery/humidifier (CTR HCEB)



3.1.14 Application 302

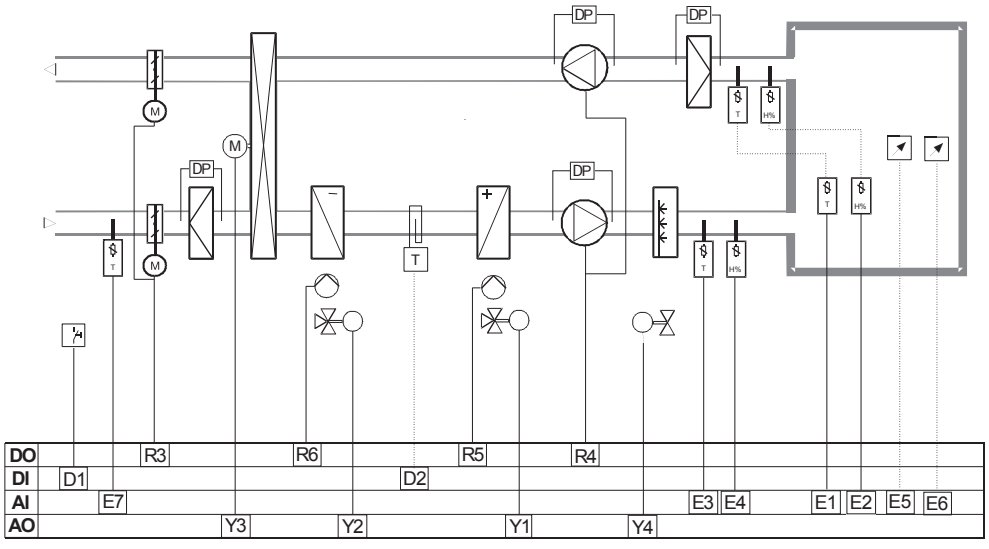
Supply-return air cascade control with humidification and dehumidification, humidity limitation, air heater/air cooler/energy recovery/humidifier (CTHR HCEh L)

Plant design:
- Outside and exhaust air damper
- Heat recovery (recuperative)
- Supply and return air fan
- Air heater, air cooler with control valve and pump
- Humidifier
- Supply air, return air or room temperature sensor
- Outside temperature sensor

Control functions:
- Temperature control, return air-supply air cascade with ta shift
- Humidity control, return air-supply air cascade
- Humidity limitation

Control functions:
- Enable control
- Delay fan cut-in
- Enable energy recovery
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode
- Free night cooling

Plant schematic:



Description:

Functions

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1, cooling valve Y2 or rotary heat exchanger Y3 according to the control deviation. The supply air temperature is limited.

The energy recovery acts on Y3 and is enabled when the outside temperature in cooling mode is higher than the room temperature, or in heating mode when it is lower than the room temperature.

The humidity control compares the room or return air humidity with the setpoint and controls valve Y4 (humidification) or cooling valve Y2 (dehumidification) according to the control deviation. The supply air humidity sensor acts as a limiter.

The fans are switched off, and the valves and dampers are closed via the main (plant) switch.

Options

External setpoint

According to choice, a setpoint adjuster (XPESF001) can be used to change or correct the setpoint for the temperature and/or the humidity.

Setpoint shift

The setpoint is changed in relation to the outside temperature according to the adjusted influence (see the diagram).

Frost protection

The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. The heating valve is opened fully and the air heater pump is switched on. The frost protection is still active when the plant is switched off.

Overheating protection

The overheating protection switches the heating off, the fans are switched on and the dampers are opened. The overheating protection is still active when the plant is switched off.

Reduced mode (timer)

Channel 1

The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, the plant is switched on and off at the reduced setpoint (2-point).

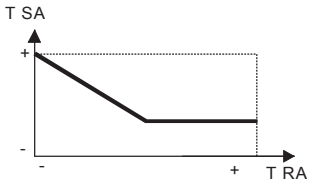
Channel 2

If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2, provided that the conditions are met, i.e. the room temperature is above the setpoint and the outside temperature is lower than the room temperature.

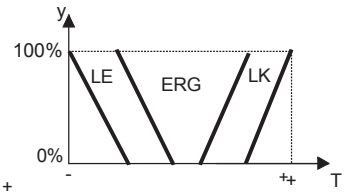
The fans are switched on and the outside air dampers are opened.

Description

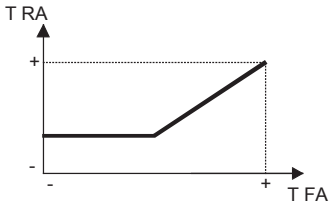
3.1.14.1 Functional diagrams



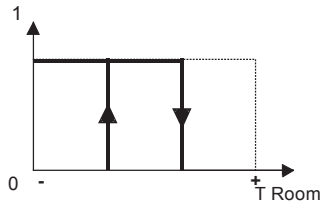
Return-supply air cascade



Heating-cooling-heat recovery sequence



Setpoint shift acc. to outside temperature



Stand-by mode with reduced setpoint

3.1.14.2 Parameter list

Supply-return air cascade control, humidification and dehumidification, humidity limitation, air heater/air cooler/energy recovery/humidifier (CTHR HCEh L)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0	Room temperature setpoint			
Act. val	20.2°C	Room temperature actual value			
Setp sup	38.0°C	Supply air temperature setpoint			
A.val sup	27.2°C	Supply air temperature actual value			
Setpoint	55.0% r.h.	Room humidity setpoint			
Act. val	40.2% r.h.	Room humidity actual value			
Setpoints					
D111	Setpoint 1	Temperature setpoint 'Normal'		20.0°C	
D112	Setpoint 2	Temperature setpoint 'Reduced'	Timer / room remote control	15.0°C	
D121	Setpoint 1	Humidity setpoint		55.0% r.h.	
Basic configuration					
A001	Application	Application	CTHR HCEh L	302	
A002	Dehumidify	Dehumidification (cooling)	On	1	
	Options (described on the following pages)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour	Cascade	2	
A013	Protection	Frost protection/overheating protection	Frost protection	1	
A014	Red. mode	Reduced mode (timer)	Stand-by mode	1	
A020	Ext.setp.h	External setpoint, humidity	Off	0	
A021	Shift hum.	Setpoint shift, humidity acc. to ta	Off	0	
A022	Limitat h	Limitation on supply air humidity	Off	0	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Room temperature sensor	Temp. 0-10V	20	
A112	E1 Set max	Upper range limit	Active sensor at 10V	50.0°C	
A113	E1 Set min	Lower range limit	Active sensor at 0V	0.0°C	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A120	E2 Function	Room humidity sensor	Humidity 0-10V	21	
A122	E2 Set max	Upper range limit	Active sensor at 10V	100.0% r.h.	

Number	Display	Function	Additional information	Factory setting	Setting
A123	E2 Set min	Lower range limit	Active sensor at 0V	0.0% r.h.	
A130	E3 Function	Supply air temperature sensor	Temp. 0-10V	20	
A132	E3 Set max	Upper range limit	Active sensor at 10V	40.0°C	
A133	E3 Set min	Lower range limit	Active sensor at 0V	-10.0°C	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A150	E5 Function	Setpoint adjuster, temperature	Not used	0	
A160	E6 Function	Setpoint adjuster, humidity	Not used	0	
A170	E7 Function	Outside temp. sensor	Temp. Ni1000	3	
A177	E7 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A178	E7 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Digital inputs				
A210	D1 Function	Main switch	Active if low	101	
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve ‘heating’	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
A320	Y2 Function	Three-way valve ‘cooling’	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A328	Y2 Blocking	Blocking		0	
A330	Y3 Function	Actuator, heat exchanger	Analogue output	1	
A331	Y3 Action	Directional control	Normal 0-10VDC	0	
A332	Y3 Max	Maximum value	Output Y3	100.0%	
A333	Y3 Min	Minimum value	Output Y3	0.0%	
A338	Y3 Blocking	Blocking		0	
A340	Y4 Function	Valve: ‘humidification’	Analogue output	1	
A341	Y4 Action	Directional control	Normal 0-10VDC	0	
A342	Y4 Max	Maximum value	Output Y4	100.0%	
A343	Y4 Min	Minimum value	Output Y4	0.0%	
A348	Y4 Blocking	Blocking		0	
	Digital outputs				
A430	R3 Function	Air damper actuator	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking	None	0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking	None	0	
A450	R5 Function	Air heater pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
A460	R6 Function	Air cooler pump	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking	None	0	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Limitations					
P500	SP1 Max	Maximum setpoint	Room temperature setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room temperature setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint	Room humidity setpoint	80.0% r.h.	
P503	SP2 Min	Minimum setpoint	Room humidity setpoint	20.0% r.h.	
P531	LIM6 Min	Minimum speed	Output Y3	0.0%	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK) supply air temperature	At room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint	Temperature	30.0°C	
P605	C1 Min	Minimum supply air setpoint	Temperature	15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term, temperature cont.	Outputs Y1, Y2 and Y3	160s	
P633	PID1 Tv	PID1 D-term, temperature cont.	Outputs Y1, Y2 and Y3	0.0s	
P642	PID2 Tn	PID2 I-term, humidity controller	Output Y4	160s	
P643	PID2 Tv	PID2 D-term, humidity controller	Output Y4	0.0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	-2.0K	
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	2.0K	
	Energy recovery, 'heating' sequence				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y3	10.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y3	-2.0K	
	Energy recovery, 'cooling' sequence				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y3	10.0K	
P707	SEQ4 Offset	Offset (Of4)	Output Y3	2.0K	
	Humidification				
P710	SEQ6 P-band	Proportional band (Xp6)	Output Y4	5.0% r.h.	
P711	SEQ6 Offset	Offset (Of6)	Output Y4	-2.0% r.h.	
	Dehumidification				
P712	SEQ7 P-band	Proportional band (Xp7)	Output Y2	5.0% r.h.	
P713	SEQ7 Offset	Offset (Of7)	Output Y2	2.0% r.h.	
Energy recovery					
P741	ER1 exh.±	Correction - return air		0.0K	
P742	ER1 room ±	Correction - room air		0.0K	
P743	ER1 sw.diff	Switching difference - energy supply		1.0K	
P744	ER1 Neutral	Neutral zone - energy supply		3.0K	
Switching points					
P780	2P1 sw.pt	Switching point, air heater pump	Relay R5	5.0%	
P781	2P1 sw.diff	Switching difference, air heater pump	Relay R5	2.0%	
P782	2P2 sw.pt	Switching point, air cooler pump	Relay R6	5.0%	
P783	2P2 sw.diff	Switching difference, air cooler pump	Relay R6	2.0%	
Delays					
P801	TM1 time	Switch-on delay, fans	Relay R4	30s	
Options					
External setpoint, temperature					
A010	Ext.setp.	External setpoint	Temperature on	1	
	Input E5 setpoint adjuster				
A150	E5 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A152	E5 Set max	Range maximum		40.0°C	
A153	E5 Set min	Range minimum		0.0°C	
A154	E5 Cal.max	Calibration of range maximum		°C	
A155	E5 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A156	E5 Cal.min	Calibration of range minimum		°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	

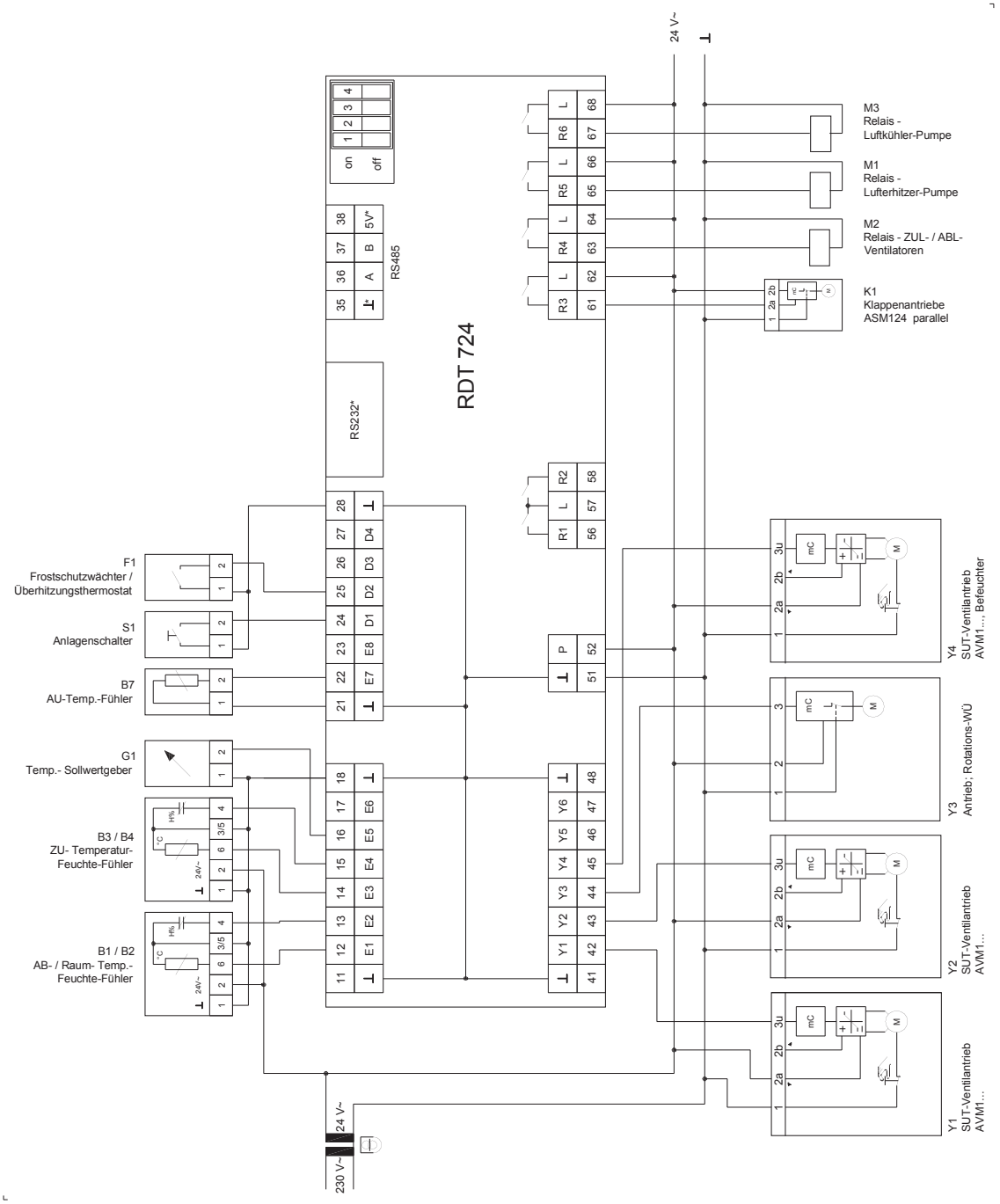
Number	Display	Function	Additional information	Factory setting	Setting
External setpoint, humidity					
A020	Ext.setp.h	External setpoint	Humidity on	1	
	Input E6 setpoint adjuster				
A160	E6 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	53	
A162	E6 Set max	Range maximum		100.0% r.h.	
A163	E6 Set min	Range minimum		0.0% r.h.	
A164	E6 Cal.max	Calibration of range maximum		% r.h.	
A165	E6 Cal.midd	Calibration of range midpoint	Possible only on device	% r.h.	
A166	E6 Cal.min	Calibration of range minimum		% r.h.	
A168	E6 Sim.val.	Simulation value	In case of sensor error	55.0% r.h.	
Shift, room temperature setpoint					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 lim wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 lim su	Summer limitation		26.0°C	
Shift, room humidity setpoint					
A021	Shift hum.	Setpoint shift, humidity, acc. to ta	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P551	SPS2 pt wi	Winter cut-in point		15.0°C	
P552	SPS2 inf wi	Winter influence		0.0	
P553	SPS2 lim wi	Winter limitation		80.0% r.h.	
P554	SPS2 pt su	Summer cut-in point		25.0°C	
P555	SPS2 inf su	Summer influence		0.0	
P556	SPS2 lim su	Summer limitation		80.0% r.h.	
Limitation, supply air humidity					
A022	Limitat.h	Limitation on supply air humidity	On	1	
	Input E4 supply air humidity sensor				
A140	E4 Function	Supply air humidity sensor	Humidity 0-10V	21	
A142	E4 Set max	Upper range limit	Active sensor at 10V	100.0% r.h.	
A143	E4 Set min	Lower range limit	Active sensor at 0V	0.0% r.h.	
	Limitation controller				
P721	LC1 setpt	Cut-in point, supply air humidity limitation		80.0% r.h.	
P722	LC1 P-band	P-band supply air humidity limitation		10.0% r.h.	
Controller					
A012	Control	Control behaviour	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating protection	Frost protection	1	
			Overheating protection	2	
	Input D2				
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Stand-by mode + night cooling	2	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling				
D500	Clk chan. 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Measuring points					
MP1		Active setpoint (D116)			
MP2		Main setpoint (D117)			
MP3		Auxiliary setpoint (D118)			
MP4		Positioning signal, main controller			
MP5		Active setpoint, humidity (D126)			
MP6		Main setpoint, humidity (D127)			
MP7		Positioning signal, main controller - humidity			
MP8		Control mode (0/1)			

3.1.14.3 Wiring diagramm

Supply-return air cascade control, humidification and dehumidification, humidity limitation, air heater/air cooler/energy recovery/humidifier (CTR HCEB L)



3.1.15 Application 311

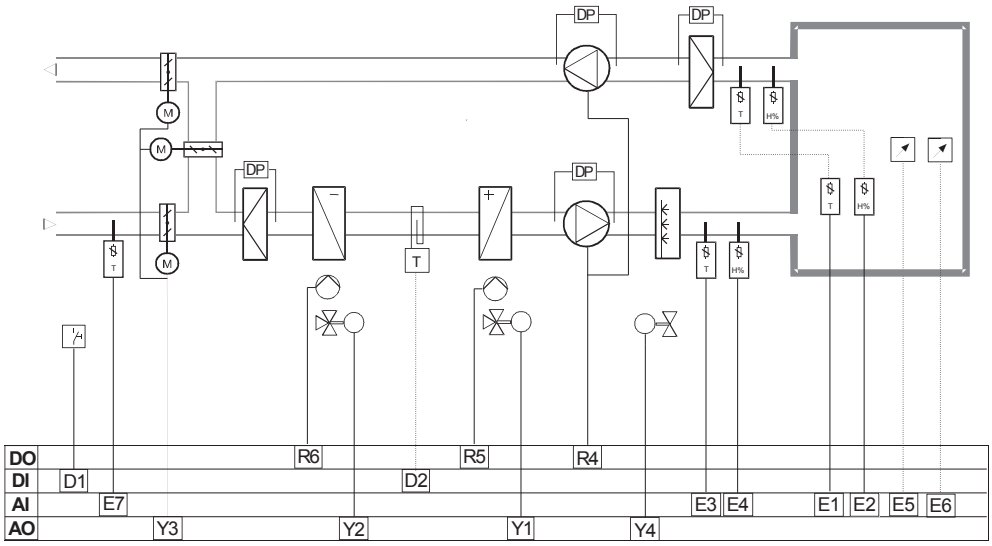
Supply-return air cascade control with humidification and dehumidification, air heater/air cooler/mixing chamber/humidifier (CTHR HCOh)

Plant design:
- Mixing chamber
- Supply and return air fan
- Air heater, air cooler with control valve and pump
- Humidifier
- Supply air, return air or room temperature sensor
- Outside temperature sensor

Control functions:
- Temperature control, return air-supply air cascade with ta shift
- Humidity control, return air-supply air cascade

Control functions:
- Enable control
- Delay fan cut-in
- Enable mixing chamber
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode
- Free night cooling

Plant schematic:



Description:

Functions

When the plant is switched on, the control is enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1, cooling valve Y2 or outside air dampers Y3 according to the control deviation. The supply air temperature is limited.

Damper sequence Y3 is enabled when the outside temperature in cooling mode is lower than the room or return air temperature, or in heating mode when it is higher than the room or return air temperature. The humidity control compares the room or return air humidity with the setpoint and controls valve Y4 (humidification) or cooling valve Y2 (dehumidification) according to the control deviation. The supply air humidity is limited.
When the plant is switched off from the main switch, the fans are switched off, and the valves and dampers are closed

Options
External setpoint
According to choice, setpoint adjuster XPESF001 can be used to change or correct the setpoint for the temperature and/or the humidity.

Setpoint shift
The setpoint is changed in relation to the outside temperature, according to the adjusted influence (see the diagram).

Frost protection
The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. The heating valve is opened fully and the air heater pump is switched on. The frost protection is still active when the plant is switched off.

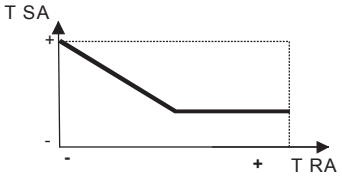
Overheating protection
The overheating protection switches the heating off and the fans are switched on. The overheating protection is still active when the plant is switched off.

Reduced mode (timer)
Channel 1
The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, the plant is switched on and off at the reduced setpoint (2-point).

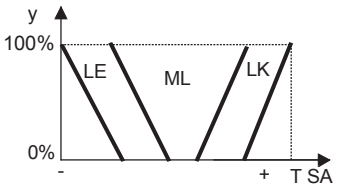
Channel 2
If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2, provided that the conditions are met, i.e. the room temperature is above the setpoint and the outside temperature is lower than the room temperature.
The fans are switched on and the outside air dampers are opened.

Description

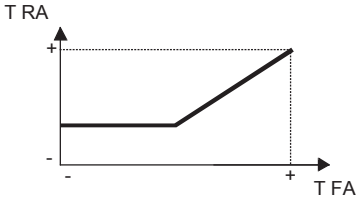
3.1.15.1 Functional diagrams



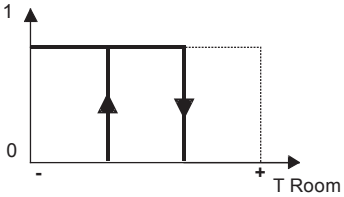
Return-supply air cascade



Heating-cooling-mixing chamber sequence



Setpoint shift acc. to outside temperature



Stand-by mode with reduced setpoint

3.1.15.2 Parameter list

Supply-return air cascade control, humidification and dehumidification, humidity limitation, air heater/air cooler/mixing chamber/humidifier (CTHR HCOh)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room temperature setpoint			
Act. val	20.2°C	Room temperature actual value			
Setp sup	38.0°C	Supply air temperature setpoint			
A.val su	27.2°C	Supply air temperature actual value			
Setpoint	55.0% r.h.	Room humidity setpoint			
Act. val	40.2% r.h.	Room humidity actual value			
Setp sup	75.0% r.h.	Supply air humidity setpoint			
A.val su	27.2% r.h.	Supply air humidity, actual value			
Setpoints					
D111	Setpoint 1	Temperature setpoint 'Normal'		20.0°C	
D112	Setpoint 2	Temperature setpoint 'Reduced'	Timer / room remote control	15.0°C	
D121	Setpoint 1	Humidity setpoint		55.0% r.h.	
Basic configuration					
A001	Application	Application	CTHR HCOh	311	
A002	Dehumidify	Dehumidification (cooling)	On	1	
	Options (described on the following pages)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour, temperature	Cascade	2	
A013	Protection	Frost protection/overheating protection	Frost protection	1	
A014	Red. mode	Reduced mode (timer)	Stand-by mode	1	
A020	Ext.setp.h	External setpoint, humidity	Off	0	
A021	Shift hum.	Setpoint shift, humidity acc. to ta	Off	0	
A022	Control h	Control behaviour, humidity	Cascade	2	
A023	Humidity P	Humidity control - priority	Off	0	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Room temperature sensor	Temp. 0-10V	20	
A112	E1 Set max	Upper range limit	Active sensor at 10V	50.0°C	
A113	E1 Set min	Lower range limit	Active sensor at 0V	0.0°C	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	

Number	Display	Function	Additional information	Factory setting	Setting
A120	E2 Function	Room humidity sensor	Humidity 0-10V	21	
A122	E2 Set max	Upper range limit	Active sensor at 10V	100.0% r.h.	
A123	E2 Set min	Lower range limit	Active sensor at 0V	0.0% r.h.	
A130	E3 Function	Supply air temperature sensor	Temp. 0-10V	20	
A132	E3 Set max	Upper range limit	Active sensor at 10V	40.0°C	
A133	E3 Set min	Lower range limit	Active sensor at 0V	-10.0°C	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A140	E4 Function	Supply air humidity sensor	Humidity 0-10V	21	
A142	E4 Set max	Upper range limit	Active sensor at 10V	100.0% r.h.	
A143	E4 Set min	Lower range limit	Active sensor at 0V	0.0% r.h.	
A150	E5 Function	Setpoint adjuster, temperature	Not used	0	
A160	E6 Function	Setpoint adjuster, humidity	Not used	0	
A170	E7 Function	Outside temp. sensor	Temp. Ni1000	3	
A177	E7 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A178	E7 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Digital inputs				
A210	D1 Function	Main switch	Active if low	101	
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve ‘heating’	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
A320	Y2 Function	Three-way valve ‘cooling’	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A328	Y2 Blocking	Blocking		0	
A330	Y3 Function	Damper actuator	Analogue output	1	
A331	Y3 Action	Directional control	Normal 0-10VDC	0	
A332	Y3 Max	Maximum value	Output Y3	100.0%	
A333	Y3 Min	Minimum value	Output Y3	0.0%	
A338	Y3 Blocking	Blocking		0	
A340	Y4 Function	Valve: ‘humidification’	Analogue output	1	
A341	Y4 Action	Directional control	Normal 0-10VDC	0	
A342	Y4 Max	Maximum value	Output Y4	100.0%	
A343	Y4 Min	Minimum value	Output Y4	0.0%	
A348	Y4 Blocking	Blocking		0	
	Digital outputs				
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking	None	0	
A450	R5 Function	Air heater pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
A460	R6 Function	Air cooler pump	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room temperature setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room temperature setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint	Room humidity setpoint	80.0% r.h.	
P503	SP2 Min	Minimum setpoint	Room humidity setpoint	20.0% r.h.	
P531	LIM6 Min	Minimum outside air component	Output Y3	10.0%	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK) supply air temperature	At room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint	Temperature	30.0°C	
P605	C1 Min	Minimum supply air setpoint	Temperature	15.0°C	
P611	C2 Offset	Setpoint offset (OfK) supply air humidity	At room setpoint	0.0% r.h.	
P612	C2 P-band	P-band (XpK)		10.0% r.h.	
P613	C2 Tn	I-term		0s	
P614	C2 Max	Maximum supply air setpoint	Humidity	80.0% r.h.	
P615	C2 Min	Minimum supply air setpoint	Humidity	20.0% r.h.	
PID controller(s)					
P632	PID1 Tn	PID1 I-term, temperature cont.	Output Y1, Y2 and Y3	160s	
P633	PID1 Tv	PID1 D-term, temperature cont.	Output Y1, Y2 and Y3	0.0s	
P642	PID2 Tn	PID2 I-term, humidity controller	Output Y4	160s	
P643	PID2 Tv	PID2 D-term, humidity controller	Output Y4	0.0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	-2.0K	
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	2.0K	
	Damper sequence, heat recovery, 'heating'				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y3	10.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y3	-2.0K	
	Damper sequence, heat recovery, 'cooling'				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y3	10.0K	
P707	SEQ4 Offset	Offset (Of4)	Output Y3	2.0K	
	Humidification				
P710	SEQ6 P-band	Proportional band (Xp6)	Output Y4	5.0% r.h.	
P711	SEQ6 Offset	Offset (Of6)	Output Y4	-2.0% r.h.	
	Dehumidification				
P712	SEQ7 P-band	Proportional band (Xp7)	Output Y2	5.0% r.h.	
P713	SEQ7 Offset	Offset (Of7)	Output Y2	2.0% r.h.	
Energy recovery					
P741	ER1 exh.±	Correction - return air		0.0K	
P742	ER1 room ±	Correction - room air		0.0K	
P743	ER1 sw.diff	Switching difference - energy supply		1.0K	
P744	ER1 Neutral	Neutral zone - energy supply		3.0K	
Switching points					
P780	2P1 sw.pt	Switching point, air heater pump	Relay R5	5.0%	
P781	2P1 sw.diff	Switching difference, air heater pump	Relay R5	2.0%	
P782	2P2 sw.pt	Switching point, air cooler pump	Relay R6	5.0%	
P783	2P2 sw.diff	Switching difference, air cooler pump	Relay R6	2.0%	
Options					
External setpoint, temperature					
A010	Ext.setp.	External setpoint	Temperature on	1	
	Input E5 setpoint adjuster				
A150	E5 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A152	E5 Set max	Range maximum		40.0°C	
A153	E5 Set min	Range minimum		0.0°C	
A154	E5 Cal.max	Calibration of range maximum		°C	
A155	E5 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A156	E5 Cal.min	Calibration of range minimum		°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	

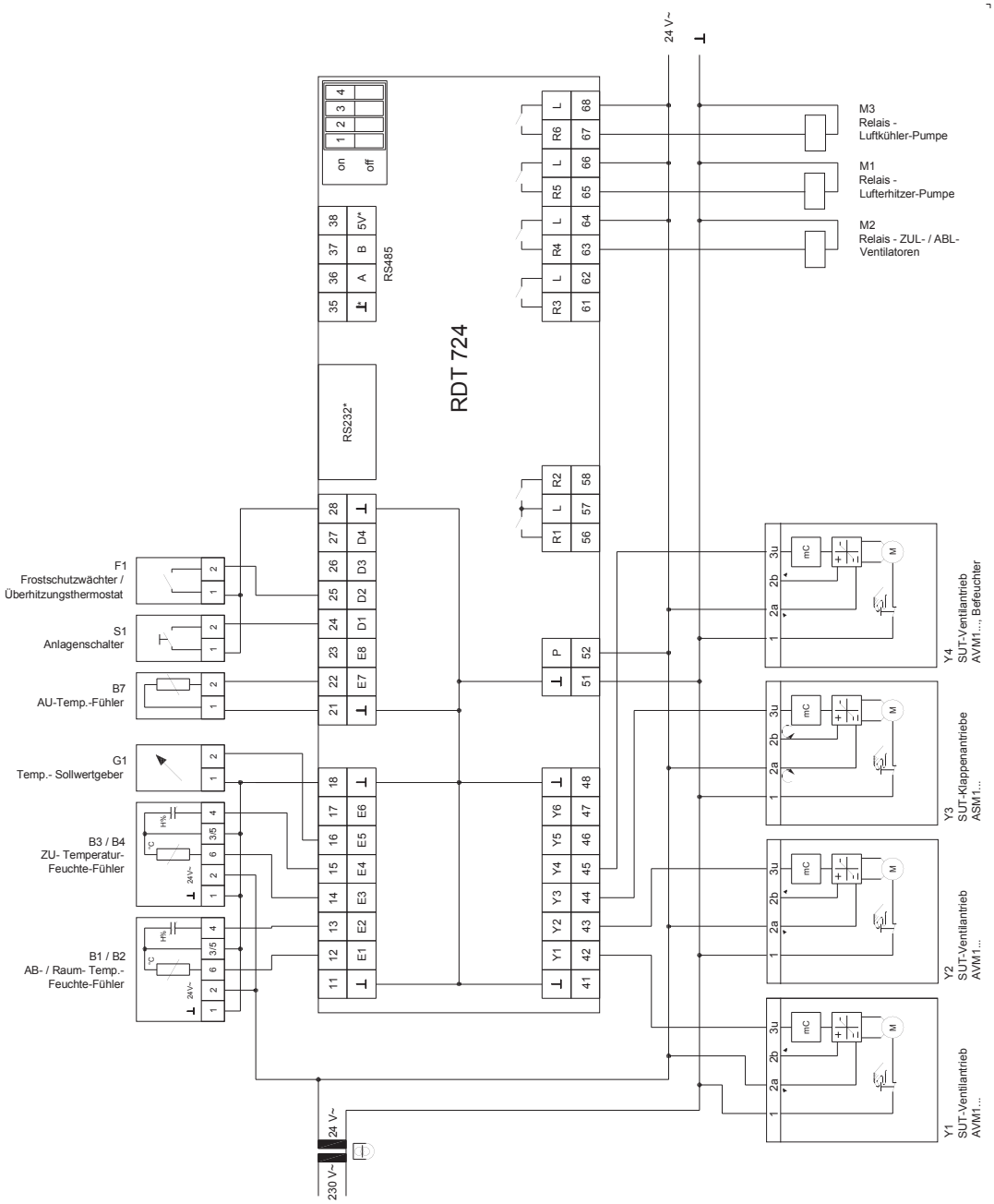
Number	Display	Function	Additional information	Factory setting	Setting
External setpoint, humidity					
A020	Ext.setp.h	External setpoint	Humidity on	1	
	Input E6 setpoint adjuster				
A160	E6 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	53	
A162	E6 Set max	Range maximum		100.0% r.h.	
A163	E6 Set min	Range minimum		0.0% r.h.	
A164	E6 Cal.max	Calibration of range maximum		% r.h.	
A165	E6 Cal.midd	Calibration of range midpoint	Possible only on device	% r.h.	
A166	E6 Cal.min	Calibration of range minimum		% r.h.	
A168	E6 Sim.val.	Simulation value	In case of sensor error	55.0% r.h.	
Shift, room temperature setpoint					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 Lim Wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Shift, room humidity setpoint					
A021	Shift hum.	Setpoint shift, humidity, acc. to ta	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P551	SPS2 pt wi	Winter cut-in point		15.0°C	
P552	SPS2 inf wi	Winter influence		0.0	
P553	SPS2 Lim Wi	Winter limitation		80.0% r.h.	
P554	SPS2 pt su	Summer cut-in point		25.0°C	
P555	SPS2 inf su	Summer influence		0.0	
P556	SPS2 Lim su	Summer limitation		80.0% r.h.	
Controller, temperature					
A012	Control	Control behaviour - temperature	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Controller, humidity					
A022	Control h	Control behaviour, humidity	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating protection	Frost protection	1	
			Overheating protection	2	
	Input D2				
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Stand-by mode + night cooling	2	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling				
D500	Clk chan. 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
Humidity - priority					
A023	Humidity P	Humidity - priority	Humidification blocks cooling	1	
			Dehumidification blocks heating	2	
			Hum. blocks C. + dehum. blocks H.	3	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Measuring points					
MP1		Active setpoint (D116)			
MP2		Main setpoint (D117)			
MP3		Auxiliary setpoint (D118)			
MP4		Positioning signal, aux. controller			
MP5		Active setpoint, humidity (D126)			
MP6		Main setpoint, humidity (D127)			
MP7		Auxiliary setpoint, humidity (D128)			
MP8		Positioning signal, aux. controller, humidity			
MP9		Control mode (0/1)			

3.1.15.3 Wiring diagramm

Supply-return air cascade control, humidification and dehumidification, humidity limitation, air heater/air cooler/mixing chamber/humidifier (CTR HCOB)



3.1.16 Application 312

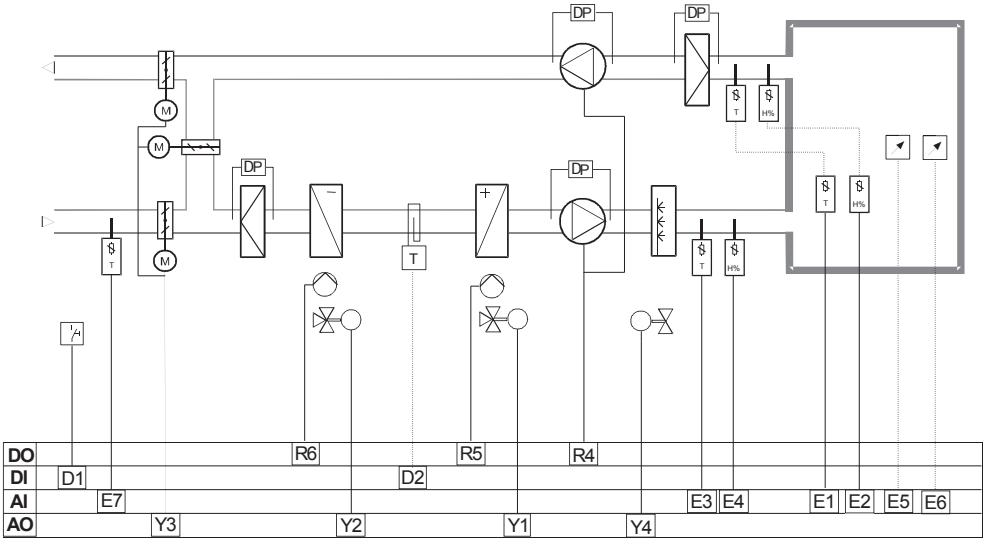
Supply-return air cascade control with humidification and dehumidification, humidity limitation, air heater/air cooler/mixing chamber/humidifier (CTHR HCOh L)

Plant design:
- Mixing chamber
- Supply and return air fan
- Air heater, air cooler with control valve and pump
- Humidifier
- Supply air, return air or room temperature sensor
- Outside temperature sensor

Control functions:
- Temperature control, return air-supply air cascade with ta shift
- Humidity control, return air-supply air cascade
- Humidity limitation

Control functions:
- Enable control
- Delay fan cut-in
- Enable mixing chamber
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode
- Free night cooling

Plant schematic:



Description:

Functions

When the plant is switched on, the control is enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1, cooling valve Y2 or outside air dampers Y3 according to the control deviation. The supply air temperature is limited. Damper sequence Y3 is enabled if the outside temperature in cooling mode is lower than the room or return air temperature, and in heating mode if it is higher than the room or return air temperature. The humidity control compares the room or return air humidity with the setpoint and controls valve Y4 (humidification) or cooling valve Y2 (dehumidification) according to the control deviation. The supply air humidity sensor acts as a limiter.
When the plant is switched off from the main switch, the fans are switched off, and the valves and dampers are closed

Options

External setpoint

According to choice, setpoint adjuster XPESF001 can be used to change or correct the setpoint for the temperature and/or the humidity.

Setpoint shift

The setpoint is changed in relation to the outside temperature according to the adjusted influence (see the diagram).

Frost protection

The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. The heating valve is opened fully and the air heater pump is switched on. The frost protection is still active when the plant is switched off.

Overheating protection

The overheating protection switches the heating off and the fans are switched on. The overheating protection is still active when the plant is switched off.

Reduced mode (timer)

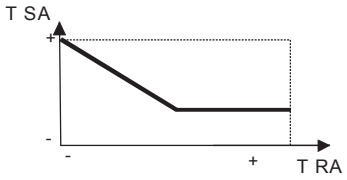
Channel 1

The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, the plant is switched on and off at the reduced setpoint (2-point).

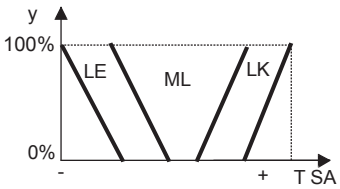
Channel 2

If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2, provided that the conditions are met, i.e. the room temperature is above the setpoint and the outside temperature is lower than the room temperature.
The fans are switched on and the outside air dampers are opened.

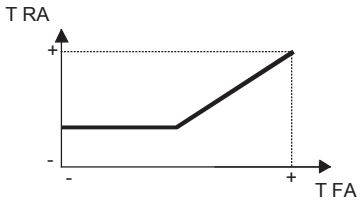
3.1.16.1 Functional diagrams



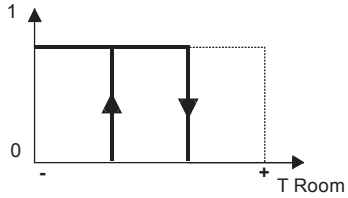
Return-supply air cascade



Heating-cooling-mixing chamber sequence



Setpoint shift acc. to outside temperature



Stand-by mode with reduced setpoint

3.1.16.2 Parameter list

Supply-return air cascade control, humidification and dehumidification, humidity limitation, air heater/air cooler/mixing chamber/humidifier (CTHR HCOh L)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room temperature setpoint			
Act. val	20.2°C	Room temperature actual value			
Setp sup	38.0°C	Supply air temperature setpoint			
A.val su	27.2°C	Supply air temperature actual value			
Setpoint	55.0% r.h.	Room humidity setpoint			
Act. val	40.2% r.h.	Room humidity actual value			
Setpoints					
D111	Setpoint 1	Temperature setpoint 'Normal'		20.0°C	
D112	Setpoint 2	Temperature setpoint 'Reduced'	Timer / room remote control	15.0°C	
D121	Setpoint 1	Humidity setpoint		55.0% r.h.	
Basic configuration					
A001	Application	Application	CTHR HCOh L	312	
A002	Dehumidify	Dehumidification (cooling)	On	1	
	Options (described on the following pages)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour, temperature	Cascade	2	
A013	Protection	Frost protection/overheating protection	Frost protection	1	
A014	Red. mode	Reduced mode (timer)	Stand-by mode	1	
A020	Ext.setp.h	External setpoint, humidity	Off	0	
A021	Shift hum.	Setpoint shift, humidity acc. to ta	Off	0	
A022	Limitat.h	Limitation on supply air humidity	Off	0	
A023	Humidity P	Humidity control - priority	Off	0	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Room temperature sensor	Temp. 0-10V	20	
A112	E1 Set max	Upper range limit	Active sensor at 10V	50.0°C	
A113	E1 Set min	Lower range limit	Active sensor at 0V	0.0°C	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A120	E2 Function	Room humidity sensor	Humidity 0-10V	21	
A122	E2 Set max	Upper range limit	Active sensor at 10V	100.0% r.h.	

Description

Number	Display	Function	Additional information	Factory setting	Setting
A123	E2 Set min	Lower range limit	Active sensor at 0V	0.0% r.h.	
A130	E3 Function	Supply air temperature sensor	Temp. 0-10V	20	
A132	E3 Set max	Upper range limit	Active sensor at 10V	40.0°C	
A133	E3 Set min	Lower range limit	Active sensor at 0V	-10.0°C	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A140	E4 Function	Supply air humidity sensor	Not used	0	
A150	E5 Function	Setpoint adjuster, temperature	Not used	0	
A160	E6 Function	Setpoint adjuster, humidity	Not used	0	
A170	E7 Function	Outside temp. sensor	Temp. Ni1000	3	
A177	E7 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A178	E7 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Digital inputs				
A210	D1 Function	Main switch	Active if low	101	
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve ‘heating’	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
A320	Y2 Function	Three-way valve ‘cooling’	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A328	Y2 Blocking	Blocking		0	
A330	Y3 Function	Damper actuator	Analogue output	1	
A331	Y3 Action	Directional control	Normal 0-10VDC	0	
A332	Y3 Max	Maximum value	Output Y3	100.0%	
A333	Y3 Min	Minimum value	Output Y3	0.0%	
A338	Y3 Blocking	Blocking		0	
A340	Y4 Function	Valve: ‘humidification’	Analogue output	1	
A341	Y4 Action	Directional control	Normal 0-10VDC	0	
A342	Y4 Max	Maximum value	Output Y4	100.0%	
A343	Y4 Min	Minimum value	Output Y4	0.0%	
A348	Y4 Blocking	Blocking		0	
	Digital outputs				
A450	R5 Function	Air heater pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
A460	R6 Function	Air cooler pump	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room temperature setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room temperature setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint	Room humidity setpoint	80.0% r.h.	
P503	SP2 Min	Minimum setpoint	Room humidity setpoint	20.0% r.h.	
P531	LIM6 Min	Minimum outside air component	Output Y3	10.0%	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK) supply air temperature	At room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint	Temperature	30.0°C	
P605	C1 Min	Minimum supply air setpoint	Temperature	15.0°C	

Number	Display	Function	Additional information	Factory setting	Setting
PID controller(s)					
P632	PID1 Tn	PID1 I-term, temperature cont.	Outputs Y1..Y3	160s	
P633	PID1 Tv	PID1 D-term, temperature cont.	Outputs Y1..Y3	0.0s	
P642	PID2 Tn	PID2 I-term, humidity controller	Output Y4	160s	
P643	PID2 Tv	PID2 D-term, humidity controller	Output Y4	0.0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	-2.0K	
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	2.0K	
	Energy recovery, 'heating' sequence				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y3	10.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y3	-2.0K	
	Energy recovery, 'cooling' sequence				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y3	10.0K	
P707	SEQ4 Offset	Offset (Of4)	Output Y3	2.0K	
	Humidification				
P710	SEQ6 P-band	Proportional band (Xp6)	Output Y4	5.0% r.h.	
P711	SEQ6 Offset	Offset (Of6)	Output Y4	-2.0% r.h.	
	Dehumidification				
P712	SEQ7 P-band	Proportional band (Xp7)	Output Y2	5.0% r.h.	
P713	SEQ7 Offset	Offset (Of7)	Output Y2	2.0% r.h.	
Energy recovery					
P741	ER1 exh.±	Correction - return air		0.0K	
P742	ER1 room ±	Correction - room air		0.0K	
P743	ER1 sw.diff	Switching difference - energy supply		1.0K	
P744	ER1 Neutral	Neutral zone - energy supply		3.0K	
Switching points					
P780	2P1 sw.pt	Switching point, air heater pump	Relay R5	5.0%	
P781	2P1 sw.diff	Switching difference, air heater pump	Relay R5	2.0%	
P782	2P2 sw.pt	Switching point, air cooler pump	Relay R6	5.0%	
P783	2P2 sw.diff	Switching difference, air cooler pump	Relay R6	2.0%	
Options					
External setpoint, temperature					
A010	Ext.setp.	External setpoint	Temperature on	1	
	Input E5 setpoint adjuster				
A150	E5 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A152	E5 Set max	Range maximum		40.0°C	
A153	E5 Set min	Range minimum		0.0°C	
A154	E5 Cal.max	Calibration of range maximum		°C	
A155	E5 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A156	E5 Cal.min	Calibration of range minimum		°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	
External setpoint, humidity					
A020	Ext.setp.h	External setpoint	Humidity on	1	
	Input E6 setpoint adjuster				
A160	E6 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	53	
A162	E6 Set max	Range maximum		100.0% r.h.	
A163	E6 Set min	Range minimum		0.0% r.h.	
A164	E6 Cal.max	Calibration of range maximum		% r.h.	
A165	E6 Cal.midd	Calibration of range midpoint	Possible only on device	% r.h.	
A166	E6 Cal.min	Calibration of range minimum		% r.h.	
A168	E6 Sim.val.	Simulation value	In case of sensor error	55.0% r.h.	
Shift, room temperature setpoint					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	

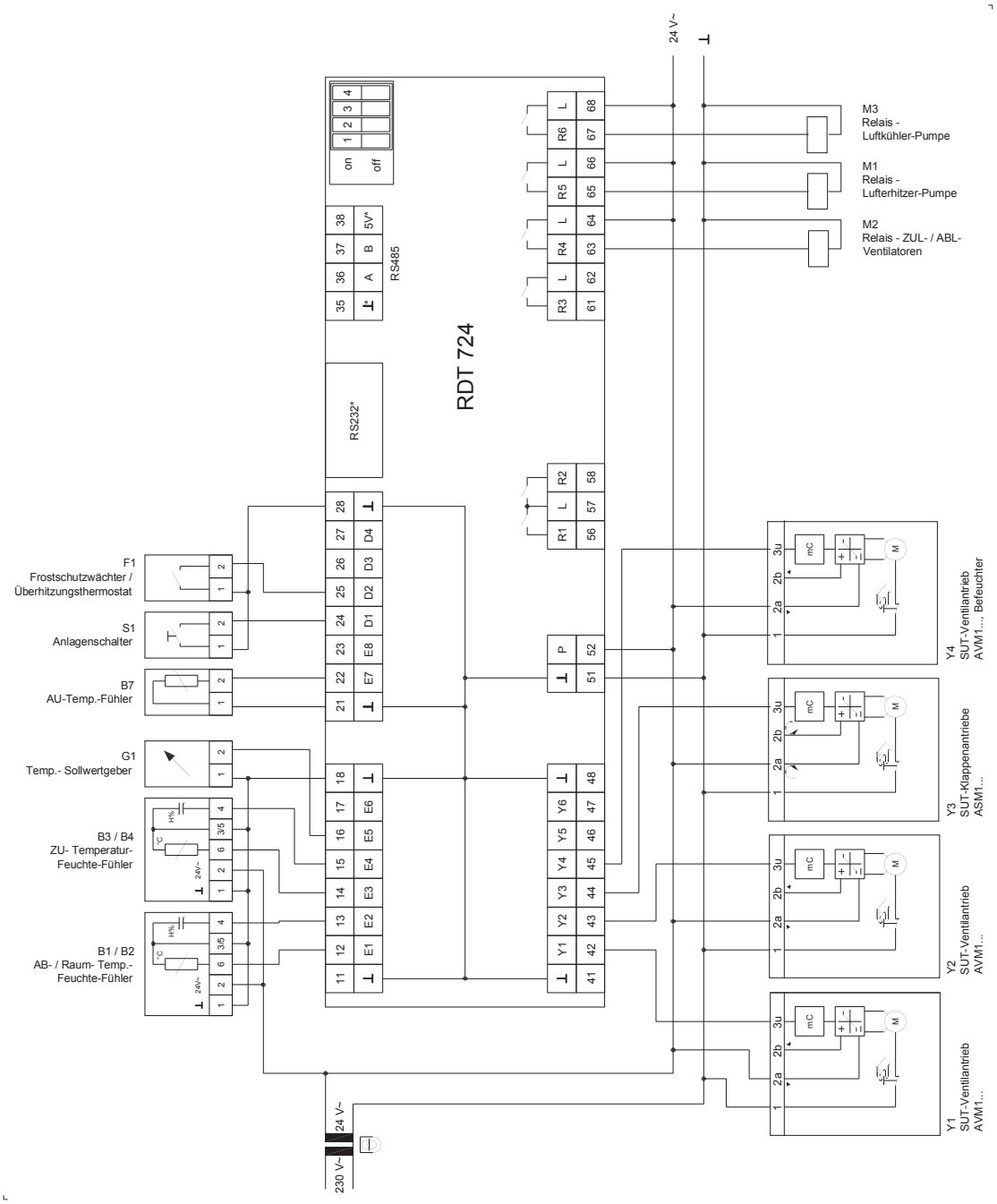
Description

Number	Display	Function	Additional information	Factory setting	Setting
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 Lim Wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Shift, room humidity setpoint					
A021	Shift hum.	Setpoint shift, humidity, acc. to ta	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P551	SPS2 pt wi	Winter cut-in point		15.0°C	
P552	SPS2 inf wi	Winter influence		0.0	
P553	SPS2 Lim Wi	Winter limitation		80.0% r.h.	
P554	SPS2 pt su	Summer cut-in point		25.0°C	
P555	SPS2 inf su	Summer influence		0.0	
P556	SPS2 Lim su	Summer limitation		80.0% r.h.	
Limitation, supply air humidity					
A022	Limitat.h	Limitation on supply air humidity	On	1	
	Input E4 supply air humidity sensor				
A140	E4 Function	Supply air humidity sensor	Humidity 0-10V	21	
A142	E4 Set max	Upper range limit	Active sensor at 10V	100.0% r.h.	
A143	E4 Set min	Lower range limit	Active sensor at 0V	0.0% r.h.	
	Limitation controller				
P721	LC1 setpt	Cut-in point, supply air humidity limitation		80.0% r.h.	
P722	LC1 P-band	P-band, supply air humidity limitation		10.0% r.h.	
Controller					
A012	Control	Control behaviour, temperature	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating protection	Frost protection	1	
			Overheating protection	2	
	Input D2				
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Stand-by mode + night cooling	2	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling				
D500	Clk chan. 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
Humidity - priority					
A023	Humidity P	Humidity - priority	Humidification blocks cooling	1	
			Dehumidification blocks heating	2	
			Hum. blocks C. + dehum. blocks H.	3	

Measuring points	
MP1	Active setpoint (D116)
MP2	Main setpoint (D117)
MP3	Auxiliary setpoint (D118)
MP4	Positioning signal, main controller
MP5	Active setpoint, humidity (D126)
MP6	Main setpoint, humidity (D127)
MP7	Positioning signal, main controller - humidity
MP8	Control mode (0/1)

3.1.16.3 Wiring diagramm

Supply-return air cascade control, humidification and dehumidification, humidity limitation, air heater/air cooler/mixing chamber/humidifier (CTR HCOB L)



3.1.17 Application 313

Supply-return air cascade control with humidification and dehumidification, pre-heater, air heater/air cooler/mixing chamber/humidifier (CTHR HCOhH)

Plant design:

- Outside and exhaust air damper
- Supply and return air fan
- Pre-heater
- Air heater, air cooler with control valve and pump
- Humidifier
- Supply air, return air or room temperature sensor
- Outside temperature sensor

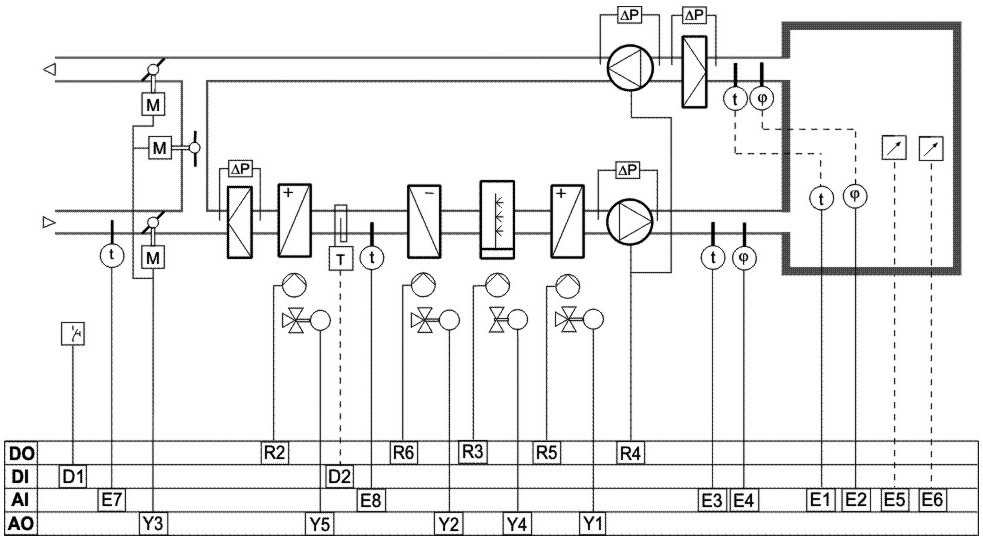
Control functions:

- Pre-heater control
- Temperature control, return air-supply air cascade with ta shift
- Humidity control, return air-supply air cascade

Control functions:

- Enable control
- Delay fan cut-in
- Enable mixing chamber
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode
- Free night cooling

Plant schematic:



Description:

Functions

When the plant is switched on, the control is enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1, cooling valve Y2 or outside air dampers Y3 according to the control deviation. In heating mode and in case of humidification, heating valve Y5 controls a minimum supply air temperature. The supply air temperature is limited.

Damper sequence Y3 is enabled if the outside temperature in cooling mode is lower than the room or return air temperature, and in heating mode if it is higher than the room or return air temperature. The humidity control compares the room or return air humidity with the setpoint and controls valve Y4 (humidification) or cooling valve Y2 (dehumidification) according to the control deviation. The supply air humidity is limited.

When the plant is switched off from the main switch, the fans are switched off, and the valves and dampers are closed.

Options

External setpoint

According to choice, setpoint adjuster XPESF001 can be used to change or correct the setpoint for the temperature and/or the humidity.

Setpoint shift

The setpoint is changed in relation to the outside temperature according to the adjusted influence (see the diagram).

Frost protection

The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. Heating valve Y5 is opened fully and the air heater pump is switched on, but heating valve Y1 remains closed. The frost protection is still active when the plant is switched off.

Overheating protection

The overheating protection switches the heating off and the fans are switched on. The overheating protection is still active when the plant is switched off.

Reduced mode (timer)

Channel 1

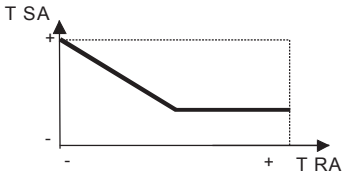
The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, the plant is switched on and off at the reduced setpoint (wred) (2-point).

Channel 2

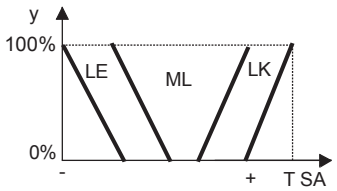
If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2, provided that the conditions are met, i.e. the room temperature is above the setpoint and the outside temperature is lower than the room temperature.

The fans are switched on and the outside air dampers are opened.

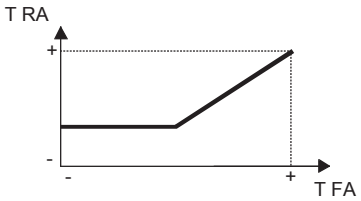
3.1.17.1 Functional diagrams



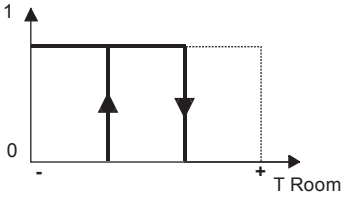
Return-supply air cascade



Heating-cooling-mixing chamber sequence



Setpoint shift acc. to outside temperature



Stand-by mode with reduced setpoint

3.1.17.2 Parameter list

Supply-return air cascade control, humidification and dehumidification, pre-heating, air heater/air cooler/mixing chamber/humidifier (CTHR HCOhH)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room temperature setpoint			
Act. val	20.2°C	Room temperature actual value			
Setp sup	38.0°C	Supply air temperature setpoint			
A.val sup	27.2°C	Supply air temperature actual value			
Setpoint	55.0% r.h.	Room humidity setpoint			
Act. val	40.2% r.h.	Room humidity actual value			
Setp su	75.0% r.h.	Supply air humidity setpoint			
A.val su	27.2% r.h.	Supply air humidity, actual value			
Pre. setp	28.0°C	Preheating setpoint			
Pre. val	26.2°C	Preheating actual value			
Setpoints					
D111	Setpoint 1	Temperature setpoint 'Normal'		20.0°C	
D112	Setpoint 2	Temperature setpoint 'Reduced'	Timer / room remote control	15.0°C	
D121	Setpoint 1	Humidity setpoint		55.0% r.h.	
Basic configuration					
A001	Application	Application	CTHR HCOhH	313	
A002	Dehumidify	Dehumidification (cooling)	On	1	
	Options (described on the following pages)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour, temperature	Cascade	2	
A013	Protection	Frost protection/overheating protection	Frost protection	1	
A014	Red. mode	Reduced mode (timer)	Stand-by mode	1	
A020	Ext.setp.h	External setpoint, humidity	Off	0	
A021	Shift h	Setpoint shift, humidity acc. to ta	Off	0	
A022	Control h	Control behaviour, humidity	Cascade	2	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Room temperature sensor	Temp. 0-10V	20	
A112	E1 Set max	Upper range limit	Active sensor at 10V	50.0°C	
A113	E1 Set min	Lower range limit	Active sensor at 0V	0.0°C	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	

Number	Display	Function	Additional information	Factory setting	Setting
A120	E2 Function	Room humidity sensor	Humidity 0-10V	21	
A122	E2 Set max	Upper range limit	Active sensor at 10V	100.0% r.h.	
A123	E2 Set min	Lower range limit	Active sensor at 0V	0.0% r.h.	
A130	E3 Function	Supply air temperature sensor	Temp. 0-10V	20	
A132	E3 Set max	Upper range limit	Active sensor at 10V	40.0°C	
A133	E3 Set min	Lower range limit	Active sensor at 0V	-10.0°C	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A140	E4 Function	Supply air humidity sensor	Humidity 0-10V	21	
A142	E4 Set max	Upper range limit	Active sensor at 10V	100.0% r.h.	
A143	E4 Set min	Lower range limit	Active sensor at 0V	0.0% r.h.	
A150	E5 Function	Setpoint adjuster, temperature	Not used	0	
A160	E6 Function	Setpoint adjuster, humidity	Not used	0	
A170	E7 Function	Outside temp. sensor	Temp. Ni1000	3	
A177	E7 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A178	E7 Sim.val.	Simulation value	In case of sensor error	0.0°C	
A180	E8 Function	Supply air temperature sensor, pre-ht.	Temp. Ni1000	3	
A187	E8 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A188	E8 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Digital inputs				
A210	D1 Function	Main switch	Active if low	101	
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve ‘heating’	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
A320	Y2 Function	Three-way valve ‘cooling’	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A328	Y2 Blocking	Blocking		0	
A330	Y3 Function	Damper actuator	Analogue output	1	
A331	Y3 Action	Directional control	Normal 0-10VDC	0	
A332	Y3 Max	Maximum value	Output Y3	100.0%	
A333	Y3 Min	Minimum value	Output Y3	0.0%	
A338	Y3 Blocking	Blocking		0	
AA340	Y4 Function	Valve: ‘humidification’	Analogue output	1	
A341	Y4 Action	Directional control	Normal 0-10VDC	0	
A342	Y4 Max	Maximum value	Output Y4	100.0%	
A343	Y4 Min	Minimum value	Output Y4	0.0%	
A348	Y4 Blocking	Blocking		0	
A350	Y5 Function	Three-way valve ‘pre-heating’	Analogue output	1	
A351	Y5 Action	Directional control	Normal 0-10VDC	0	
A352	Y5 Max	Maximum value	Output Y5	100.0%	
A353	Y5 Min	Minimum value	Output Y5	0.0%	
A358	Y5 Blocking	Blocking		0	
	Digital outputs				
A420	R2 Function	Air heater pump, pre-heating	Digital (On)	2	
A421	R2 Action	Directional control	Normal NO	0	
A424	R2 Td on	Switch-on delay		0s	
A425	R2 Td off	Switch-off delay		0s	
A426	R2 min on	Minimum operating time		0s	
A427	R2 min off	Minimum idle time		0s	
A428	R2 Blocking	Blocking	None	0	
A430	R3 Function	Humidifier pump	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking	None	0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	

Description

Number	Display	Function	Additional information	Factory setting	Setting
A448	R4 Blocking	Blocking	None	0	
A450	R5 Function	Air heater pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
A460	R6 Function	Air cooler pump	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room temperature setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room temperature setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint	Room humidity setpoint	80.0% r.h.	
P503	SP2 Min	Minimum setpoint	Room humidity setpoint	20.0% r.h.	
P531	LIM6 Min	Minimum outside air component	Output Y3	10.0%	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK) supply air temperature	At room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint	Temperature	30.0°C	
P605	C1 Min	Minimum supply air setpoint	Temperature	15.0°C	
P611	C2 Offset	Setpoint offset (OfK) supply air humidity	At room setpoint	0.0% r.h.	
P612	C2 P-band	P-band (XpK)		10.0% r.h.	
P613	C2 Tn	I-term		0s	
P614	C2 Max	Maximum supply air setpoint	Humidity	80.0% r.h.	
P615	C2 Min	Minimum supply air setpoint	Humidity	20.0% r.h.	
PID controller(s)					
P632	PID1 Tn	PID1 I-term, temperature cont,	Outputs Y1, Y2 and Y3	160s	
P633	PID1 Tv	PID1 D-term, temperature cont.	Outputs Y1, Y2 and Y3	0.0s	
P642	PID2 Tn	PID2 I-term, humidity controller	Output Y4	160s	
P643	PID2 Tv	PID2 D-term, humidity controller	Output Y4	0.0s	
P651	PID3 P-band	PID3 P-band, temp. controller, preh.	Output Y5	10K	
P652	PID3 Tn	PID3 I-term, temp. cont., preh.	Output Y5	160s	
P653	PID3 Tv	PID3 D-term, temp. cont., preh.	Output Y5	0.0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	-2.0K	
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	2.0K	
	Damper sequence, heat recovery, 'heating'				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y3	10.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y3	-2.0K	
	Damper sequence, heat recovery, 'cooling'				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y3	10.0K	
P707	SEQ4 Offset	Offset (Of4)	Output Y3	2.0K	
	Humidification				
P710	SEQ6 P-band	Proportional band (Xp6)	Output Y4	5.0% r.h.	
P711	SEQ6 Offset	Offset (Of6)	Output Y4	-2.0% r.h.	
	Dehumidification				
P712	SEQ7 P-band	Proportional band (Xp7)	Output Y2	5.0% r.h.	
P713	SEQ7 Offset	Offset (Of7)	Output Y2	2.0% r.h.	

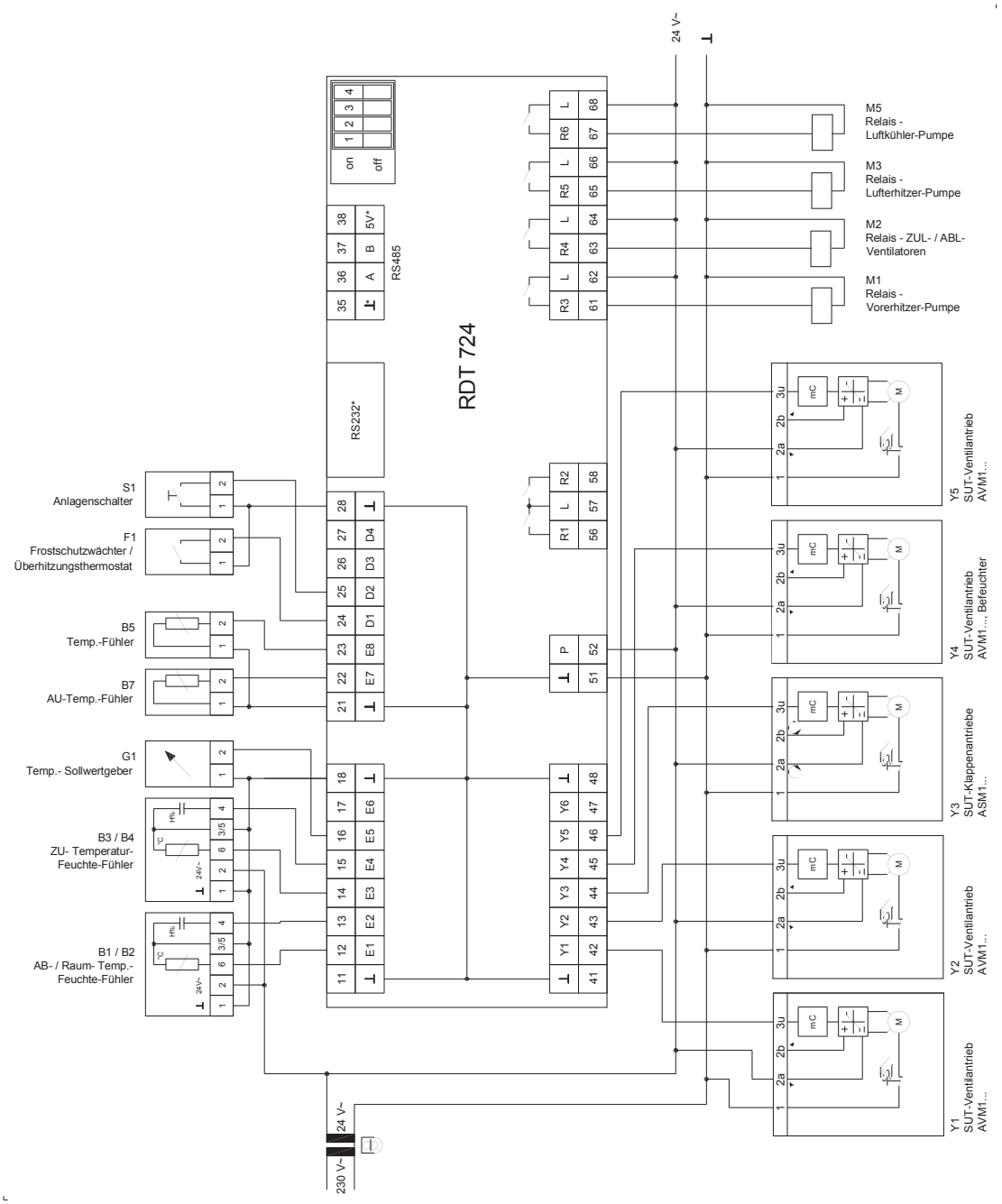
Number	Display	Function	Additional information	Factory setting	Setting
Energy recovery					
P741	ER1 exh.±	Correction - return air		0.0K	
P742	ER1 room ±	Correction - room air		0.0K	
P743	ER1 sw.diff	Switching difference - energy supply		1.0K	
P744	ER1 Neutral	Neutral zone - energy supply		3.0K	
Switching points					
P780	2P1 sw.pt	Switching point, air heater pump	Relay R5	5.0%	
P781	2P1 sw.diff	Switching difference, air heater pump	Relay R5	2.0 %	
P782	2P2 sw.pt	Switching point, air cooler pump	Relay R6	5.0%	
P783	2P2 sw.diff	Switching difference, air cooler pump	Relay R6	2.0%	
P784	2P3 sw.pt	Switching point, humidifier pump	Relay R3	5.0%	
P785	2P3 sw.diff	Switching difference, humidifier pump	Relay R3	2.0%	
P786	2P4 sw.pt	Switching point for pump - pre-heating	Relay R2	5.0%	
P787	2P4 sw.diff	Switching difference for pump - pre-ht.	Relay R2	2.0%	
pre-heating					
P811	Variable 1	Setpoint - pre-heating		10.0°C	
P812	Variable 2	Setpoint - pre-heating, humidification		10.0°C	
Options					
External setpoint, temperature					
A010	Ext.setp.	External setpoint	Temperature on	1	
	Input E5 setpoint adjuster				
A150	E5 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A152	E5 Set max	Range maximum		40.0°C	
A153	E5 Set min	Range minimum		0.0°C	
A154	E5 Cal.max	Calibration of range maximum		°C	
A155	E5 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A156	E5 Cal.min	Calibration of range minimum		°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	
External setpoint, humidity					
A020	Ext.setp.h	External setpoint	Humidity on	1	
	Input E6 setpoint adjuster				
A160	E6 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	53	
A162	E6 Set max	Range maximum		100.0% r.h.	
A163	E6 Set min	Range minimum		0.0% r.h.	
A164	E6 Cal.max	Calibration of range maximum		% r.h.	
A165	E6 Cal.midd	Calibration of range midpoint	Possible only on device	% r.h.	
A166	E6 Cal.min	Calibration of range minimum		% r.h.	
A168	E6 Sim.val.	Simulation value	In case of sensor error	55.0% r.h.	
Shift, room temperature setpoint					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 Lim Wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Shift, room humidity setpoint					
A021	Shift hum.	Setpoint shift, humidity, acc. to ta	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P551	SPS2 pt wi	Winter cut-in point		15.0°C	
P552	SPS2 inf wi	Winter influence		0.0	
P553	SPS2 Lim Wi	Winter limitation		80.0% r.h.	
P554	SPS2 pt su	Summer cut-in point		25.0°C	
P555	SPS2 inf su	Summer influence		0.0	
P556	SPS2 Lim su	Summer limitation		80.0% r.h.	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Controller, temperature					
A012	Control	Control behaviour, temperature	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Controller, humidity					
A022	Control h	Control behaviour, humidity	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating protection	Frost protection	1	
			Overheating protection	2	
	Input D2				
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Stand-by mode + night cooling	2	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling				
D500	Clk chan. 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
Measuring points					
MP1		Active setpoint (D116)			
MP2		Main setpoint (D117)			
MP3		Auxiliary setpoint (D118)			
MP4		Positioning signal, aux. controller			
MP5		Active setpoint, humidity (D126)			
MP6		Main setpoint, humidity (D127)			
MP7		Auxiliary setpoint, humidity (D128)			
MP8		Positioning signal, aux. controller, humidity			
MP9		Control mode (0/1)			

3.1.17.3 Wiring diagramm

Supply-return air cascade control, humidification and dehumidification, pre-heating, air heater/air cooler/mixing chamber/humidifier (CTR HCOBH)



3.1.18 Application 314

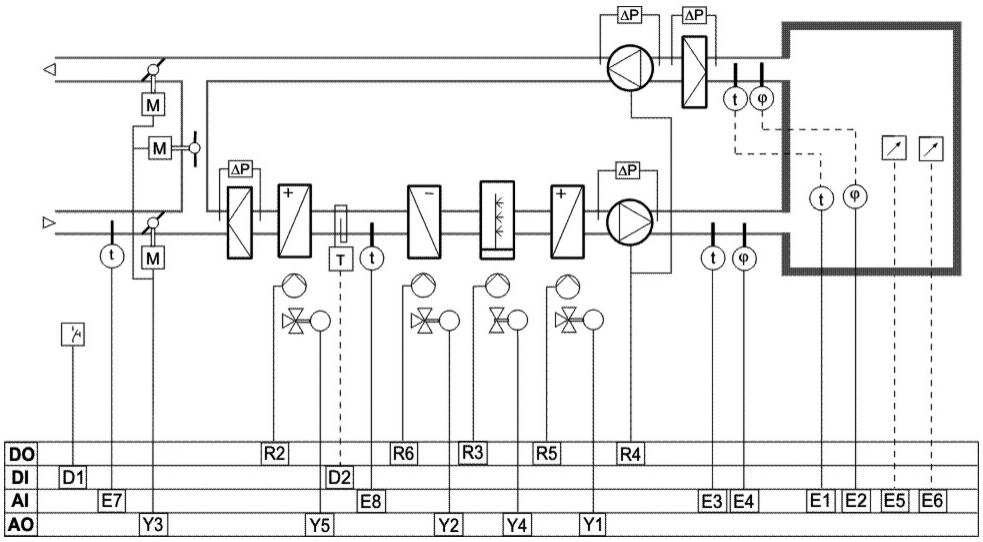
Supply-return air cascade control with humidification and dehumidification, pre-heater, humidity limitation, air heater/air cooler/mixing chamber/humidifier (CTHR HCOhHL)

Plant design:
- Outside and exhaust air damper
- Supply and return air fan
- Pre-heater
- Air heater, air cooler with control valve and pump
- Humidifier
- Supply air, return air or room temperature sensor
- Outside temperature sensor

Control functions:
- Pre-heater control
- Temperature control, return air-supply air cascade with ta shift
- Humidity control, return air-supply air cascade
- Humidity limitation

Control functions:
- Enable control
- Delay fan cut-in
- Enable mixing chamber
- Main (plant) switch
- Frost protection function
- Overheating protection
- Automatic pump cut-in
- Stand-by mode
- Free night cooling

Plant schematic:



Description:

Functions

When the plant is switched on, the control is enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1, cooling valve Y2 or outside air dampers Y3 according to the control deviation. In heating mode and in case of humidification, heating valve Y5 controls a minimum supply air temperature. The supply air temperature is limited.

Damper sequence Y3 is enabled if the outside temperature in cooling mode is lower than the room or return air temperature, and in heating mode if it is higher than the room or return air temperature.

The humidity control compares the room or return air humidity with the setpoint and controls valve Y4 (humidification) or cooling valve Y2 (dehumidification) according to the control deviation. The supply air humidity sensor acts as a limiter.

When the plant is switched off from the main switch, the fans are switched off, and the valves and dampers are closed.

Options

External setpoint

According to choice, setpoint adjuster XPESF001 can be used to change or correct the setpoint for the temperature and/or the humidity.

Setpoint shift

The setpoint is changed in relation to the outside temperature according to the adjusted influence (see the diagram).

Frost protection

The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. Heating valve Y5 is opened fully and the air heater pump is switched on, but heating valve Y1 remains closed. The frost protection is still active when the plant is switched off.

Overheating protection

The overheating protection switches the heating off and the fans are switched on. The overheating protection is still active when the plant is switched off.

Reduced mode (timer)

Channel 1

The timer programme switches the plant off until stand-by mode becomes active. In stand-by mode, the plant is switched on and off at the reduced setpoint (2-point).

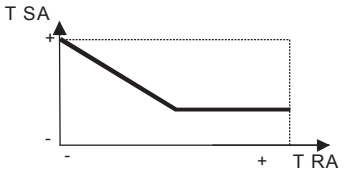
Channel 2

If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2, provided that the conditions are met, i.e. the room temperature is above the setpoint and the outside temperature is lower than the room temperature.

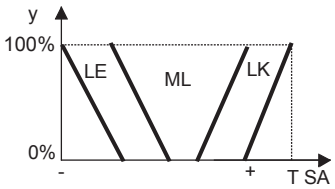
The fans are switched on and the outside air dampers are opened.

Description

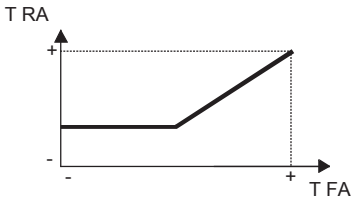
3.1.18.1 Functional diagrams



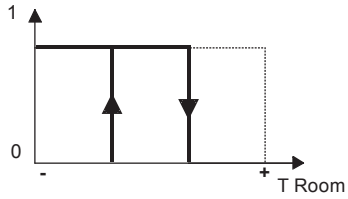
Return-supply air cascade



Heating-cooling-mixing chamber sequence



Setpoint shift acc. to outside temperature



Stand-by mode with reduced setpoint

3.1.18.2 Parameter list

Supply-return air cascade control, humidification and dehumidification, pre-heating, humidity limitation, air heater/air cooler/mixing chamber/humidifier (CTHR HCOhHL)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room temperature setpoint			
Act. val	20.2°C	Room temperature actual value			
Setp sup	38.0°C	Supply air temperature setpoint			
A.val su	27.2°C	Supply air temperature actual value			
Setpoint	55.0% r.h.	Room humidity setpoint			
Act. val	40.2% r.h.	Room humidity actual value			
Preh. setp.	28.0°C	Preheating setpoint			
Preh. act.	26.2°C	Preheating actual value			
Setpoints					
D111	Setpoint 1	Temperature setpoint 'Normal'		20.0°C	
D112	Setpoint 2	Temperature setpoint 'Reduced'	Timer / room remote control	15.0°C	
D121	Setpoint 1	Humidity setpoint		55.0% r.h.	
Basic configuration					
A001	Application	Application	CTHR HCOhHL	314	
A002	Dehumidify	Dehumidification (cooling)	On	1	
	Options (described on the following pages)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour, temperature	Cascade	2	
A013	Protection	Frost protection/overheating protection	Frost protection	1	
A014	Red. mode	Reduced mode (timer)	Stand-by mode	1	
A020	Ext.setp.h	External setpoint, humidity	Off	0	
A021	Shift hum.	Setpoint shift, humidity acc. to ta	Off	0	
A022	Limitat.h	Limitation on supply air humidity	Off	0	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Room temperature sensor	Temp. 0-10V	20	
A112	E1 Set max	Upper range limit	Active sensor at 10V	50.0°C	
A113	E1 Set min	Lower range limit	Active sensor at 0V	0.0°C	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	

Number	Display	Function	Additional information	Factory setting	Setting
A120	E2 Function	Room humidity sensor	Humidity 0-10V	21	
A122	E2 Set max	Upper range limit	Active sensor at 10V	100.0% r.h.	
A123	E2 Set min	Lower range limit	Active sensor at 0V	0.0% r.h.	
A130	E3 Function	Supply air temperature sensor	Temp. 0-10V	20	
A132	E3 Set max	Upper range limit	Active sensor at 10V	40.0°C	
A133	E3 Set min	Lower range limit	Active sensor at 0V	-10.0°C	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A140	E4 Function	Supply air humidity sensor	Not used	0	
A150	E5 Function	Setpoint adjuster, temperature	Not used	0	
A160	E6 Function	Setpoint adjuster, humidity	Not used	0	
A170	E7 Function	Outside temp. sensor	Temp. Ni1000	3	
A177	E7 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A178	E7 Sim.val.	Simulation value	In case of sensor error	0.0°C	
A180	E8 Function	Supply air temp. sensor, pre-heating	Temp. Ni1000	3	
A187	E8 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A188	E8 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Digital inputs				
A210	D1 Function	Main switch	Active if low	101	
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve ‘heating’	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A318	Y1 Blocking	Blocking		0	
A320	Y2 Function	Three-way valve ‘cooling’	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A328	Y2 Blocking	Blocking		0	
A330	Y3 Function	Damper actuator	Analogue output	1	
A331	Y3 Action	Directional control	Normal 0-10VDC	0	
A332	Y3 Max	Maximum value	Output Y3	100.0%	
A333	Y3 Min	Minimum value	Output Y3	0.0%	
A338	Y3 Blocking	Blocking		0	
A340	Y4 Function	Valve: ‘humidification’	Analogue output	1	
A341	Y4 Action	Directional control	Normal 0-10VDC	0	
A342	Y4 Max	Maximum value	Output Y4	100.0%	
A343	Y4 Min	Minimum value	Output Y4	0.0%	
A348	Y4 Blocking	Blocking		0	
A350	Y5 Function	Three-way valve ‘pre-heating’	Analogue output	1	
A351	Y5 Action	Directional control	Normal 0-10VDC	0	
A352	Y5 Max	Maximum value	Output Y5	100.0%	
A353	Y5 Min	Minimum value	Output Y5	0.0%	
A358	Y5 Blocking	Blocking		0	
	Digital outputs				
A420	R2 Function	Air heater pump - pre-heating	Digital (On)	2	
A421	R2 Action	Directional control	Normal NO	0	
A424	R2 Td on	Switch-on delay		0s	
A425	R2 Td off	Switch-off delay		0s	
A426	R2 min on	Minimum operating time		0s	
A427	R2 min off	Minimum idle time		0s	
A428	R2 Blocking	Blocking	None	0	
A430	R3 Function	Humidifier pump	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking	None	0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking	None	0	

Description

Number	Display	Function	Additional information	Factory setting	Setting
A450	R5 Function	Air heater pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking	None	0	
A460	R6 Function	Air cooler pump	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking	None	0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room temperature setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room temperature setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint	Room humidity setpoint	80.0% r.h.	
P503	SP2 Min	Minimum setpoint	Room humidity setpoint	20.0% r.h.	
P531	LIM6 Min	Minimum outside air component	Output Y3	10.0%	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK) supply air temp.	At room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint	Temperature	30.0°C	
P605	C1 Min	Minimum supply air setpoint	Temperature	15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term, temperature cont.	Outputs Y1..Y3	160s	
P633	PID1 Tv	PID1 D-term, temperature cont.	Outputs Y1..Y3	0.0s	
P642	PID2 Tn	PID2 I-term, humidity controller	Output Y4	160s	
P643	PID2 Tv	PID2 D-term, humidity controller	Output Y4	0.0s	
P651	PID3 Xp	PID3 P-band, temperature cont., preh.	Output Y5	10K	
P652	PID3 Tn	PID3 I-term, temp. cont., preh.	Output Y5	160s	
P653	PID3 Tv	PID3 D-term, temp. cont., preh.	Output Y5	0.0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	-2.0K	
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	2.0K	
	Damper sequence, heat recovery, 'heating'				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y3	10.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y3	-2.0K	
	Damper sequence, heat recovery, 'cooling'				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y3	10.0K	
P707	SEQ4 Offset	Offset (Of4)	Output Y3	2.0K	
	Humidification				
P710	SEQ6 P-band	Proportional band (Xp6)	Output Y4	5.0% r.h.	
P711	SEQ6 Offset	Offset (Of6)	Output Y4	-2.0% r.h.	
	Dehumidification				
P712	SEQ7 P-band	Proportional band (Xp7)	Output Y2	5.0% r.h.	
P713	SEQ7 Offset	Offset (Of7)	Output Y2	2.0% r.h.	
Energy recovery					
P741	ER1 exh.±	Correction - return air		0.0K	
P742	ER1 room ±	Correction - room air		0.0K	
P743	ER1 sw.diff	Switching difference - energy supply		1.0K	
P744	ER1 Neutral	Neutral zone - energy supply		3.0K	

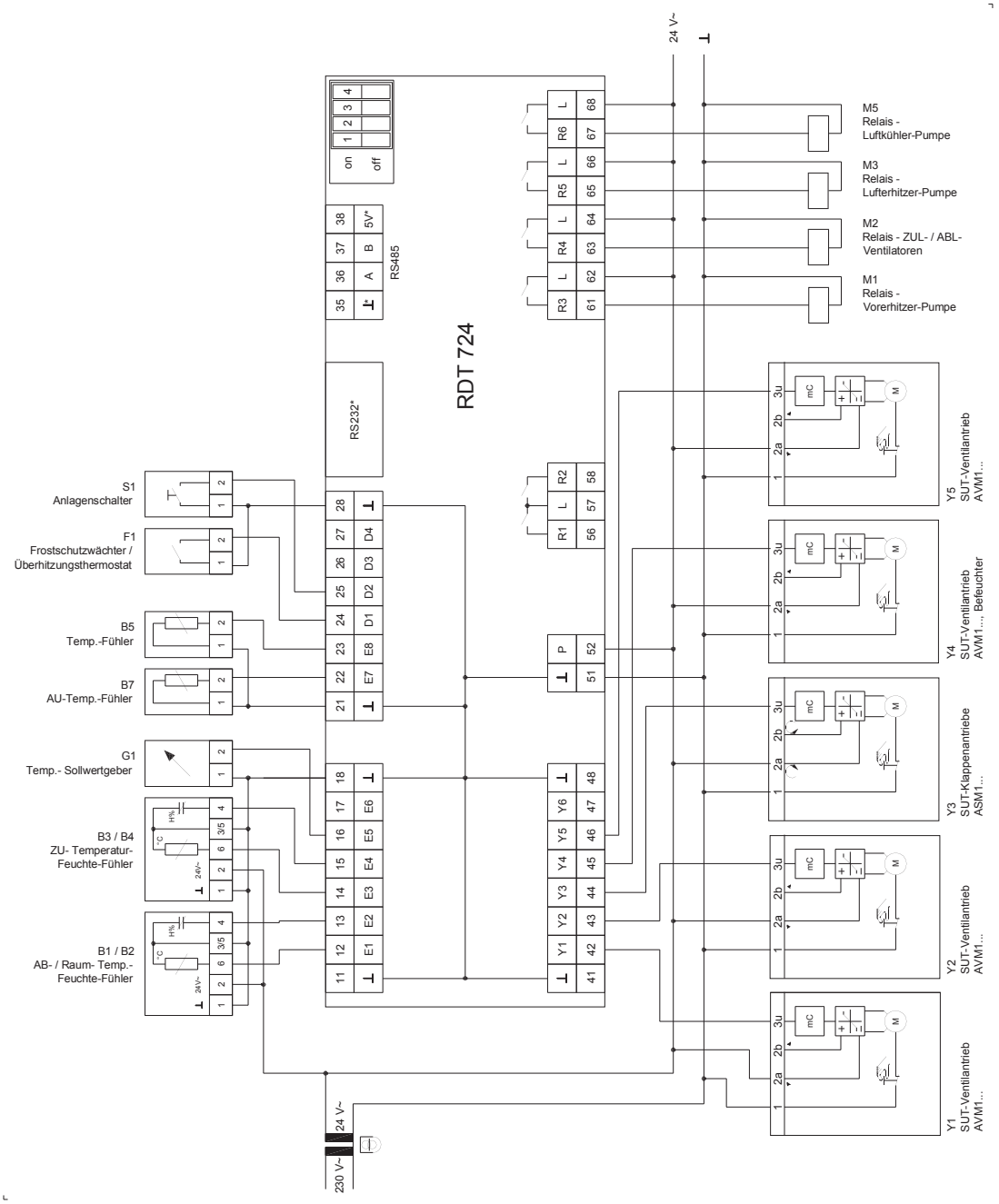
Number	Display	Function	Additional information	Factory setting	Setting
Switching points					
P780	2P1 sw.pt	Switching point, air heater pump	Relay R5	5.0%	
P781	2P1 sw.diff	Switching difference, air heater pump	Relay R5	2.0%	
P782	2P2 sw.pt	Switching point, air cooler pump	Relay R6	5.0%	
P783	2P2 sw.diff	Switching difference, air cooler pump	Relay R6	2.0%	
P784	2P3 sw.pt	Switching point, humidifier pump	Relay R3	5.0%	
P785	2P3 sw.diff	Switching difference, humidifier pump	Relay R3	2.0%	
P786	2P4 sw.pt	Switching point for pump - pre-heating	Relay R2	5.0%	
P787	2P4 sw.diff	Switching diff. for pump - pre-heating	Relay R2	2.0%	
Pre-heating					
P811	Variable 1	Setpoint - pre-heating		10.0°C	
P812	Variable 2	Setpoint - pre-heating, humidification		10.0°C	
Options					
External setpoint, temperature					
A010	Ext.setp.	External setpoint	Temperature on	1	
	Input E5 setpoint adjuster				
A150	E5 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	51	
A152	E5 Set max	Range maximum		40.0°C	
A153	E5 Set min	Range minimum		0.0°C	
A154	E5 Cal.max	Calibration of range maximum		°C	
A155	E5 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A156	E5 Cal.min	Calibration of range minimum		°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	
External setpoint, humidity					
A020	Ext.setp.h	External setpoint	Humidity on	1	
	Input E6 setpoint adjuster				
A160	E6 Function	Setpoint adjuster	Temp.XPES (Ext. setpoint)	53	
A162	E6 Set max	Range maximum		100.0% r.h.	
A163	E6 Set min	Range minimum		0.0% r.h.	
A164	E6 Cal.max	Calibration of range maximum		% r.h.	
A165	E6 Cal.midd	Calibration of range midpoint	Possible only on device	% r.h.	
A166	E6 Cal.min	Calibration of range minimum		% r.h.	
A168	E6 Sim.val.	Simulation value	In case of sensor error	55.0% r.h.	
Shift, room temperature setpoint					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		0.0	
P543	SPS1 Lim Wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Shift, room humidity setpoint					
A021	Shift hum.	Setpoint shift, humidity, acc. to ta	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P551	SPS2 pt wi	Winter cut-in point		15.0°C	
P552	SPS2 inf wi	Winter influence		0.0	
P553	SPS2 Lim Wi	Winter limitation		80.0% r.h.	
P554	SPS2 pt su	Summer cut-in point		25.0°C	
P555	SPS2 inf su	Summer influence		0.0	
P556	SPS2 Lim su	Summer limitation		80.0% r.h.	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Limitation, supply air humidity					
A022	Limitat.h	Limitation on supply air humidity	On	1	
	Input E4 supply air humidity sensor				
A140	E4 Function	Supply air humidity sensor	Humidity 0-10V	21	
A142	E4 Set max	Upper range limit	Active sensor at 10V	100.0% r.h.	
A143	E4 Set min	Lower range limit	Active sensor at 0V	0.0% r.h.	
	Limitation controller				
P721	LC1 setpt	Cut-in point - supply air humidity limitation		80.0% r.h.	
P722	LC1 P-band	P-band - supply air humidity limitation		10.0% r.h.	
Controller					
A012	Control	Control behaviour, temperature	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection/overheating protection					
A013	Protection	Frost protection/overheating protection	Frost protection	1	
			Overheating protection	2	
	Input D2				
A220	D2 Function	Frost protection monitor/overheating th.	Active if low	101	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Stand-by mode + night cooling	2	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling				
D500	Clk chan. 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
Measuring points					
MP1		Active setpoint (D116)			
MP2		Main setpoint (D117)			
MP3		Auxiliary setpoint (D118)			
MP4		Positioning signal, aux. controller			
MP5		Active setpoint, humidity (D126)			
MP6		Main setpoint, humidity (D127)			
MP7		Positioning signal, aux. controller, humidity			
MP8		Control mode (0/1)			

3.1.18.3 Wiring diagramm

Supply-return air cascade control, humidification and dehumidification, pre-heating, humidity limitation, air heater/air cooler/mixing chamber/humidifier (CTR HCOBHL)



3.1.19 Application 901

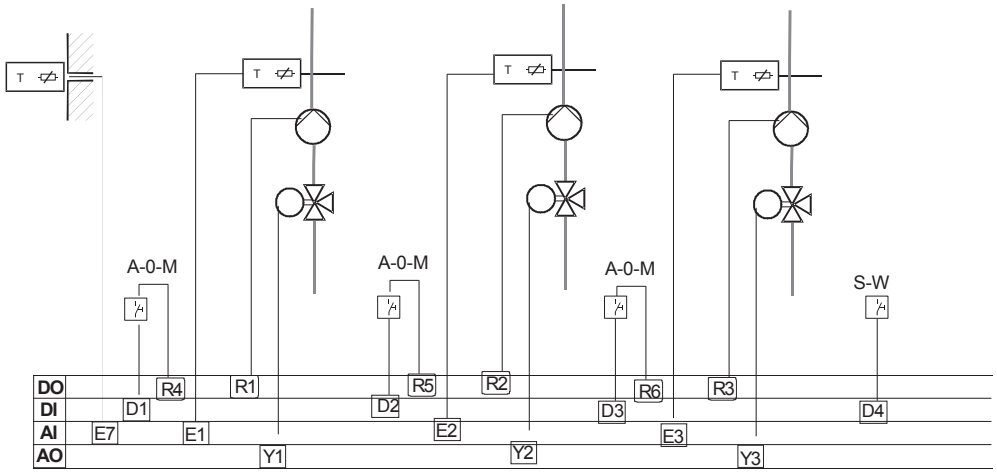
ta-led flow-temperature control, 1 to 3 zones, with summer/winter change-over (TF H 3Z)

Plant design:
- Up to 3 static heaters

Control functions:
- Up to 3 ta-led heating control loops

Control functions:
- 1 – 3 zones
- Summer/winter change-over
- Timer with 3 channels

Plant schematic:



Description:

Function

The temperature control compares the flow temperature with the setpoint and controls the heating valve according to the control deviation.
The number of zones can be set from 1 - 3.
Summer/winter change-over can be set for each zone. Reduced mode can be set for each zone and is not active in summer.
The frost protection setpoint is active in winter.

Options

Reduced mode

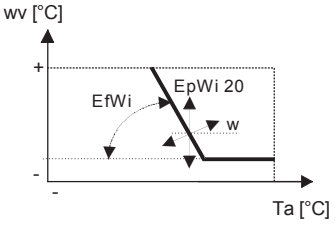
In reduced mode, the heating valve is closed immediately and the pump is switched off after 1800 s. If the outside temperature is <= than the reduced setpoint (15°C), the temperature control is activated until the outside temperature is > than the reduced setpoint (15°C)+1K.

Setpoint shift

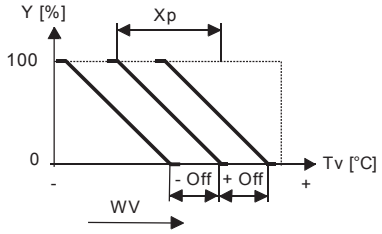
The setpoint is changed in relation to the outside temperature according to the adjusted inflow (see the diagram). The fixed point and inflow can be adjusted for each zone.

3.1.19.1 Functional diagrams

Winter

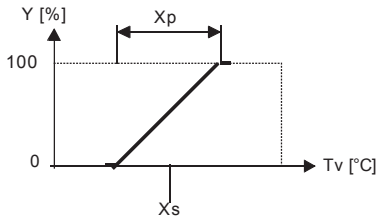


Setpoint shift acc. to outside temperature



Heating sequence

Summer



3.1.19.2 Parameter list

ta-led flow-temperature control, 1 to 3 zones, with summer/winter change-over (TF H 3Z)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Z1 setp	19.3°C	Flow setpoint	Zone 1		
Fval	14.4°C	Actual flow value	Zone 1		
Z2 setp	19.3°C	Flow setpoint	Zone 2		
Fval	14.4°C	Actual flow value	Zone 2		
Z3 setp	19.3°C	Flow setpoint	Zone 3		
Fval	14.4°C	Actual flow value	Zone 3		
Setpoints					
	Shown according to parameter A002, zones				
D111	Z1 setp 1	Setpoint ‘Normal’, zone 1		22.0°C	
D112	Z1 setp 2	Setpoint ‘Reduced’, zone 1	Timer or digital input	15.0°C	
D113	Z1 setp 3	Setpoint ‘Summer’, zone 1	Main switch	12.0°C	
D121	Z2 setp 1	Setpoint ‘Normal’, zone 2		22.0°C	
D122	Z2 setp 2	Setpoint ‘Reduced’, zone 2	Timer or digital input	15.0°C	
D123	Z2 setp 3	Setpoint ‘Summer’, zone 2	Main switch	12.0°C	
D131	Z3 setp 1	Setpoint ‘Normal’, zone 3		22.0°C	
D132	Z3 setp 2	Setpoint ‘Reduced’, zone 3	Timer or digital input	15.0°C	
D133	Z3 setp 3	Setpoint ‘Summer’, zone 3	Main switch	12.0°C	
Basic configuration					
A001	Application	Flow - HC	Flow - heating, 1-3 zones	901	
A002	Zones	Number of zones	1..3	1	

Description

Number	Display	Function	Additional information	Factory setting	Setting
	Analogue input E7 (Outside temperature sensor)				
A170-A178 are dependent on the shift					
A170	E7 Function	Outside temperature sensor 1	Temp. Ni1000	3	
A177	E7 Cal.temp	Temp. calibration, outside sensor 1	Input: meas. val.	°C	
A178	E7 Sim.val.	Simulation value, outside sensor 1	In case of sensor error	0.0°C	
	Digital input D4 (Summer)				
A240	D4 Function	S/W change-over switch	Active if low	101	
Zone 1					
A002	Zones	Number of zones	1..3	1	
Options					
A010	Z1 summer	Main switch	OFF	0	
	Shift				
A011	Z1 shift	Selection of outside temp., zone 1	0=off, 1=on	1	
	Reduced mode, setpoint 2				
A012	Z1 red.mod.	Selection of setpoint 2, zone 1	0=off 1= on	0	
D400	Clk chan. 1	Timer channel 1		3	
D401	Clk C1 mode	Mode		1	
I/O configuration					
	Analogue input 1				
A110	E1 Function	Flow temp. sensor, zone 1	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication, zone 1	Off	0	
A117	E1 Cal.temp	Temperature calibration, zone 1	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value, zone 1	In case of sensor error	22.0°C	
	Digital input D1 (off/reduced, zone 1)				
A210	D1 Function	Main switch (‘Frost’ setpoint is active)	Active if high	102	
	Analogue output (control valve, zone 1)				
A310	Y1 Function	Three-way valve, zone 1	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 max	Maximum value	Output Y1	100.0%	
A313	Y1 min	Minimum value	Output Y1	0.0%	
	Digital output R1 (pump, zone 1)				
A410	R1 Function	Circul. pump, zone 1	Digital (On)	2	
A411	R1 Action	Directional control	Normal NO	0	
A414	R1 Td on	Switch-on delay		0s	
A415	R1 Td off	Switch-off delay		1800s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 Blocking	Blocking		0	
	Digital output R4 (timer, zone 1)				
A440	R4 Function	Parameter A010	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking		0	
Limitations					
P500	SP1 Max	Maximum setpoint, zone 1	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint, zone 1	Room setpoint	5.0°C	
P520	LIM1 max	Maximum limitation, zone 1	Flow temperature	80.0°C	
P521	LIM1 min	Minimum limitation, zone 1	Flow temperature	5.0°C	
Shift parameters					
P541	SWS1 pt wi	Winter cut-in point	Fixed point	20.0°C	
P542	SWS1 inf wi	Winter influence	Slope (factor)	1.0	
PID controller(s)					
P632	PID1 Tn	PID1 I-term, zone 1	Output Y1	160s	
P633	PID1 Tv	PID1 D-term, zone 1	Output Y1	0.0s	

Number	Display	Function	Additional information	Factory setting	Setting
Sequence					
P700	SEQ1 P-band	Proportional band (Xp), heating	Output Y1	20.0K	
P701	SEQ1 Offset	Offset (Of), heating	Output Y1	10.0K	
P702	SEQ2 P-band	Proportional band (Xp), cooling		20.0K	
P703	SEQ2 Offset	Offset (Of), cooling		-10K	
Frost protection					
P811	Variable 1	Setpoint - pump frost protection, zone 1		2°C	
P814	Variable 4	Setpoint 'Frost protection', zone 1		5°C	
Zone 2					
A002	Zones	Number of zones	1..3	2	
Options					
A020	Z2 summer	Main switch	OFF	0	
	Shift				
A021	Z2 shift	Selection of outside temp., zone 2	0=off, 1=on	1	
	Reduced mode, setpoint 2				
A022	Z2 red.mod.	Selection of setpoint 2, zone 2	0=off 1= on	0	
D500	Clk chan. 2	Timer channel 2		3	
D501	Clk C2 mode	Mode		1	
I/O configuration					
	Analogue input 2				
A120	E2 Function	Flow temp. sensor, zone 2	Temp. Ni1000	3	
A121	E2 Scheme	Sensor multiplication, zone 2	Off	0	
A127	E2 Cal.temp	Temperature calibration, zone 2	Input: meas. val.	°C	
A128	E2 Sim.val.	Simulation value, zone 2	In case of sensor error	20.0°C	
	Digital input D2 (off/reduced, zone 2)				
A220	D2 Function	Main switch ('Frost' setpoint is active)	Active if high	102	
	Analogue output (control valve, zone 2)				
A320	Y2 Function	Three-way valve, zone 2	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 max	Maximum value	Output Y2	100.0%	
A323	Y2 min	Minimum value	Output Y2	0.0%	
	Digital output R2 (pump, zone 2)				
A420	R2 Function	Circul. pump, zone 2	Digital (On)	2	
A421	R2 Action	Directional control	Normal NO	0	
A424	R2 Td on	Switch-on delay		0s	
A425	R2 Td off	Switch-off delay		1800s	
A426	R2 min on	Minimum operating time		0s	
A427	R2 min off	Minimum idle time		0s	
A428	R2 Blocking	Blocking		0	
	Digital output R5 (timer, zone 2)				
A450	R5 Function	Parameter A020	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking		0	
Limitations					
P502	SP2 Max	Maximum setpoint, zone 2	Room setpoint	30.0°C	
P503	SP2 Min	Minimum setpoint, zone 2	Room setpoint	5.0°C	
P522	LIM2 Max	Maximum limitation, zone 2	Flow temperature	80.0°C	
P523	LIM2 Min	Minimum limitation, zone 2	Flow temperature	5.0°C	
Shift parameters					
P551	SPS2 pt wi	Winter cut-in point	Fixed point	20.0°C	
P552	SPS2 inf wii	Winter influence	Slope (factor)	1.0	
PID controller(s)					
P642	PID2 Tn	PID2 I-term, zone 2	Output Y2	160s	
P643	PID2 Tv	PID2 D-term, zone 2	Output Y2	0.0s	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Sequence					
P704	SEQ3 P-band	Proportional band (Xp)	Output Y2	20.0K	
P705	SEQ3 Offset	Offset (Of)	Output Y2	10.0K	
P706	SEQ4 P-band	Proportional band (Xp), cooling		20.0K	
P707	SEQ4 Offset	Offset (Of), cooling		-10K	
Frost protection					
P812	Variable 2	Setpoint - pump frost protection, zone 2		2°C	
P815	Variable 5	Setpoint 'Frost protection', zone 2		5°C	
Zone 3					
A002	Zones	Number of zones	1..3	3	
Options					
A030	Z3 summer	Main switch	OFF	0	
	Shift				
A031	Z3 shift	Selection of outside temp., zone 3	0=off, 1=on	1	
	Reduced mode, setpoint 2				
A032	Z3 red.mod.	Selection of setpoint 2, zone 3	0=off 1= on	0	
D600	Clk chan. 3	Timer channel 3		3	
D601	Clk C3 mode	Mode		1	
I/O configuration					
	Analogue input 3				
A130	E3 Function	Flow temp. sensor, zone 3	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication, zone 3	Off	0	
A137	E3 Cal.temp	Temperature calibration, zone 3	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value, zone 3	In case of sensor error	20.0°C	
	Digital input D3 (off/reduced, zone 3)				
A230	D3 Function	Main switch ('Frost' setpoint is active)	Active if high	102	
	Analogue output (control valve, zone 3)				
A330	Y3 Function	Three-way valve, zone 3	Analogue output	1	
A331	Y3 Action	Directional control	Normal 0-10VDC	0	
A332	Y3 max	Maximum value	Output Y3	100.0%	
A333	Y3 min	Minimum value	Output Y3	0.0%	
	Digital output R3 (pump, zone 3)				
A430	R3 Function	Circul. pump, zone 3	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		1800s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking		0	
	Digital output R6 (timer, zone 3)				
A460	R6 Function	Parameter A030	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking		0	
Limitations					
P504	SP3 Max	Maximum setpoint, zone 3	Room setpoint	30.0°C	
P505	SP3 Min	Minimum setpoint, zone 3	Room setpoint	5.0°C	
P524	LIM3 Max	Maximum limitation, zone 3	Flow temperature	80.0°C	
P525	LIM3 Min	Minimum limitation, zone 3	Flow temperature	5.0°C	
Shift parameters					
P561	SPS3 pt wi	Winter cut-in point	Fixed point	20.0°C	
P562	SPS3 inf wi	Winter influence	Slope (factor)	1.0	
PID controller(s)					
P652	PID3 Tn	PID3 I-term, zone 3	Output Y3	160s	
P653	PID3 Tv	PID3 D-term, zone 3	Output Y3	0.0s	

Number	Display	Function	Additional information	Factory setting	Setting
Sequences					
P708	SEQ5 P-band	Proportional band (Xp)	Output Y3	20.0K	
P709	SEQ5 Offset	Offset (Of)	Output Y3	10.0K	
P710	SEQ6 P-band	Proportional band (Xp), cooling		20.0K	
P711	SEQ6 Offset	Offset (Of), cooling		-10K	
Frost protection					
P813	Variable 3	Setpoint - pump frost protection, zone 3		2°C	
P816	Variable 6	Setpoint 'Frost protection', zone 3		5°C	

3.1.20 Application 902

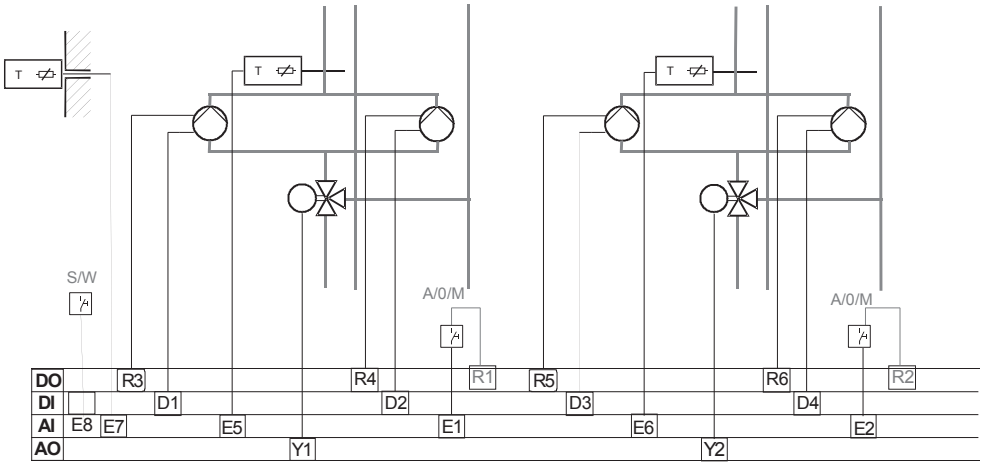
ta-led flow-temperature control, 2 zones, with summer/winter change-over (TF H 2Z 2P)

Plant design:
- 2 static heaters

Control functions:
- 2 ta-led heating control loops with summer/winter change-over

Control functions:
- 2 zones
- Summer/winter change-over
- Timer with 2 channels
- Automatic pump change-over
- Pump change-over in case of a fault

Plant schematic:



Functions

The temperature control compares the flow temperature with the flow setpoint and controls the heating valve according to the control deviation.
Summer/winter change-over can be set for each zone. Reduced mode can be set for each zone and is not active in summer.
The frost protection setpoint is active in winter.
The change to the flow setpoint is dependent on the outside temperature, in accordance with the adjusted inflow (see the diagram). The fixed point and inflow can be adjusted for each zone.

Automatic pump switching compensates the operating hours of the two pumps. The pumps are switched over in case of a fault.

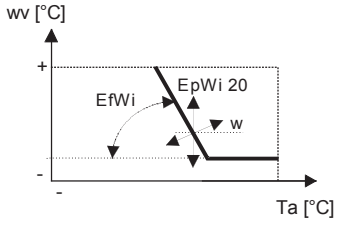
Options

Reduced mode (timer / room remote control)

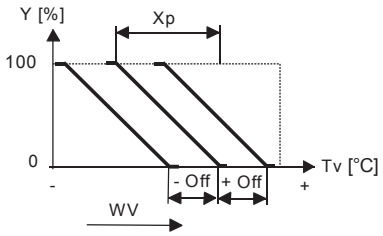
In reduced mode, the heating valve is closed immediately and the pump is switched off after 1800s. If the outside temperature is <= than the reduced setpoint (15°C), the temperature control is activated until the outside temperature is > than the reduced setpoint (15°C)+1K.

3.1.20.1 Functional diagrams

Winter

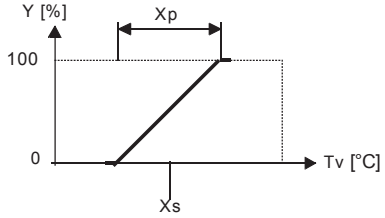


Setpoint shift acc. to outside temperature



Heating sequence

Summer



3.1.20.2 Parameter list

ta-led flow-temperature control, 2 zones (TF H 2Z 2P)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Z1 Setp	28.0°C	Flow setpoint	Zone 1		
Fval	30.8°C	Actual flow value	Zone 1		
Z2 Setp	28.0°C	Flow setpoint	Zone 2		
Fval	30.8°C	Actual flow value	Zone 2		
Setpoints					
	Shown according to parameter A002, zones				
D111	Z1 setp 1	'Normal', zone 1		22.0°C	
D112	Z1 setp 2	'Reduced', zone 1	Timer	15.0°C	
D113	Z1 setp 3	'Summer', zone 1		12.0°C	
D121	Z2 setp 1	'Normal', zone 2		20.0°C	
D122	Z2 setp 2	'Reduced', zone 2	Timer	15.0°C	
D123	Z2 setp 3	'Summer', zone 2		12.0°C	
Basic configuration					
A001	Application	Flow - HC	TF H 2Z 2P	902	
A002	Zones	Number of zones	1..2	1	

Number	Display	Function	Additional information	Factory setting	Setting
	Analogue input E7 (Outside temperature sensor)				
A170	E7 Function	Outside temperature sensor	Temp. Ni1000	3	
A177	E7 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A178	E7 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Input E8 (Summer-winter change-over switch)				
A180	E8 Function	S/W change-over switch	Active if low	101	
Zone 1					
A002	Zones	Number of zones	1..2	1	
Options					
A010	Z1 summer	Main switch	OFF	0	
	Shift				
A011	Z1 shift	Selection of outside temp., zone 1	0=off, 1=on	1	
	Reduced mode, setpoint 2				
A012	Z1 red.mod.	Selection of setpoint 2, zone 1	0=off 1= on	0	
D400	Clk chan 1	Timer channel 1		3	
D401	Clk C1 mode	Mode		1	
I/O configuration					
	Analogue input 1				
A110	E1 Function	Flow temp. sensor, zone 1	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication, zone 1	Off	0	
A117	E1 Cal.temp	Temperature calibration, zone 1	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value, zone 1	In case of sensor error	22.0°C	
	Input E5 (off/reduced, zone 1)				
A150	E5 Function	Main switch (‘Frost’ setpoint is active)	Active if high	102	
	Digital inputs				
A210	D1 Function	Fault - pump 1, zone 1	Active if low	101	
A220	D2 Function	Fault - pump 2, zone 1	Active if low	101	
	Analogue output Y1 (control valve, zone 1)				
A310	Y1 Function	Three-way valve, zone 1	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 max	Maximum value	Output Y1	100.0%	
A313	Y1 min	Minimum value	Output Y1	0.0%	
	Digital output R1, off/reduced, zone 1				
A410	R1 Function	Parameter A010	Digital (On)	2	
A411	R1 Action	Directional control	Normal NO	0	
A414	R1 Td on	Switch-on delay		0s	
A415	R1 Td off	Switch-off delay		0s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 Blocking	Blocking		0	
	Digital output R3				
A430	R3 Function	Pump 1, zone 1	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking		0	
	Digital output R4				
A440	R4 Function	Pump 2, zone 1	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking		0	
Limitations					
P500	SP1 Max	Maximum setpoint, zone 1	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint, zone 1	Room setpoint	5.0°C	
P520	LIM1 Max	Maximum limitation, zone 1	Flow setpoint	80.0°C	
P521	LIM1 Min	Minimum limitation, zone 1	Flow setpoint	5.0°C	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Shift parameters					
P541	SPS1 pt wi	Winter cut-in point, zone 1	Fixed point	20.0°C	
P542	SPS1 inf wi	Winter influence, zone 1	Slope (factor)	1.0	
PID controller(s)					
P632	PID1 Tn	PID1 I-term, zone 1	Output Y1	160s	
P633	PID1 Tv	PID1 D-term, zone 1	Output Y1	0.0s	
Sequence					
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	20.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	10.0K	
P702	SEQ2 P-band	Proportional band (Xp), cooling		20.0K	
P703	SEQ2 Offset	Offset (Of), cooling		-10K	
Pump run-on					
P801	TM1 time	Pump run-on, zone 1	Output R3 / R4	1800s	
Operating hours compensation					
P811	Variable 1	Limit value for operating hours, zone 1	Output R3 / R4	100	
Frost protection					
P813	Variable 3	Setpoint - pump frost protection, zone 1		2°C	
P815	Variable 5	Setpoint 'Frost protection', zone 1		5°C	
Zone 2					
A002	Zones	Number of zones	1..2	2	
Options					
A020	Z2 summer	Main switch	OFF	0	
	Shift				
A021	Z2 shift	Selection of outside temp., zone 1	0=off, 1=on	1	
	Reduced mode, setpoint 2				
A022	Z2 red.mod.	Selection of setpoint 2, zone 2	0=off 1= on	0	
D500	Clk chan. 2	Timer channel 2		3	
D501	Clk C2 mode	Mode		1	
I/O configuration					
	Analogue input 2				
A120	E2 Function	Flow temp. sensor, zone 2	Temp. Ni1000	3	
A121	E2 Scheme	Sensor multiplication, zone 2	Off	0	
A127	E2 Cal.temp	Temperature calibration, zone 2	Input: meas. val.	°C	
A128	E2 Sim.val.	Simulation value, zone 2	In case of sensor error	22.0°C	
	Input E6 (off/reduced, zone 2)				
A160	E6 Function	Main switch ('Frost' setpoint is active)	Active if high	102	
	Digital inputs				
A230	D3 Function	Fault - pump 1, zone 2	Active if low	101	
A240	D4 Function	Fault - pump 2, zone 2	Active if low	101	
	Analogue output Y2 (control valve, zone 2)				
A320	Y2 Function	Three-way valve, zone 2	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y1	100.0%	
A323	Y2 Min	Minimum value	Output Y1	0.0%	
	Digital output R2, off/reduced, zone 2				
A420	R2 Function	Parameter A020	Digital (On)	2	
A421	R2 Action	Directional control	Normal NO	0	
A424	R2 Td on	Switch-on delay		0s	
A425	R2 Td off	Switch-off delay		0s	
A426	R2 min on	Minimum operating time		0s	
A427	R2 min off	Minimum idle time		0s	
A428	R2 Blocking	Blocking		0	
	Digital output R5				
A450	R5 Function	Pump 1, zone 2	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	

Number	Display	Function	Additional information	Factory setting	Setting
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking		0	
	Digital output R6				
A460	R6 Function	Pump 2, zone 2	Digital (On)	2	
A461	R6 Direc. cont.	Directional control	Normal NO	0	
A464	R6 Tv on	Switch-on delay		0s	
A465	R6 Tv off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Block	Blocking		0	
Limitations					
P502	SP2 Max	Maximum setpoint, zone 2	Room setpoint	30.0°C	
P503	SP2 Min	Minimum setpoint, zone 2	Room setpoint	5.0°C	
P522	LIM2 Max	Maximum limitation, zone 2	Flow setpoint	80.0°C	
P523	LIM2 Min	Minimum limitation, zone 2	Flow setpoint	5.0°C	
Shift parameters					
P551	SPS2 pt wi	Winter cut-in point, zone 2	Fixed point	20.0°C	
P552	SPS2 inf wi	Winter influence, zone 2	Slope (factor)	1.0	
PID controller(s)					
P642	PID2 Tn	PID2 I-term, zone 2	Output Y2	160s	
P643	PID2 Tv	PID2 D-term, zone 2	Output Y2	0.0s	
Sequence					
P704	SEQ3 P-band	Proportional band (Xp)	Output Y2	20.0K	
P705	SEQ3 Offset	Offset (Of)	Output Y2	10.0K	
P706	SEQ4 P-band	Proportional band (Xp), cooling		20.0K	
P707	SEQ4 Offset	Offset (Of), cooling		-10K	
Pump run-on					
P802	TM2 time	Pump run-on, zone 2	Output R5 / R6	1800s	
Operating hours compensation					
P812	Variable 2	Limit value for operating hours, zone 2	Output R5 / R6	100	
Frost protection					
P814	Variable 4	Setpoint - pump frost protection, zone 2		2°C	
P816	Variable 6	Setpoint ‘Frost protection’, zone 2		5°C	
Measuring points					
MP1		Room setpoint, zone 1 (D116)			
MP2		Flow setpoint, zone 1 (D117)			
MP3		Positioning signal, main controller, zone 1			
MP4		Reduced mode, zone 1			
MP5		Room setpoint, zone 2 (D126)			
MP6		Flow setpoint, zone 2 (D127)			
MP7		Positioning signal, main controller, zone 2			
MP8		Reduced mode, zone 2			

3.1.21 Application 903

Domestic hot water control (DHW)

Plant design:

- 1 domestic hot water control

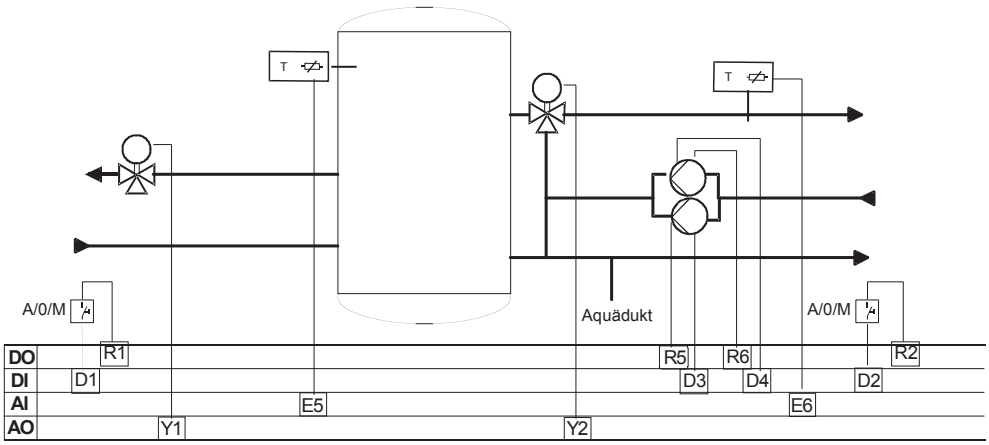
Control functions:

- 2 control loops

Control functions:

- Timer with 2 channels
- Automatic pump change-over
- Pump change-over in case of a fault
- Anti-legionella function

Plant schematic:



Functions

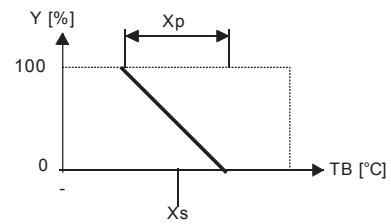
The domestic hot water control compares the domestic hot water temperature with the DHW setpoint, and controls heating valve Y1 according to the control deviation.

The sanitary control compares the sanitary temperature with the sanitary set-point, and controls heating valve Y2 according to the control deviation.

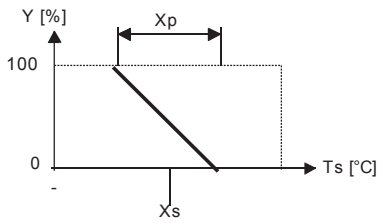
When the plant is switched off from the main switch, the pumps are switched off and the heating valve is closed.

Automatic pump switching compensates the operating hours of the two pumps and, in addition, the pumps are switched over in case of a fault.

3.1.21.1 Functional diagrams



Domestic hot water control



Sanitary control

3.1.21.2 Parameter list

Domestic hot water control (DHW)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	60.0°C	Boiler setpoint	Zone 1		
Act. val	55.8°C	Boiler actual value	Zone 1		
Setpoint	50.0°C	Sanitary setpoint	Zone 2		
Act. val	45.8°C	Sanitary actual value	Zone 2		
Setpoints					
D111	Setpoint 1	Boiler setpoint		60.0°C	
D121	Setpoint 2	Sanitary setpoint		50.0°C	
Basic configuration					
A001	Application	Flow - HC	DHW	903	
	Timer channel 1, off/reduced				
D400	Clk chan. 1	Timer channel 1		3	
D401	Clk C1 mode	Mode		1	
	Timer channel 2, anti-legionella protection				
D500	Clk chan. 2	Timer channel 2		3	
D501	Clk C2 mode	Mode		1	
Boiler/sanitary					
I/O configuration					
	Analogue input 5, boiler sensor				
A150	E5 Function	Boiler temperature sensor	Temp. Ni1000	3	
A157	E5 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	60.0°C	
	Analogue input 6, sanitary sensor				
A160	E6 Function	Flow temp. sensor, zone 2	Temp. Ni1000	3	
A167	E6 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A168	E6 Sim.val.	Simulation value	In case of sensor error	50.0°C	
	Digital input D1, off/reduced				
A210	D1 Function	Main switch	Active if high	102	
	Digital input D2, anti-legionella protection				
A220	D2 Function		Active if low	101	
	Digital input D3, fault - pump 1				
A230	D3 Function		Active if low	101	
	Digital input D4, fault - pump 2				
A240	D4 Function		Active if low	101	
	Analogue output Y1, control valve, boiler				
A310	Y1 Function	Three-way valve	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
	Analogue output Y2, control valve, sanitary				
A320	Y2 Function	Three-way valve, zone 2	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y1	100.0%	
A323	Y2 Min	Minimum value	Output Y1	0.0%	
	Digital output R1, off/reduced				
A410	R1 Function	Timer channel 1	Digital (On)	2	
A411	R1 Action	Directional control	Normal NO	0	
A414	R1 Td on	Switch-on delay		0s	
A415	R1 Td off	Switch-off delay		0s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 Blocking	Blocking		0	

Description

Number	Display	Function	Additional information	Factory setting	Setting
	Digital output R2, anti-legionella protection				
A420	R2 Function	Timer channel 2	Digital (On)	2	
A421	R2 Action	Directional control	Normal NO	0	
A424	R2 Td on	Switch-on delay		0s	
A425	R2 Td off	Switch-off delay		0s	
A426	R2 min on	Minimum operating time		0s	
A427	R2 min off	Minimum idle time		0s	
A428	R2 Blocking	Blocking		0	
	Digital output R5, pump 1, sanitary				
A450	R5 Function	Pump 1	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Tdoff	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking		0	
	Digital output R6, pump 2, sanitary				
A460	R6 Function	Pump 2, zone 2	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking		0	
Limitations					
P500	SP1 Max	Setpoint 1 maximum	Boiler	80.0°C	
P501	SP1 Min	Setpoint 1 minimum	Boiler	50.0°C	
P502	SP2 Max	Setpoint 2 maximum	Sanitary	60.0°C	
P503	SP2 Min	Setpoint 2 minimum	Sanitary	40.0°C	
PID controller(s) Boiler					
P631	PID1 P-band	PID1 P-band	Output Y1	10K	
P632	PID1 Tn	PID1 I-term	Output Y1	160s	
P633	PID1 Tv	PID1 D-term	Output Y1	0.0s	
PID controller(s) sanitary					
P641	PID3 P-band	PID3 P-band	Output Y2	10K	
P642	PID3 Tn	PID3 I-term, zone 2	Output Y2	160s	
P643	PID3 Tv	PID3 D-term, zone 2	Output Y2	0.0s	
Pump run-on					
P801	TM1 time	Pump run-on	Output R5 / R6	120s	
Operating hours compensation					
P811	Variable 1	Limit value, operating hours	Output R5 / R6	100h	
Anti-legionella protection					
P812	Variable 2	Legionella setpoint		70°C	
Measuring points					
None					

3.1.22 Application 904

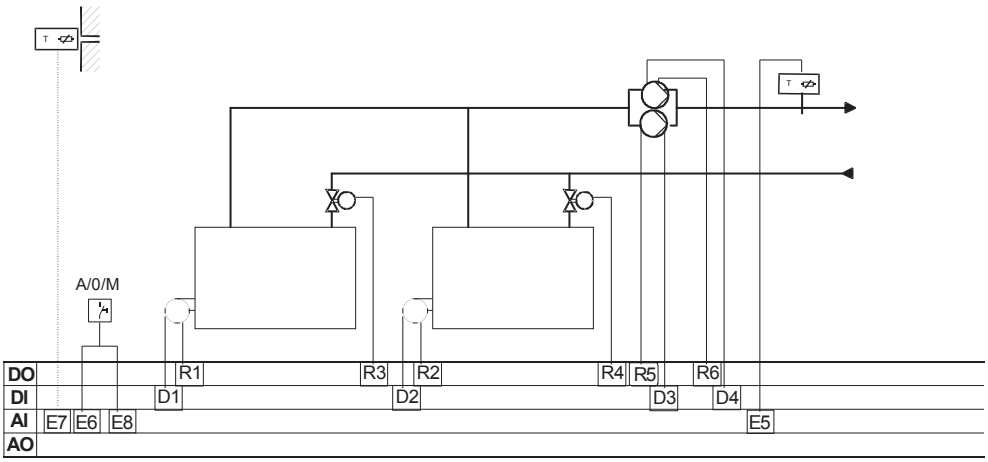
2-boiler-cascade (BC)

Plant design:
- 2-boiler-cascade

Control functions:
- Temperature control, flow: fixed value with ta-shift (optional)

Control functions:
- Timer with 2 channels (1 main switch; 1 boiler pump change-over)
- Automatic boiler switch on
- Boiler change-over in case of a fault
- Automatic pump change-over
- Pump change-over in case of a fault

Plant schematic:



Functions

The temperature control compares the flow temperature with the setpoint and switches the boilers in sequence. On the priority boiler, the butterfly valve is always open.

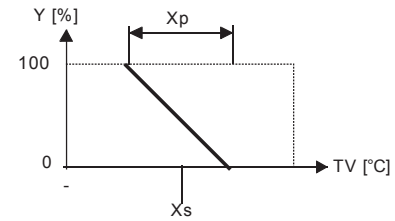
When the plant is switched off from the main switch, the boilers are switched off and, after 10 minutes, the pumps are switched off and the butterfly valve is closed.

Automatic pump switching compensates the operating hours of the two pumps and in addition, the pumps are switched over in case of a fault.

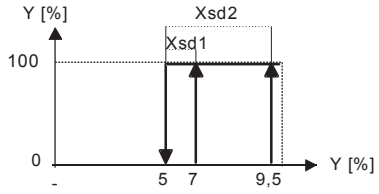
The setpoint is changed in relation to the outside temperature, according to the adjusted influence.

Description

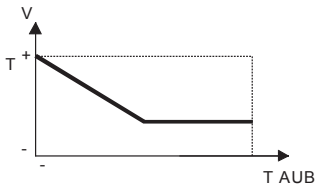
3.1.22.1 Functional diagrams



Temperature control



Sequence



Setpoint shift acc. to outside temperature (option)

3.1.22.2 Parameter list

2-boiler cascade (BC)

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	80.0°C	Flow setpoint			
Act. val	75.8°C	Actual flow value			
Setpoints					
D111	Setpoint	Setpoint		80.0°C	
Basic configuration					
A001	Application	Flow - HC	BC	904	
	Shift				
A011	Shift		0=off, 1=on	0	
D400	Clk chan. 1	Timer channel 1		3	
D401	Clk C1 mode	Mode		1	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Boiler sequence 1 > 2	Active if low	101	
A120	E2 Function	Boiler sequence 2 > 1	Active if low	101	
A150	E5 Function	Flow temp. sensor	Temp. Ni1000	3	
A157	E5 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	20.0°C	
A160	E6 Function	Main switch, auto	Active if low	101	
A170	E7 Function	Outside temp. sensor	Temp. Ni1000	3	
A177	E7 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A178	E7 Sim.val.	Simulation value	In case of sensor error	20.0°C	
A180	E8 Function	Main switch, manual	Active if low	101	
	Digital inputs				
A210	D1 Function	Fault - boiler 1	Active if low	101	
A220	D2 Function	Fault - boiler 2	Active if low	101	
A230	D3 Function	Fault - pump 1	Active if low	101	
A240	D4 Function	Fault - pump 2	Active if low	101	

Number	Display	Function	Additional information	Factory setting	Setting
	Digital outputs				
A410	R1 Function	Boiler 1	Digital (On)	2	
A411	R1 Action	Directional control	Normal NO	0	
A414	R1 Td on	Switch-on delay		0s	
A415	R1 Td off	Switch-off delay		0s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 Blocking	Blocking		0	
A420	R2 Function	Boiler 2	Digital (On)	2	
A421	R2 Action	Directional control	Normal NO	0	
A424	R2 Td on	Switch-on delay		0s	
A425	R2 Td off	Switch-off delay		0s	
A426	R2 min on	Minimum operating time		0s	
A427	R2 min off	Minimum idle time		0s	
A428	R2 Blocking	Blocking		0	
A430	R3 Function	Butterfly valve 1	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		600s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking		0	
A440	R4 Function	Butterfly valve 2	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		600s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking		0	
A450	R5 Function	Pump 1	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking		0	
A460	R6 Function	Pump 2	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking		0	
Limitations					
P500	SP1 Max	Setpoint maximum	Flow temperature	90.0°C	
P501	SP1 Min	Setpoint minimum	Flow temperature	5.0°C	
Shift parameters					
P541	SPS1 pt wi	Winter cut-in point	Fixed point	15.0°C	
P542	SPS1 inf wi	Winter influence	Slope (factor)	1.0	
P543	SPS1 Lim Wi	Winter limitation		90°C	
PID controller(s)					
P631	PID1 P-band	PID1 P-band		10K	
P632	PID1 Tn	PID1 I-term		0s	
P633	PID1 Tv	PID1 D-term		0s	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Boiler cut-in (Y1)					
P780	2P1 sw.pt	Switching point, boiler 1	Boiler cut-in 1	70%	
P781	2P1 sw.diff	Switching difference, boiler 2	Switching difference 1	20%	
P782	2P2 sw.pt	Switching point, boiler 2	Boiler cut-in 2	95%	
P783	SP2 sw.diff	Switching difference, boiler 2	Switching difference 2	35%	
P784	2P3 sw.pt	Switching point, bivalency		30°C	
P785	2P3 sw.diff	Switching difference, bivalency		1K	
Time modules					
P801	TM1 time	Pump run-on	Output R5 / R6	600s	
P802	TM2 time	Delay time, boiler switch-in		300s	
803	TM3 time	Minimum burner run time		120s	
Operating hours compensation					
P811	Variable 1	Limit value, operating hours - pump		100h	
P812	Variable 2	Limit value, operating hours - boiler		200h	
Measuring points					
None					

3.1.23 Application 905

Flow temperature regulation with heating/cooling for surface temperature control, 1 zone – TV HKC 1Z

Plant structure:

- One air-conditioning plant

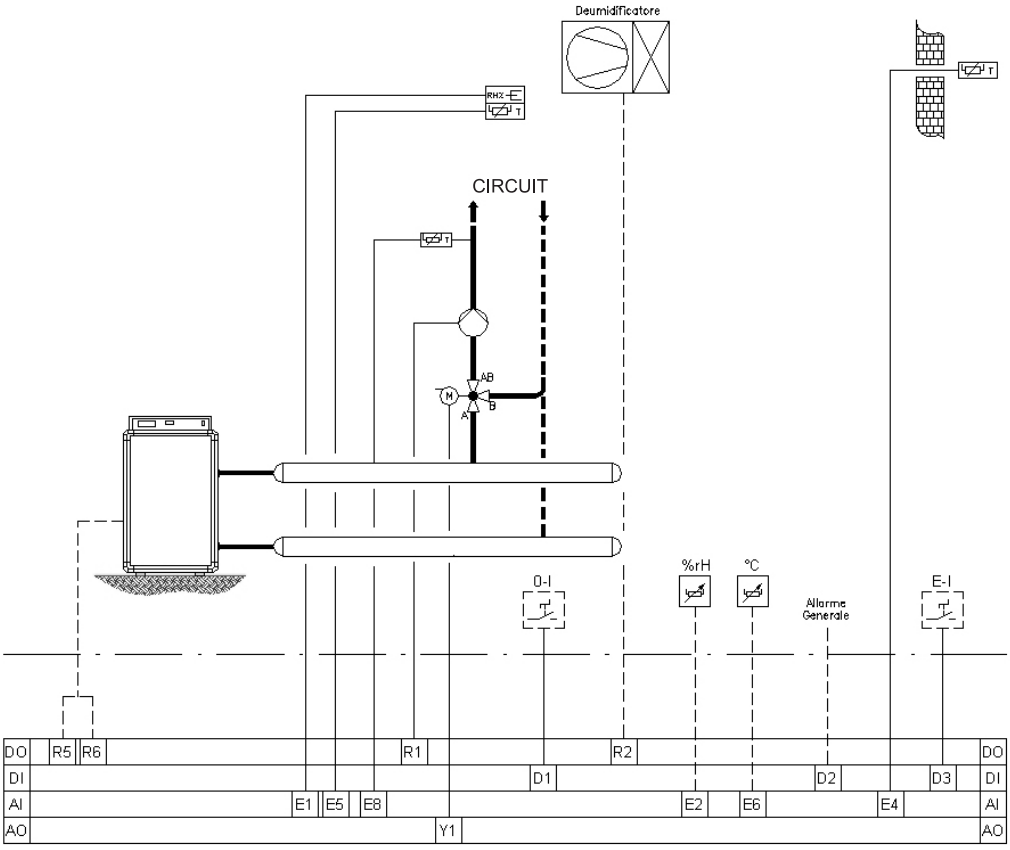
Regulation functions:

- Weather-based compensation for season (can be switched off)
- Temperature control for cooling with fixed value or cascade
- Active dew-point control

Control functions:

- Summer/winter change-over
- One timer channel
- Control for heat pump
- Control for circulating pump
- Command for dehumidification
- General alarm (display)

Plant schematic:



Description

Function

The plant is switched on via input D1. The controller compares the temperature value with the relevant setpoint and controls the valve according to the control deviation.
During winter time, the flow temperature setpoint is compensated according to the outside temperature and and is additionally influenced by the room temperature. This room temperature influence can be disabled via parameter P815. A frost protection function is enabled during winter time. The plant is left in normal operating mode until it no longer maintains a value of +3 K as compared to the frost protection temperature.
In summer time, the flow temperature is controlled to a fixed value. Parameter A005 can be used to select the other types of control:
1 = Cascade with room temperature
2 = Cascade, room temperature, with setpoint shift according to outside temperature
In summer mode, the flow temperature is influenced by the dew-point control (limitation).
The circulating pump function is limited by the maximum flow temperature (winter) (P530) and the minimum flow temperature (summer) (P532).

Options

Reduced operating mode

Operating mode can be adjusted via configuration parameter A003:
1 = Normal / reduced (factory setting)
0 = Normal / OFF

Heat pump

The heat pump is controlled via relay R5; according to the mode of functioning set via parameter A003, this command functions as follows:
Normal / reduced = heat pump signal is continuously active
Normal / OFF = heat pump signal follows the time programme
The summer/winter mode transition for the heat pump is displayed via output R6.
Winter = contacts open
Summer = contacts closed
N.B.: The heat pump manufacturer's instructions must be followed when changing over the operating mode.
This function can also be used in order to forward the change-over command to room thermostats or to the FXV distributor unit.

Circulating pump

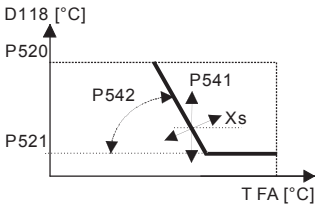
Control of the plant's circulating pump is handled via R1. Depending on the mode of functioning set with parameter A003, this command functions as follows:
Normal / reduced = pump control signal is continuously active
Normal / OFF = pump control signal follows the time programme

Dehumidification
Dehumidification is handled by a two-point controller. It is controlled between the humidity setpoint and the cut-out point for the dehumidifier. The mode of functioning can be set with parameters A004/A014:
1 = humidity control continuously switched on (factory setting)
0 = humidity control follows the time programme
The dehumidifier is controlled via relay R2.
Dew point floor drying (screed curing) as per standard EN 1264-4
This function can be enabled only with the summer/winter control signal on the winter position and via parameter A002 (visible only in winter). When drying is completed (A002 = 2), the controller returns to automatic mode.

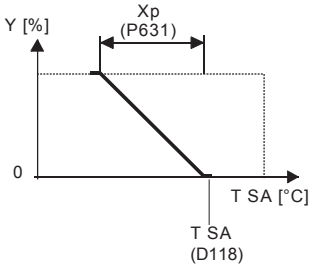
Setpoint correction
It is possible to connect a potentiometer for temperature setpoint correction. Its function is set with the value for parameter A010.
It is possible to connect a potentiometer for correction of the humidity setpoint. Its function is set with parameter A020.

3.1.23.1 Functional diagrams

Winter

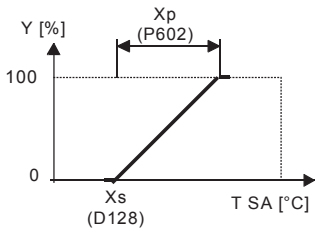


Setpoint shift acc. to outside temperature

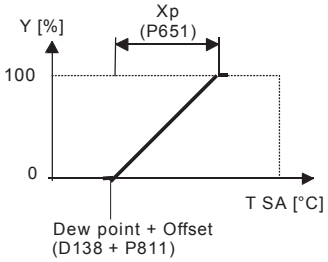


Heating sequence

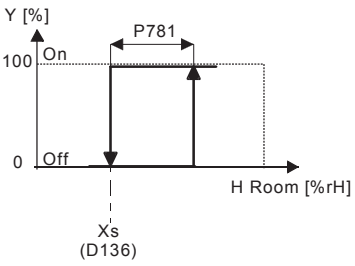
Summer



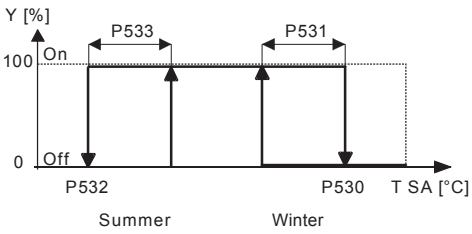
Cooling sequence



Dew-point control



Dehumidification



Circulating pump

3.1.23.2 Parameter list

Number	Display	Description	Range min	max	Factory setting
		Default display			
D001a	T room	Actual value, room temperature			
D001b	H room	Actual value, room humidity			
		Setpoints			
D111	Normal heat	Setpoint, room heating: normal	P501	P500	21 °C
D112	Reduc. heat	Setpoint, room heating: reduced	P501	P500	18 °C
D115	Extern heat	Setpoint, room heating: normal, external	-	-	-
D116	Activ heat	Setpoint, room heating: active	-	-	-
D118	Flow heat	Setpoint, flow, heating: effective	-	-	-
D121	Normal cool	Setpoint, room/flow, cooling: normal	P503	P502	23 / 15 °C
D122	Reduc. cool	Setpoint, room/flow, cooling: reduced	P503	P502	28 / 18 °C
D125	Extern cool	Setpoint, room, cooling: normal, external	-	-	-
D126	Activ cool	Setpoint, room, cooling: active	-	-	-
D127	Main cool	Setpoint, room, cooling: effective following shift	-	-	-
D128	Flow cool	Setpoint, flow, cooling: effective	-	-	-
D131	Set humid	Setpoint, room humidity	P505	P504	55 %rh
D135	Extern.humi	Setpoint, room humidity, external	-	-	-
D136	Actif humi	Setpoint, room humidity, active	-	-	-
D138	Dewpoint	Dew point	-	-	-
D201	Input E1				
D202	Input E2				
D204	Input E4				
D205	Input E5				
D206	Input E6				
D208	Input E8				
D211	Output Y1				
D223	Input digit	Inputs D1 / D2 / D3			
D228	Relay	Outputs R1 / R2			
D229	Relay	Outputs R5 / R6			
		Timer			
D400	Clk chan. 1	Timer channel 1, function	-	-	3
D401	Clk C1 mode	Timer channel 1, mode	-	-	1
D4x1	Clk C1	Timer channel 1, switching point ‘on’	-	-	6:00
D4x2	Clk C1	Timer channel 1 switching point ‘off’	-	-	22:00
		Basic configuration			
A001	Application	Application	-	-	905: TV HKC 1Z
A002	Floor Dry 1	Floor drying 0 = Stop / 1 = Start / 2 = Finished	0	2	0
A003	Reduced 1	Night mode 0 = Off / 1 = Reduced	0	1	1
A004	Dehumid 1	Dehumidification, night 0 = Off / 1 = Normal	0	1	1
A005	Summer 1	Cooling mode 0 = Fixed value / 1 = Cascade / 2 = Shift	0	2	0
A010	Ext. setp.	External setpoint adjuster, room temperature	0	1	0
A020	Ext. setp.h	External setpoint adjuster, humidity	0	1	0
		Input E1 (room humidity)			
A110	E1 function	Function	-	-	21
A112	E1 set max	Upper range limit	-	-	100 %rh
A113	E1 set min	Lower range limit	-	-	0 %rh
A118	E1 sim.val.	Simulation value	-	-	55 %rh

Number	Display	Description	Range min	Range max	Factory setting
		Input E2 (setpoint adjuster, humidity)			
A120	E2 function	Function	-	-	0 (52)
A122	E2 set max	Upper range limit	-	-	5.0 %rh
A123	E2 set min	Lower range limit	-	-	-5.0 %rh
A128	E2 sim.val.	Simulation value	-	-	0.0 %rh
		Input E4 (outside temperature)			
A140	E4 function	Function	-	-	3
A148	E4 sim.val.	Simulation value	-	-	0 °C
		Input E5 (room temperature)			
A150	E5 function	Function	-	-	3
A158	E5 sim.val	Simulation value	-	-	21 °C
		Input E6 (setpoint adjuster, room temperature)			
A160	E6 function	Function	-	-	0 (50)
A162	E6 set max	Upper range limit	-	-	3.0 °C
A163	E6 set min	Lower range limit	-	-	-3.0 °C
A168	E6 sim.val.	Simulation value	-	-	0.0 °C
		Input E8 (flow temperature)			
A180	E8 function	Function	-	-	3
A188	E8 sim.val.	Simulation value	-	-	21 °C
		Input D1 (off)			
A210	D1 function	Function	-	-	102
		Input D2 (alarm)			
A220	D2 function	Function	-	-	101
		Input D3 (change-over)			
A230	D3 function	Function	-	-	101
		Output Y1 (heating valve / cooling valve)			
A310	Y1 function	Function	-	-	1
A311	Y1 action	Direction of operation	-	-	0
A312	Y1 max	Upper limit value	-	-	100 %
A313	Y1 min	Lower limit value	-	-	0 %
		Output R1 (zone pump)			
A410	R1 function	Function	-	-	2
A411	R1 action	Direction of operation	-	-	0
A414	R1 Td on	Switch-on delay	-	-	0
A415	R1 Td off	Switch-off delay	-	-	0
A416	R1 min on	Min. operating time	-	-	0
A417	R1 min off	Min. idle time	-	-	0
A418	R1 blocking	Blocking	-	-	0
		Output R2 (dehumidifier)			
A420	R2 function	Function	-	-	2
A421	R2 action	Direction of operation	-	-	0
A424	R2 Td on	Switch-on delay	-	-	0
A425	R2 Td off	Switch-off delay	-	-	0
A426	R2 min on	Min. operating time	-	-	0
A427	R2 min off	Min. idle time	-	-	0
A428	R2 blocking	Blocking	-	-	0
		Output R5 (heat pump)			
A450	R5 function	Function	-	-	2
A451	R5 action	Direction of operation	-	-	0
A454	R5 Td on	Switch-on delay	-	-	0
A455	R5 Td off	Switch-off delay	-	-	0
A456	R5 min on	Min. operating time	-	-	0
A457	R5 min off	Min. idle time	-	-	0
A458	R5 blocking	Blocking	-	-	0

Description

Number	Display	Description	Range min	max	Factory setting
		Output R6 (change-over)			
A460	R6 function	Function	-	-	2
A461	R6 action	Direction of operation	-	-	0
A464	R6 Td on	Switch-on delay	-	-	0
A465	R6 Td off	Switch-off delay	-	-	0
A466	R6 min on	Min. operating time	-	-	0
A467	R6 min off	Min. idle time	-	-	0
A468	R6 blocking	Blocking	-	-	0
		Limitations			
P500	SP1 max	Maximum setpoint, heating	-	-	30 °C
P501	SP1 min	Minimum setpoint, heating	-	-	5 °C
P502	SP2 max	Maximum setpoint, cooling	-	-	40 / 19 °C
P503	SP2 min	Minimum setpoint, cooling	-	-	20 / 15 °C
P504	SP3 max	Maximum setpoint, humidity	-	-	65 %rh
P505	SP3 min	Minimum setpoint, humidity	-	-	45 %rh
P520	LIM1 max	Maximum setpoint, flow, heating	-	-	45 °C
P521	LIM1 min	Minimum setpoint, flow, heating	-	-	20 °C
P522	LIM2 max	Maximum setpoint, flow, cooling	-	-	19 °C
P523	LIM2 min	Minimum setpoint, flow, cooling	-	-	15 °C
P528	LIM5 max	Minimum setpoint, flow, floor drying	-	-	25 °C
P530	LIM6 max	Maximum flow temperature: pump, heating	-	-	45 °C
P531	LIM6 min	Switching difference: pump, heating	-	-	7 K
P532	LIM7 max	Minimum flow temperature: pump, cooling	-	-	13 °C
P533	LIM7 min	Switching difference: pump, cooling	-	-	2 K
		Shift: winter, flow			
P541	SPS1 pt wi	Fixed point, heating	-	-	20 °C
P542	SPS1 inf wi	Slope, heating	-	-	0.8
		Shift: summer, room			
P544	SPS1 pt su	Fixed point, cooling	-	-	25 °C
P545	SPS1 inf su	Slope, cooling	-	-	0.5
P546	SPS1 lim su	Max. limitation, cooling	-	-	31 °C
		Cascade, cooling			
P602	C1 P-band	P-band	-	-	2.0 K
P603	C1 Tn	I-term	-	-	0 s
		PI controller, heating			
P631	PID1 P-band	P-band	-	-	20 K
P632	PID1 Tn	I-term	-	-	240 s
		PI controller, cooling			
P641	PID2 P-band	P-band	-	-	20 K
P642	PID2 Tn	I-term	-	-	240 s
		PI controller, dew point			
P651	PID3 P-band	P-band	-	-	20 K
P652	PID3 Tn	I-term	-	-	240 s
		2-point dehumidification			
P781	2P1 sw.diff	Switching difference	-	-	5 %rh
		Neutral zones			
P701	SEQ1 offset	Neutral zone, flow: heating	-	-	0 K
P703	SEQ2 offset	Neutral zone, flow: cooling	-	-	0 K
P705	SEQ3 offset	Neutral zone, flow: dew point	-	-	0 K

Number	Display	Description	Range min	max	Factory setting
		Time module			
P801	TM1 time	Drying time, min. flow temperature	-	-	72 h
P802	TM2 time	Drying time, max. flow temperature	-	-	96 h
		Variables			
P811	Offset dp1	Offset, dew point	-10	10	1 K
P815	Room inf Z1	Room influence factor	0	10	3.0
P819	Frost	Room frost protection	P501	P500	5.0 °C
Measuring points					
MP1		Operating mode ‘off’			
MP2		Operating mode ‘reduced’			
MP3		Flow setpoint: heating			
MP4		Flow setpoint: cooling			
MP5		Dew point temperature			
MP6		Floor drying: active			
MP7		Floor drying: time			

3.1.24 Application 906

Flow temperature control with heating/cooling for surface temperature control, 2 zones - TV HKC 2Z

Plant structure:

- Two air-conditioning zones

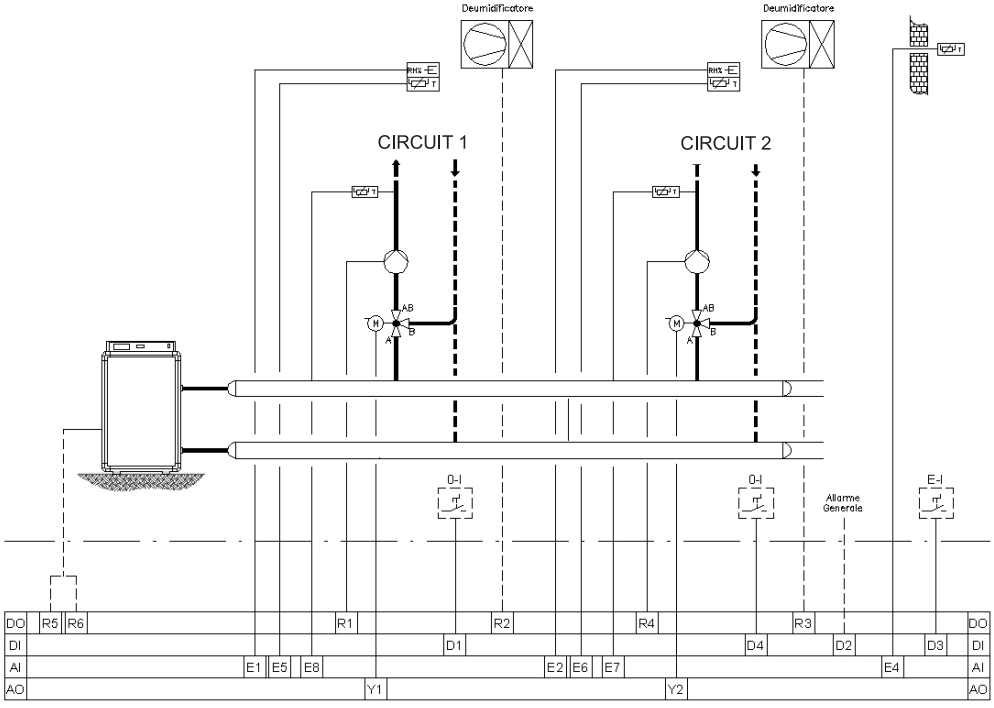
Regulation functions:

- Weather-based compensation for season (can be switched off)
- Temperature control for cooling with fixed value or cascade
- Active dew-point control

Control functions:

- Summer/winter change-over
- One timer channel for each zone
- Control for heat pump
- Control for circulating pump
- Command for dehumidification
- General alarm (display)

Plant schematic:



Description:

Function

The plant is switched on via input D1 for zone 1 and via input D4 for zone 2.
The controller compares the temperature value with the relevant setpoint and controls the relevant valve according to the control deviation.
During winter time, the flow temperature setpoint is compensated according to the outside temperature and and is additionally influenced by the room temperature. This room temperature influence can be disabled via parameters

P815/P816. A frost protection function is enabled during winter time. The plant is left in normal operating mode until it no longer maintains a value of +3 K as compared to the frost protection temperature (P818/P819).
In summer time, the flow temperature is controlled to a fixed value. Parameters A005/A015 can be used to select the other types of control:
1 = Cascade with room temperature
2 = Cascade, room temperature, with setpoint shift according to outside temperature
In summer mode, the flow temperature is influenced by the dew-point control (limitation). The dew-point is calculated separately for each zone and it influences the corresponding maximum value of the temperature controller.
The circulating pump function is limited by the maximum flow temperature (winter) (P530) and the minimum flow temperature (summer) (P532).

Options

Reduced operating mode

Operating mode can be set via the configuration parameters, A003/A013:
1 = Normal / reduced (factory setting)
0 = Normal / OFF

Heat pump

The heat pump is controlled via relay R5; depending on the mode of functioning set with parameters A003/A013, this command functions as follows:
Normal / reduced = heat pump signal is continuously active
Normal / OFF = heat pump signal follows the time programme
The summer/winter mode transition for the heat pump is displayed via output R6.
Winter = contacts open
Summer = contacts closed
N.B.: The heat pump manufacturer's instructions must be followed when changing over the operating mode.
This function can also be used in order to forward the change-over command to room thermostats or to the FXV distributor unit.

Circulating pump

Control of the plant's circulating pump is handled via relay R1 for zone 1 and relay R4 for zone 2. Depending on the mode of functioning set with parameters A003/A013, this command functions as follows:
Normal / reduced = pump control signal is continuously active
Normal / OFF = pump control signal follows the time programme

Dehumidification

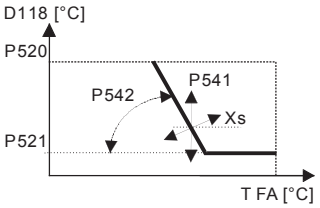
Dehumidification is handled by a two-point controller. It is controlled between the humidity setpoint and the cut-out point for the dehumidifier. The mode of functioning can be set with parameters A004/A014:
1 = humidity control continuously switched on (factory setting)
0 = humidity control follows the time programme
The dehumidifier is controlled via relay R2 for zone 1 and via relay R3 for zone 2.

Floor drying (screed curing) as per standard EN 1264-4

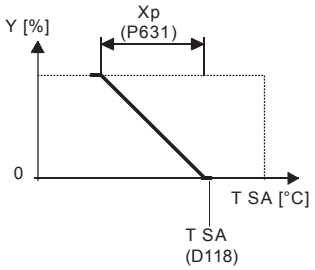
This function can be enabled only with the summer/winter control signal on the winter position and via parameters A002/A012 (visible in winter only). When drying is completed (A002/A012 = 2), the controller returns to automatic mode.

3.1.24.1 Functional diagrams

Winter

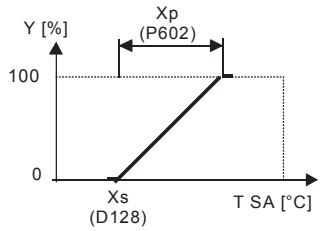


Setpoint shift acc. to outside temperature

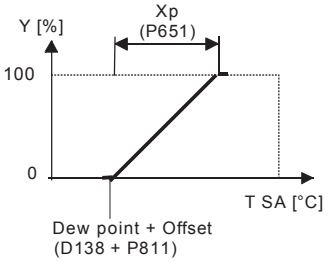


Heating sequence

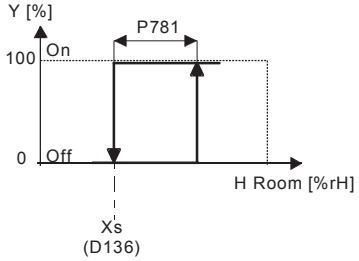
Summer



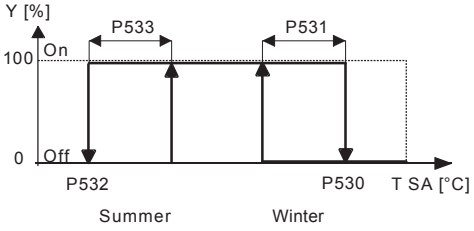
Cooling sequence



Dew-point control



Dehumidification



Circulating pump

3.1.24.2 Parameter list

Number	Display	Description	Range min	Range max	Factory setting
		Default display			
D001a	T room 1	Actual value, room temperature Z1			
D001b	H room 1	Actual value, room humidity Z1			
D002a	T room 2	Actual value, room temperature Z2			
D002b	H room 2	Actual value, room humidity Z2			
		Setpoints: Z1			
D111	Normal 1h	Setpoint, room heating: normal	P501	P500	21 °C
D112	Reduc. 1h	Setpoint, room heating: reduced	P501	P500	18 °C
D116	Activ 1h	Setpoint, room heating: active	-	-	-
D118	Flow 1h	Setpoint, flow, heating: effective	-	-	-
D121	Normal 1c	Setpoint, room/flow, cooling: normal	P503	P502	23 / 15 °C
D122	Reduc. 1c	Setpoint, room/flow, cooling: reduced	P503	P502	28 / 18 °C
D126	Activ 1c	Setpoint, room, cooling: active	-	-	-
D127	Main 1c	Setpoint, room, cooling: effective following shift	-	-	-
D128	Flow 1c	Setpoint, flow, cooling: effective	-	-	-
D131	Set humi 1	Setpoint, room humidity	P505	P504	55 %rh
D138	Dewpoint 1	Dew point	-	-	-
		Setpoints: Z2			
D141	Normal 2h	Setpoint, room heating: normal	P501	P500	21 °C
D142	Reduc. 2h	Setpoint, room heating: reduced	P501	P500	18 °C
D146	Activ 2h	Setpoint, room heating: active	-	-	-
D148	Flow 2h	Setpoint, flow, heating: effective	-	-	-
D151	Normal 2c	Setpoint, room, cooling: normal	P507	P506	23 / 15 °C
D152	Reduc. 2c	Setpoint, room, cooling: reduced	P507	P506	28 / 18 °C
D156	Activ 2c	Setpoint, room, cooling: active	-	-	-
D157	Main 2c	Setpoint, room, cooling: effective following shift	-	-	-
D158	Flow 2c	Setpoint, flow, cooling: effective	-	-	-
D161	Set humi 2	Setpoint, room humidity	P505	P504	55 %rh
D168	Dewpoint 2	Dew point	-	-	-
		Display			
D201	Input E1				
D202	Input E2				
D204	Input E4				
D205	Input E5				
D206	Input E6				
D207	Input E7				
D208	Input E8				
D211	Output Y1				
D212	Output Y2				
D223	Input digit	Inputs D1 / D2 / D3 / D4			
D228	Relay	Outputs R1 / R2 / R3 / R4			
D229	Relay	Outputs R5 / R6			
		Timer			
D400	Clk chan. 1	Timer channel 1, function	-	-	3
D401	Clk C1 mode	Timer channel 1, mode	-	-	1
D4x1	Clk C1	Timer channel 1 switching point ‘on’	-	-	6:00
D4x2	Clk C1	Timer channel 1 switching point ‘off’	-	-	22:00
D500	Clk chan. 2	Timer channel 2, function	-	-	3
D501	Clk C2 mode	Timer channel 2, mode	-	-	1
D5x1	Clk C2	Timer channel 2 switching point ‘on’	-	-	6:00
D5x2	Clk C2	Timer channel 2 switching point ‘off’	-	-	22:00

Description

Number	Display	Description	Range min	max	Factory setting
		Basic configuration			
A001	Application	Application	-	-	906: TV HKC 2Z
A002	Floor Dry 1	Floor drying 0 = Stop / 1 = Start / 2 = Finished	0	2	0
A003	Reduced 1	Reduced mode Z1 0 = Off / 1 = Reduced	0	1	1
A004	Dehumid 1	Dehumidification, night Z1 0 = Off / 1 = Normal	0	1	1
A005	Summer 1	Cooling mode Z1 0 = Fixed value / 1 = Cascade / 2 = Shift	0	2	0
A012	Floor Dry 2	Floor drying 0 = Stop / 1 = Start / 2 = Finished	0	2	0
A013	Reduced 2	Reduced mode Z2 0 = Off / 1 = Reduced	0	1	1
A014	Dehumid 2	Dehumidification, night Z2 0 = Off / 1 = Ein	0	1	1
A015	Summer 2	Cooling mode Z2 0 = Fixed value / 1 = Cascade / 2 = Shift	0	2	0
		Input E1 (room humidity Z1)			
A110	E1 function	Function	-	-	21
A112	E1 set max	Upper range limit	-	-	100 %rh
A113	E1 set min	Lower range limit	-	-	0 %rh
A118	E1 sim.val.	Simulation value	-	-	55 %rh
		Input E2 (room humidity Z2)			
A120	E2 function	Function	-	-	21
A122	E2 set max	Upper range limit	-	-	100 %rh
A123	E2 set min	Lower range limit	-	-	0 %rh
A128	E2 sim.val.	Simulation value	-	-	55 %rh
		Input E4 (outside temperature)			
A140	E4 function	Function	-	-	3
A141	E4 scheme	Sensor multiplication	0	1	0
A148	E4 sim.val.	Simulation value	-	-	0 °C
		Input E5 (room temperature Z1)			
A150	E5 function	Function	-	-	3
A158	E5 sim.val.	Simulation value	-	-	21 °C
		Input E6 (room temperature Z2)			
A160	E6 function	Function	-	-	3
A168	E6 sim.val.	Simulation value	-	-	21 °C
		Input E7 (flow temperature Z2)			
A170	E7 function	Function	-	-	3
A178	E7 sim.val.	Simulation value	-	-	21 °C
		Input E8 (flow temperature Z1)			
A180	E8 function	Function	-	-	3
A188	E8 sim.val.	Simulation value	-	-	21 °C
		Input D1 (Off Z1)			
A210	D1 function	Function	-	-	102
		Input D2 (alarm)			
A220	D2 function	Function	-	-	101
		Input D3 (change-over)			
A230	D3 function	Function	-	-	101
		Input D4 (Off Z2)			
A240	D4 function	Function	-	-	102

Number	Display	Description	Range min	Range max	Factory setting
		Output Y1 (heating valve / cooling valve Z1)			
A310	Y1 function	Function	-	-	1
A311	Y1 action	Direction of operation	-	-	0
A312	Y1 max	Upper limit value	-	-	100 %
A313	Y1 min	Lower limit value	-	-	0 %
		Output Y2 (heating valve / cooling valve Z2)			
A320	Y2 function	Function	-	-	1
A321	Y2 action	Direction of operation	-	-	0
A322	Y2 max	Upper limit value	-	-	100 %
A323	Y2 min	Lower limit value	-	-	0 %
		Output R1 (zone pump Z1)			
A410	R1 function	Function	-	-	2
A411	R1 action	Direction of operation	-	-	0
A414	R1 Td on	Switch-on delay	-	-	0
A415	R1 Td off	Switch-off delay	-	-	0
A416	R1 min on	Min. operating time	-	-	0
A417	R1 min off	Min. idle time	-	-	0
A418	R1 blocking	Blocking	-	-	0
		Output R2 (dehumidifier Z1)			
A420	R2 function	Function	-	-	2
A421	R2 action	Direction of operation	-	-	0
A424	R2 Td on	Switch-on delay	-	-	0
A425	R2 Td off	Switch-off delay	-	-	0
A426	R2 min on	Min. operating time	-	-	0
A427	R2 min off	Min. idle time	-	-	0
A428	R2 blocking	Blocking	-	-	0
		Output R3 (dehumidifier Z2)			
A430	R3 function	Function	-	-	2
A431	R3 action	Direction of operation	-	-	0
A434	R3 Td on	Switch-on delay	-	-	0
A435	R3 Td off	Switch-off delay	-	-	0
A436	R3 min on	Min. operating time	-	-	0
A437	R3 min off	Min. idle time	-	-	0
A438	R3 blocking	Blocking	-	-	0
		Output R4 (zone pump Z2)			
A440	R4 function	Function	-	-	2
A441	R4 action	Direction of operation	-	-	0
A444	R4 Td on	Switch-on delay	-	-	0
A445	R4 Td off	Switch-off delay	-	-	0
A446	R4 min on	Min. operating time	-	-	0
A447	R4 min off	Min. idle time	-	-	0
A448	R4 blocking	Blocking	-	-	0
		Output R5 (heat pump)			
A450	R5 function	Function	-	-	2
A451	R5 action	Direction of operation	-	-	0
A454	R5 Td on	Switch-on delay	-	-	0
A455	R5 Td off	Switch-off delay	-	-	0
A456	R5 min on	Min. operating time	-	-	0
A457	R5 min off	Min. idle time	-	-	0
A458	R5 blocking	Blocking	-	-	0
		Output R6 (change-over)			
A460	R6 function	Function	-	-	2
A461	R6 action	Direction of operation	-	-	0
A464	R6 Td on	Switch-on delay	-	-	0
A465	R6 Td off	Switch-off delay	-	-	0
A466	R6 min on	Min. operating time	-	-	0
A467	R6 min off	Min. idle time	-	-	0
A468	R6 blocking	Blocking	-	-	0

Description

Number	Display	Description	Range min	max	Factory setting
		Limitations			
P500	SP1 max	Maximum setpoint, heating	-	-	30 °C
P501	SP1 min	Minimum setpoint, heating	-	-	5 °C
P502	SP2 max	Maximum setpoint, cooling Z1	-	-	40 / 19 °C
P503	SP2 min	Minimum setpoint, cooling Z1	-	-	20 / 15 °C
P504	SP3 max	Maximum setpoint, humidity	-	-	65 %rh
P505	SP3 min	Minimum setpoint, humidity	-	-	45 %rh
P506	SP4 max	Maximum setpoint, cooling Z2	-	-	40 / 19 °C
P507	SP4 min	Minimum setpoint, cooling Z2	-	-	20 / 15 °C
P520	LIM1 max	Maximum setpoint, flow, heating Z1	-	-	45 °C
P521	LIM1 min	Minimum setpoint, flow, heating Z1	-	-	20 °C
P522	LIM2 max	Maximum setpoint, flow, cooling Z1	-	-	19 °C
P523	LIM2 min	Minimum setpoint, flow, cooling Z1	-	-	15 °C
P524	LIM3 max	Maximum setpoint, flow, heating Z2	-	-	45 °C
P525	LIM3 min	Minimum setpoint, flow, heating Z2	-	-	20 °C
P526	LIM4 max	Maximum setpoint, flow, cooling Z2	-	-	19 °C
P527	LIM4 min	Minimum setpoint, flow, cooling Z2	-	-	15 °C
P528	LIM5 max	Minimum setpoint, flow, floor drying Z1	-	-	25 °C
P529	LIM5 min	Minimum setpoint, flow, floor drying Z2	-	-	25 °C
P530	LIM6 max	Maximum flow temperature, pump Z1 heating	-	-	45 °C
P531	LIM6 min	Switching difference, flow temperature, pump Z1 heating	-	-	7 K
P532	LIM7 max	Maximum flow temperature, pump Z1 cooling	-	-	13 °C
P533	LIM7 min	Switching difference. flow temperature, pump Z1 cooling	-	-	2 K
P534	LIM8 max	Maximum flow temperature, pump Z2 heating	-	-	45 °C
P535	LIM8 min	Switching difference, flow temperature, pump Z2 heating	-	-	7 K
P536	LIM9 max	Maximum flow temperature, pump Z2 cooling	-	-	13 °C
P537	LIM9 min	Switching difference, flow temperature, pump Z2 cooling	-	-	2 K
		Shift: winter, flow Z1			
P541	SPS1 pt wi	Fixed point, heating	-	-	20 °C
P542	SPS1 inf wi	Slope, heating	-	-	0.8
		Shift: summer, room Z1			
P544	SPS1 pt su	Fixed point, cooling	-	-	25 °C
P545	SPS1 inf su	Slope, cooling	-	-	0.5
P546	SPS1 lim su	Max. limitation, cooling	-	-	31 °C
		Shift: winter, flow Z2			
P551	SPS2 pt wi	Fixed point, heating	-	-	20 °C
P552	SPS2 inf wi	Slope, heating	-	-	0.8
		Shift: summer, room Z2			
P554	SPS2 pt su	Fixed point, cooling	-	-	25 °C
P555	SPS2 inf su	Slope, cooling	-	-	0.5
P556	SPS2 lim su	Max. limitation, cooling	-	-	31 °C
		Cascade, cooling			
P602	C1 P-band	P-band Z1	-	-	2.0 K
P603	C1 Tn	I-term Z1	-	-	0 s
P612	C2 P-band	P-band Z2	-	-	2.0 K
P613	C2 Tn	I-term Z2	-	-	0 s

Number	Display	Description	Range min	max	Factory setting
		PI controller, heating Z1			
P631	PID1 P-band	P-band	-	-	20 K
P632	PID1 Tn	I-term	-	-	240 s
		PI controller, cooling Z1			
P641	PID2 P-band	P-band	-	-	20 K
P642	PID2 Tn	I-term	-	-	240 s
		PI controller, dew point			
P651	PID3 P-band	P-band	-	-	20 K
P652	PID3 Tn	I-term	-	-	240 s
		PI controller, heating Z2			
P661	PID4 P-band	P-band	-	-	20 K
P662	PID4 Tn	I-term	-	-	240 s
		PI controller, cooling Z2			
P671	PID5 P-band	P-band	-	-	20 K
P672	PID5 Tn	I-term	-	-	240 s
		2-point controller, dehumidification			
P781	2P1 sw.diff	Switching difference Z1	-	-	5 %rh
P783	2P2 sw.diff	Switching difference Z2	-	-	5 %rh
		Neutral zones			
P701	SEQ1 offset	Neutral zone, flow: heating	-	-	0 K
P703	SEQ2 offset	Neutral zone, flow: cooling	-	-	0 K
P705	SEQ3 offset	Neutral zone, flow: dew point	-	-	0 K
		Time module			
P801	TM1 time	Drying time, min. flow temperature	-	-	72 h
P802	TM2 time	Drying time, max. flow temperature	-	-	96 h
		Variables			
P811	Offset dp1	Offset, dew point Z1	-10	10	1 K
P812	Offset dp2	Offset, dew point Z2	-10	10	1 K
P815	Room inf Z1	Room influence factor Z1	0	10	3.0
P816	Room inf Z2	Room influence factor Z2	0	10	3.0
P818	Z1 frost	Room frost protection Z1	P501	P500	5.0 °C
P819	Z2 frost	Room frost protection Z2	P501	P500	5.0 °C

Measuring points

MP1	Operating mode ‘off’ Z1
MP2	Operating mode ‘reduced’ Z1
MP3	Floor drying, Z1
MP4	Floor drying: time Z1
MP5	Operating mode ‘off’ Z2
MP6	Operating mode ‘reduced’ Z2
MP7	Floor drying, Z2
MP8	Floor drying: time Z2

3.1.25 Application 907

Flow temperature control with heating/cooling for multiple-zone surface temperature control - TV HKC 3Z

Plant structure:

- Air-conditioning plant with up to three zones for temperature/humidity

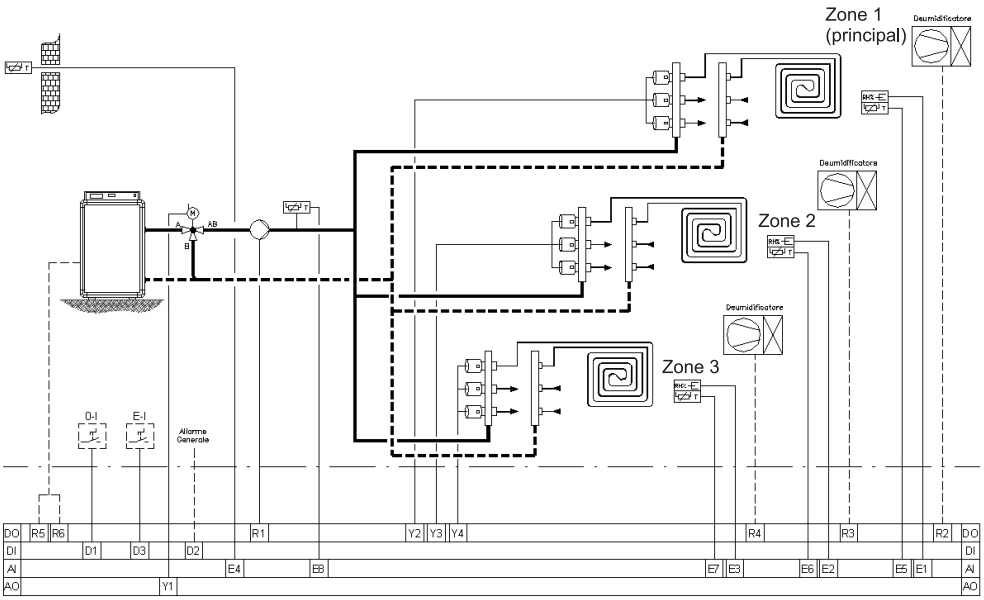
Regulation functions:

- Weather-based compensation for season (can be switched off)
- Temperature control for cooling with fixed value or cascade
- Active dew-point control

Control functions:

- Summer/winter change-over
- One timer channel for each zone
- Control for heat pump
- Control for circulating pump
- Command for dehumidification
- Command for zone valve (optional)
- General alarm (display)

Plant schematic:



Description:

Function

One zone or up to a maximum of three zones can be controlled according to choice. Each zone has its own setpoints for temperature and humidity. Zone 1 is the main zone; the settings for this zone are used as the basis for controlling the heat pump, the circulating pump and the control valve. The plant is switched on via input D1. The controller compares the temperature value with the relevant setpoint and controls the valve according to the control deviation.
During winter time, the flow temperature setpoint is compensated according to the outside temperature and and is additionally influenced by the room temperature. This room temperature influence can be disabled via parameter P815.

A frost protection function is enabled during winter time. The plant is left in normal operating mode until it no longer maintains a value of +3 K as compared to the frost protection temperature.
In summer time, the flow temperature is controlled to a fixed value.
Parameters A005/A015 can be used to select the other types of control:
1 = Cascade with room temperature
2 = Cascade, room temperature, with setpoint shift according to outside temperature
In summer mode, the flow temperature is influenced by the dew-point control (limitation). The dew-point is calculated separately for each zone and it influences the corresponding maximum value for the temperature controller.
The circulating pump function is limited by the maximum flow temperature (winter) (P530) and the minimum flow temperature (summer) (P532).

Options

Reduced operating mode

Operating mode can be adjusted via configuration parameter A003:
1 = Normal / reduced (factory setting)
0 = Normal / OFF
The selected operating mode is valid for all zones except when zone 1 = 1 (normal / reduced); in this case, zones 2 and 3 can each be operated with their own time programmes. These optional time programmes are only effective on the respective temperature setpoints.

Heat pump

The heat pump is controlled via relay R5; according to the mode of functioning set with parameter A003, this command functions as follows:
Normal / reduced = heat pump signal is continuously active
Normal / OFF = heat pump signal follows the time programme
The summer/winter mode transition for the heat pump is displayed via output R6.
Winter = contacts open
Summer = contacts closed
N.B.: The heat pump manufacturer's instructions must be followed when changing over the operating mode.
This function can also be used in order to forward the change-over command to room thermostats or to the FXV distributor unit.

Circulating pump

Control of the plant's circulating pump is handled via R1. Depending on the mode of functioning set with parameter A003, this command functions as follows:
Normal / reduced = pump control signal is continuously active
Normal / OFF = pump control signal follows the time programme

Dehumidification

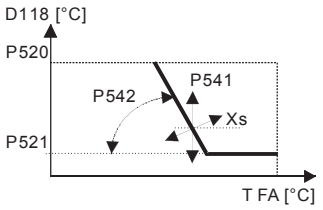
Dehumidification is handled by a two-point controller. It is controlled between the humidity setpoint and the cut-out point for the dehumidifier. The mode of functioning can be set with parameters A004:
1 = humidity control continuously switched on (factory setting)
0 = humidity control follows the time programme
The dehumidifier is controlled via relays R2, R3 and relay R4.

Zone valve
Each zone can switch its own thermal actuator (AXT), which is controlled via a 12V relay (not included in the scope of delivery). A two-point controller is used for this control.

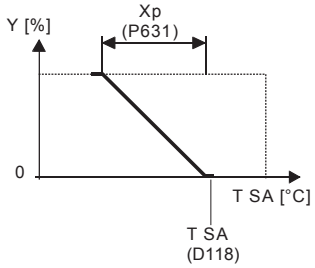
Floor drying (screed curing) as per standard EN 1264-4
This function can be enabled only with the summer/winter control signal on the winter position and via parameter A002 (visible only in winter). When drying is completed (A002 = 2), the controller returns to automatic mode.

3.1.25.1 Functional diagrams

Winter

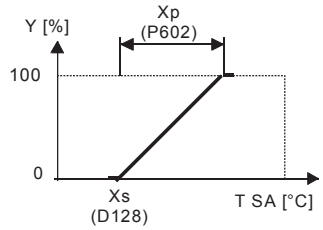


Setpoint shift acc. to outside temperature

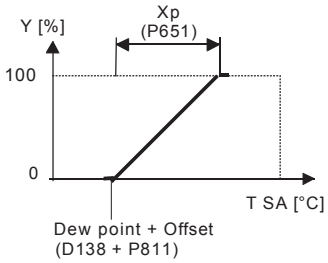


Heating sequence

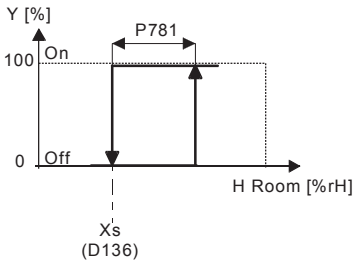
Summer



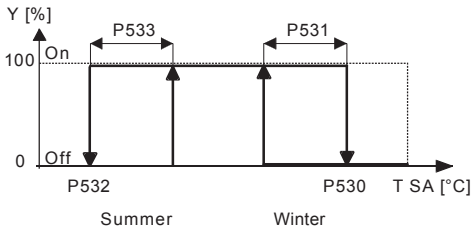
Cooling sequence



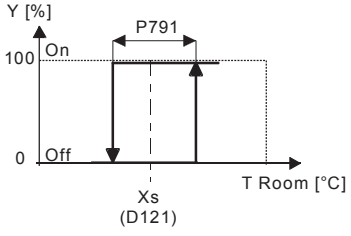
Dew-point control



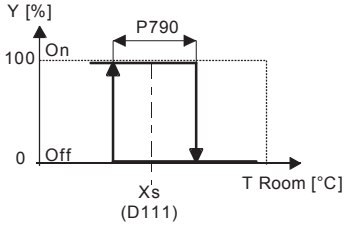
Dehumidification



Circulating pump



Zone valve (summer)



Zone valve (winter)

3.1.25.2 Parameter list

Number	Display	Description	Range min	Range max	Factory setting
		Default display			
D001a	T room 1	Actual value, room temperature Z1			
D001b	H room 1	Actual value, room humidity Z1			
D002a	T room 2	Actual value, room temperature Z2			
D002b	H room 2	Actual value, room humidity Z2			
D003a	T room 3	Actual value, room temperature Z3			
D003b	H room 3	Actual value, room humidity Z3			
		Setpoints			
D111	Normal 1h	Setpoint, room heating: normal	P501	P500	21 °C
D112	Reduc. 1h	Setpoint, room heating: reduced	P501	P500	18 °C
D116	Activ 1h	Setpoint, room heating: active	-	-	-
D118	Flow 1h	Setpoint, flow, heating: effective	-	-	-
D121	Normal 1c	Setpoint, room, cooling: normal	P503	P502	23 °C
D122	Reduc. 1c	Setpoint, room, cooling: reduced	P503	P502	28 °C
D126	Activ 1c	Setpoint, room, cooling: active	-	-	-
D127	Main 1c	Setpoint, room, cooling: effective following shift	-	-	-
D128	Flow 1c	Setpoint, flow, cooling: effective	-	-	-
D131	Set humi 1	Setpoint, room humidity Z1	P505	P504	55 %rh
D132	Set humi 2	Setpoint, room humidity Z2	P505	P504	55 %rh
D133	Set humi 3	Setpoint, room humidity Z3	P505	P504	55 %rh
D136	Dewpoint 1	Dew point Z1	-	-	-
D137	Dewpoint 2	Dew point Z2	-	-	-
D138	Dewpoint 3	Dew point Z3	-	-	-
D141	Normal 2h	Setpoint, room heating: normal Z2	P501	P500	21 °C
D142	Normal 2c	Setpoint, room, cooling: normal Z2	P503	P502	23 °C
D143	Reduced 2	Offset, room setpoint, reduced Z2	-10 K	10 K	4 K
D151	Normal 3h	Setpoint, room, heating: normal Z3	P501	P500	21 °C
D152	Normal 3c	Setpoint, room, cooling: normal Z3	P503	P502	23 °C
D153	Reduced 3	Offset, room setpoint, reduced Z3	-10 K	10 K	4 K
D161	Flow Normal	Setpoint, flow, cooling: normal	P523	P522	15 °C
D162	Flow Reduc.	Setpoint, flow, cooling: reduced	P523	P522	18 °C
		Display			
D201	Input E1				
D202	Input E2				
D203	Input E3				
D204	Input E4				
D205	Input E5				
D206	Input E6				
D207	Input E7				
D208	Input E8				
D211	Output Y1				
D212	Output Y2				
D213	Output Y3				
D214	Output Y4				
D223	Input digit	Inputs D1 / D2 / D3			
D225	Output digi	Digital outputs Y3 / Y4 / Y5			
D228	Relay	Outputs R1 / R2 / R3 / R4			
D229	Relay	Outputs R5 / R6			
		Timer			
D400	Clk chan. 1	Timer channel 1, function	-	-	3
D401	Clk C1 mode	Timer channel 1, mode	-	-	1
D4x1	Clk C1	Timer channel 1 switching point ‘on’	-	-	6:00
D4x2	Clk C1	Timer channel 1 switching point ‘off’	-	-	22:00

Description

Number	Display	Description	Range min	max	Factory setting
D500	Clk chan. 2	Timer channel 2, function	-	-	3
D501	Clk C2 mode	Timer channel 2, mode	-	-	1
D5x1	Clk C2	Timer channel 2, switching point ‘on’	-	-	6:00
D5x2	Clk C2	Timer channel 2, switching point ‘off’	-	-	22:00
D600	Clk chan. 3	Timer channel 3, function	-	-	3
D601	Clk C3 mode	Timer channel 3, mode	-	-	1
D6x1	Clk C3	Timer channel 3, switching point ‘on’	-	-	6:00
D6x2	Clk C3	Timer channel 3, switching point ‘off’	-	-	22:00
		Basic configuration			
A001	Application	Application	-	-	907: TV HKC 3Z
A002	Floor Dry 1	Floor drying 0 = Stop / 1 = Start / 2 = Finished	0	2	0
A003	Reduced 1	Night mode Z1 0 = Off / 1 = Reduced	0	1	1
A004	Dehumid 1	Dehumidification, night 0 = Off / 1 = Normal	0	1	1
A005	Summer 1	Cooling mode 0 = Fixed value / 1 = Cascade / 2 = Shift	0	2	0
A006	Zones	Number of zones	1	3	2
A013	Reduced 2	Night mode Z2 0 = Off / 1 = Reduced	0	1	1
A023	Reduced 3	Night mode Z3 0 = Off / 1 = Reduced	0	1	1
A030	Valve Z1	Zone valve Z1	0	1	0
A040	Valve Z2	Zone valve Z2	0	1	0
A050	Valve Z3	Zone valve Z3 0 = Off / 1 = On	0	1	0
A041	Clk chan. 2	Timer Z2	0	1	0
A051	Clk chan. 3	Timer Z3 0 = Off / 1 = On	0	1	0
		Input E1 (room humidity Z1)			
A110	E1 function	Function	-	-	21
A112	E1 set max	Upper range limit	-	-	100 %rh
A113	E1 set min	Lower range limit	-	-	0 %rh
A118	E1 sim.val.	Simulation value	-	-	55 %rh
		Input E2 (room humidity Z2)			
A120	E2 function	Function	-	-	21
A122	E2 set max	Upper range limit	-	-	100 %rh
A123	E2 set min	Lower range limit	-	-	0 %rh
A128	E2 sim.val.	Simulation value	-	-	55 %rh
		Input E3 (room humidity Z3)			
A130	E3 function	Function	-	-	21
A132	E3 set max	Upper range limit	-	-	100 %rh
A133	E3 set min	Lower range limit	-	-	0 %rh
A138	E3 sim.val.	Simulation value	-	-	55 %rh
		Input E4 (outside temperature)			
A140	E4 funtion	Function	-	-	3
A141	E4 scheme	Sensor multiplication	0	1	0
A147	E4 cal.temp	Temperature calibration			
A148	E4 sim.val.	Simulation value	-	-	0 °C

Number	Display	Description	Range min	Range max	Factory setting
		Input E5 (room temperature Z1)			
A150	E5 function	Function	-	-	3
A157	E5 cal.temp	Temperature calibration			
A158	E5 sim.val.	Simulation value	-	-	21 °C
		Input E6 (room temperature Z2)			
A160	E6 function	Function	-	-	3
A167	E6 cal.temp	Temperature calibration			
A168	E6 sim.val.	Simulation value	-	-	21 °C
		Input E7 (room temperature Z3)			
A170	E7 function	Function	-	-	3
A177	E7 cal.temp	Temperature calibration			
A178	E7 sim.val.	Simulation value	-	-	21 °C
		Input E8 (flow temperature)			
A180	E8 function	Function	-	-	3
A187	E8 cal.temp	Temperature calibration			
A188	E8 sim.val.	Simulation value	-	-	21 °C
		Input D1 (off)			
A210	D1 function	Function	-	-	102
		Input D2 (alarm)			
A220	D2 function	Function	-	-	101
		Input D3 (change-over)			
A230	D3 function	Function	-	-	101
		Output Y1 (heating valve / cooling valve)			
A310	Y1 function	Function	-	-	1
A311	Y1 action	Direction of operation	-	-	0
A312	Y1 max	Upper limit value	-	-	100 %
A313	Y1 min	Lower limit value	-	-	0 %
		Output Y2 (zone valve 1)			
A320	Y2 function	Function	-	-	2
A321	Y2 action	Direction of operation	-	-	0
A322	Y2 max	Upper limit value	-	-	123 %
A323	Y2 min	Lower limit value	-	-	0 %
		Output Y3 (zone valve 2)			
A330	Y3 function	Function	-	-	2
A331	Y3 action	Direction of operation	-	-	0
A332	Y3 max	Upper limit value	-	-	123 %
A333	Y3 min	Lower limit value	-	-	0 %
		Output Y4 (zone valve 3)			
A340	Y4 function	Function	-	-	2
A341	Y4 action	Direction of operation	-	-	0
A342	Y4 max	Upper limit value	-	-	123 %
A343	Y4 min	Lower limit value	-	-	0 %
		Output R1 (zone pump)			
A410	R1 function	Function	-	-	2
A411	R1 action	Direction of operation	-	-	0
A414	R1 Td on	Switch-on delay	-	-	0
A415	R1 Td off	Switch-off delay	-	-	0
A416	R1 min on	Min. operating time	-	-	0
A417	R1 min off	Min. idle time	-	-	0
A418	R1 blocking	Blocking	-	-	0

Description

Number	Display	Description	Range min	max	Factory setting
		Output R2 (dehumidifier 1)			
A420	R2 function	Function	-	-	2
A421	R2 action	Direction of operation	-	-	0
A424	R2 Td on	Switch-on delay	-	-	0
A425	R2 Td off	Switch-off delay	-	-	0
A426	R2 min on	Min. operating time	-	-	0
A427	R2 min off	Min. idle time	-	-	0
A428	R2 blocking	Blocking	-	-	0
		Output R3 (dehumidifier 2)			
A430	R3 function	Function	-	-	2
A431	R3 action	Direction of operation	-	-	0
A434	R3 Td on	Switch-on delay	-	-	0
A435	R3 Td off	Switch-off delay	-	-	0
A436	R3 min on	Min. operating time	-	-	0
A437	R3 min off	Min. idle time	-	-	0
A438	R3 blocking	Blocking	-	-	0
		Output R4 (dehumidifier 3)			
A440	R4 function	Function	-	-	2
A441	R4 action	Direction of operation	-	-	0
A444	R4 Td on	Switch-on delay	-	-	0
A445	R4 Td off	Switch-off delay	-	-	0
A446	R4 min on	Min. operating time	-	-	0
A447	R4 min off	Min. idle time	-	-	0
A448	R4 blocking	Blocking	-	-	0
		Output R5 (heat pump)			
A450	R5 function	Function	-	-	2
A451	R5 action	Direction of operation	-	-	0
A454	R5 Td on	Switch-on delay	-	-	0
A455	R5 Td off	Switch-off delay	-	-	0
A456	R5 min on	Min. operating time	-	-	0
A457	R5 min off	Min. idle time	-	-	0
A458	R5 blocking	Blocking	-	-	0
		Output R6 (change-over)			
A460	R6 function	Function	-	-	2
A461	R6 action	Direction of operation	-	-	0
A464	R6 Td on	Switch-on delay	-	-	0
A465	R6 Td off	Switch-off delay	-	-	0
A466	R6 min on	Min. operating time	-	-	0
A467	R6 min off	Min. idle time	-	-	0
A468	R6 blocking	Blocking	-	-	0
		Limitations			
P500	SP1 max	Maximum setpoint, heating	-	-	30 °C
P501	SP1 min	Minimum setpoint, heating	-	-	5 °C
P502	SP2 max	Maximum setpoint, cooling	-	-	40 °C
P503	SP2 min	Minimum setpoint, cooling	-	-	20 °C
P504	SP3 max	Maximum setpoint, humidity	-	-	65 %rh
P505	SP3 min	Minimum setpoint, humidity	-	-	45 %rh
P520	LIM1 max	Maximum setpoint, flow, heating	-	-	45 °C
P521	LIM1 min	Minimum setpoint, flow, heating	-	-	20 °C
P522	LIM2 max	Maximum setpoint, flow, cooling	-	-	19 °C
P523	LIM2 min	Minimum setpoint, flow, cooling	-	-	15 °C
P528	LIM5 max	Minimum setpoint, flow, floor drying	-	-	25 °C
P530	LIM6 max	Maximum flow temperature: pump, heating	-	-	45 °C
P531	LIM6 min	Switching difference: pump, heating	-	-	7 K

Number	Display	Description	Range min	Range max	Factory setting
P532	LIM7 max	Minimum flow temperature: pump, cooling	-	-	13 °C
P533	LIM7 min	Switching difference: pump, cooling	-	-	2 K
		Shift: winter, flow			
P541	SPS1 pt wi	Fixed point, heating	-	-	20 °C
P542	SPS1 inf wi	Slope, heating	-	-	0.8
		Shift: summer, room			
P544	SPS1 pt su	Fixed point, cooling	-	-	25 °C
P545	SPS1 inf su	Slope, cooling	-	-	0.5
P546	SPS1 lim su	Max. limitation, cooling	-	-	31 °C
		Cascade, cooling			
P602	C1 P-band	P-band	-	-	2.0 K
P603	C1 Tn	I-term	-	-	0 s
		PI controller, heating			
P631	PID1 P-band	P-band	-	-	20 K
P632	PID1 Tn	I-term	-	-	240 s
		PI controller, cooling			
P641	PID2 P-band	P-band	-	-	20 K
P642	PID2 Tn	I-term	-	-	240 s
		PI controller, dew point			
P651	PID3 P-band	P-band	-	-	20 K
P652	PID3 Tn	I-term	-	-	240 s
		Neutral zones			
P701	SEQ1 offset	Neutral zone, flow: heating	-	-	0 K
P703	SEQ2 offset	Neutral zone, flow: cooling	-	-	0 K
P705	SEQ3 offset	Neutral zone, flow: dew point	-	-	0 K
		2-point dehumidification			
P781	2P1 sw.diff	Switching difference Z1	-	-	5 %rh
P783	2P2 sw.diff	Switching difference Z2	-	-	5 %rh
P785	2P3 sw.diff	Switching difference Z3	-	-	5 %rh
		2-point zone valve			
P790	2P6 sw.pt	Switching difference, heating Z1	-	-	0.5 K
P791	2P6 sw.diff	Switching difference, cooling Z1	-	-	0.5 K
P792	2P7 sw.pt	Switching difference, heating Z2	-	-	0.5 K
P793	2P7 sw.diff	Switching difference, cooling Z2	-	-	0.5 K
P794	2P8 sw.pt	Switching difference, heating Z3	-	-	0.5 K
P795	2P8 sw.diff	Switching difference, cooling Z3	-	-	0.5 K
		Time module			
P801	TM1 time	Drying time, min. flow temperature	-	-	72 h
P802	TM2 time	Drying time, max. flow temperature	-	-	96 h
		Variables			
P811	Offset dp1	Offset, dew point Z1	-10	10	1 K
P812	Offset dp2	Offset, dew point Z2	-10	10	1 K
P813	Offset dp3	Offset, dew point Z3	-10	10	1 K
P815	Room inf Z1	Room influence factor Z1	0	10	3.0
P819	Frost	Room frost protection	P501	P500	5.0 °C

Measuring points

MP1	Operating mode ‘off’ Z1
MP2	Operating mode ‘reduced’ Z1
MP3	Flow setpoint: heating
MP4	Flow setpoint: cooling
MP5	Dew point temperature Z1
MP6	Dew point temperature Z2
MP7	Dew point temperature Z3
MP8	Floor drying: active
MP9	Floor drying: time

3.1.26 Application 911

Constant supply air control, THS Hh, without/with humidification

Plant design:

- Outside and exhaust air damper
- Supply and return air fan
- Air heater with control valve
- Supply air or room temperature sensor
- Outside temperature sensor (option - without TA sensor, no alarm)

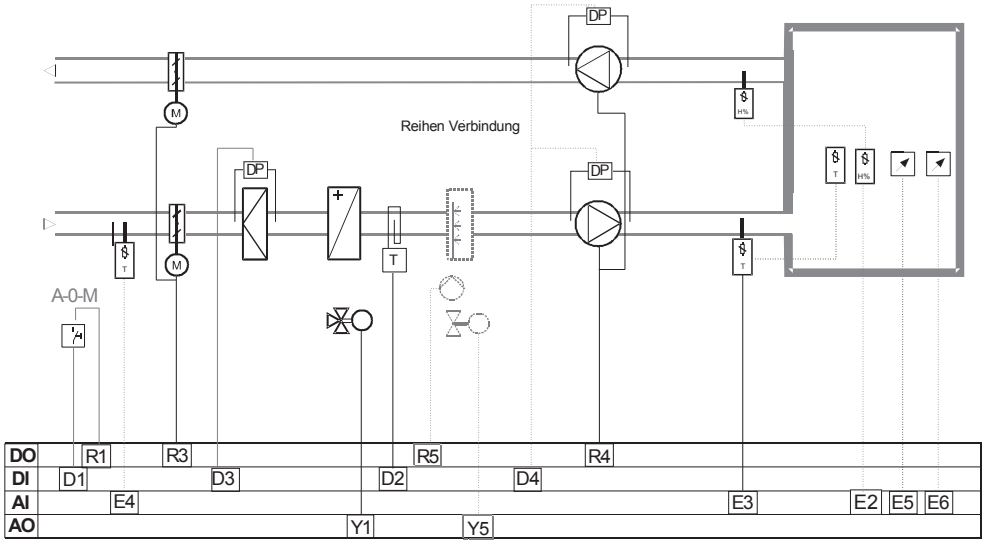
Control functions:

- Temperature control, supply air: fixed value with ta shift (optional)
- Humidity control return air or room, fixed value

Control functions:

- Enable dampers
- Delay fan cut-in
- Main (plant) switch
- Frost protection function
- Stand-by mode (only with room temperature)
- Filter, differential pressure
- Fan, V-belt

Plant schematic:



Description:

Function

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the supply air or room temperature with the setpoint, and controls the heating valve according to the control deviation. The supply air temperature is limited.

When the plant is switched off from the main switch, the fans are switched off, and the heating valve and dampers are closed.

The humidity control, when enabled, compares the room or return air humidity with the setpoint and controls humidification pump R5 or valve Y5 according to the control deviation.

Options

External setpoint

According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via the setpoint adjuster, XPESF001.
In addition, a room operating unit can be used to switch the plant over from auto-matic to continuous or stand-by mode.

Setpoint shift

The setpoint is changed in relation to the outside temperature, according to the adjusted influence.

Frost protection

The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. The heating valve is opened fully. The frost protection is still active when the plant is switched off.

Reduced mode (timer) only with room temperature

In reduced mode, the plant remains switched off as long as the room temperature does not fall below the reduction setpoint (D112). Below this value, the plant switches on, heating valve Y1 is fully opened and continues to function as long as the room temperature is less than two degrees (P763) above the setpoint (D112).

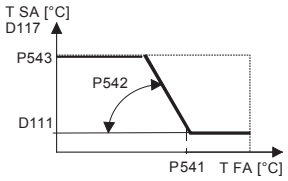
Humidity control

If humidity control is active, the controller compares the current humidity value with the setpoint and acts on relay R5 and analogue output Y5 according to the deviation.

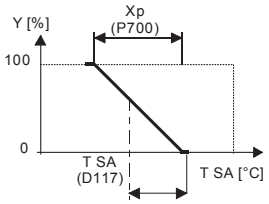
External setpoint humidity

According to choice, an external setpoint adjuster can be used for the humidity setpoint.

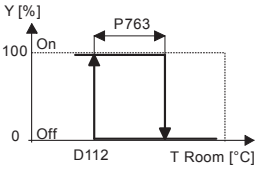
3.1.26.1 Functional diagrams



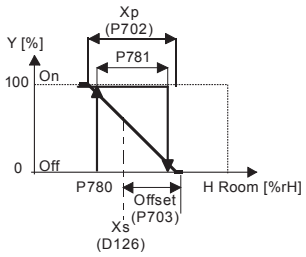
Winter setpoint shift acc. to outside temperature (option)



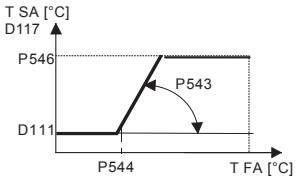
Heating sequence



Stand-by mode with reduced setpoint (room temperature)



Return air room humidity control



Summer setpoint shift acc. to outside temperature (option)

3.1.26.2 Parameter list

Constant supply air control, THS Hh, without/with humidification

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	22.0°C	Room setpoint			
Act. val	20.2°C	Actual room value			
Setpoints					
D111	Setpoint 1	Setpoint ‘Normal’		22.0°C	
D112	Setpoint 2	Setpoint ‘Reduced’	Timer / room remote control	15.0°C	
D121	Setpoint 1	Setpoint, humidity		55% r.h.	
Timer					
D400	Clk chan.1	Timer channel 1		3	
D401	Clk C1 mode	Mode		1	
Basic configuration					
A001	Application	Application	THS Hh	911	
A002	Humidify	Humidification	OFF	0	
	Options (described on the next page)				
A010	Ext.setp.	External setpoint	Off, temperature	0	
A011	Shift	Setpoint shift	Off	0	
A013	Frost	Frost protection	On	1 (always active)	
A014	Red. mode	Reduced mode (timer) Only with room temperature	Off	0	
A020	Ext.setp.	External setpoint	Off, humidity	0	
I/O configuration					
	Analogue inputs				
A120	E2 Function	Room humidity sensor	Humidity 0-10V	21	
A122	E2 Set Max	Upper range limit	Active sensor at 10V	100% r.h.	
A123	E2 Set min.	Lower range limit	Active sensor at 0V	0% r.h.	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Outside temp. sensor	Not used	0	
A150	E5 Function	Setpoint adjuster	Not used	0	
A160	E6 Function	Setpoint adjuster	Not used	0	

Number	Display	Function	Additional information	Factory setting	Setting
	Digital inputs				
A210	D1 Function	Main switch (off/reduced)	Active if high	102	
A220	D2 Function	Frost protection monitor	Active if low	101	
A230	D3 Function	Filter - alarm	Active if low	101	
A240	D4 Function	Fan V-belt - alarm	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve, heating	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A350	Y5 Function	Three-way valve, humidification	Analogue output	1	
A351	Y5 Action	Directional control	Normal 0-10VDC	0	
A352	Y5 Max	Maximum value	Output Y5	100.0%	
A353	Y5 Min	Minimum value	Output Y5	0.0%	
	Digital outputs				
A410	R1 Function	Timer channel 1	Digital (On)	2	
A411	R1 Action	Directional control	Normal NO	0	
A414	R1 Td on	Switch-on delay		0s	
A415	R1 Td off	Switch-off delay		0s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 Blocking	Blocking		0	
A430	R3 Function	Damper actuator	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking		0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking		0	
A450	R5 Function	Humidification pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking		0	
Limitations					
P500	SP1 Max	Maximum setpoint		30.0°C	
P501	SP1 Min	Minimum setpoint		15.0°C	
P502	SP2 Max	Maximum setpoint	Humidity	80% r.h.	
P503	SP2 Min	Minimum setpoint	Humidity	40% r.h.	
Controller					
P632	PID1 Tn	PID1 I-term	Output Y1	160s	
P633	PID1 Tv	PID1 D-term	Output Y1	0.0s	
P642	PID2 Tn	PID2 I-term, humidity controller	Output Y5	0.0s	
P643	PID2 Tv	PID2 D-term, humidity controller	Output Y5	0.0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp1)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)1	Output Y1	5.0K	
	Humidification				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y5	5.0% r.h.	
P703	SEQ2 Offset	Offset (Of2)	Output Y5	2.5% r.h.	
Switching points					
P780	2P1 sw.pt	Switching point - humidification pump	Relay R5	90 %	
P781	2P1 sw.diff	Switching difference - humidif. pump	Relay R5	80%	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Delays					
P801	TM1 time	Switch-on delay, fans	Relay R4	30s	
Options					
External setpoint					
A010	Ext.setp.	External setpoint, temperature	On	1	
	Input E5 setpoint adjuster (XPESF001)				
A150	E5 Function	Setpoint adjuster		51	
A152	E5 Set Max	Range maximum		30.0°C	
A153	E5 Set min	Range minimum		10.0°C	
A154	E5 Cal.Max	Calibration of range maximum		°C	
A155	E5 Cal.midd	Calibration of range midpoint	Possible only on device	°C	
A156	E5 Cal.Min	Calibration of range minimum		°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Input E4 outside air temperature				
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
A141	E4 Scheme	Sensor multiplication	Normal input (off)	0	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	22.0°C	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		1.0	
P543	SPS1 Lim Wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Reduced mode (stand-by mode with timer)					
A014	Red. mode	Reduced mode	Stand-by mode on	1	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
External setpoint					
A020	Ext.setp.	External setpoint, humidity	On	1	
	Input E6 setpoint adjuster (XPESF001)				
A160	E6 Function	Setpoint adjuster		53	
A162	E6 Set Max	Range maximum		100.0% r.h.	
A163	E6 Set min	Range minimum		0.0% r.h.	
A164	E6 Cal.Max	Calibration of range maximum		% r.h.	
A165	E6 Cal.Midd	Calibration of range midpoint	Possible only on device	% r.h.	
A166	E6 Cal.Min	Calibration of range minimum		% r.h.	
A168	E6 Sim.val.	Simulation value	In case of sensor error	55.0% r.h.	
Measuring points					
MP1		Active setpoint (D116)			
MP2		Main setpoint (D117)			
MP3		Positioning signal, main controller			
MP4		Stand-by mode (0/1)			
MP5		Control mode (0/1)			

3.1.27 Application 912

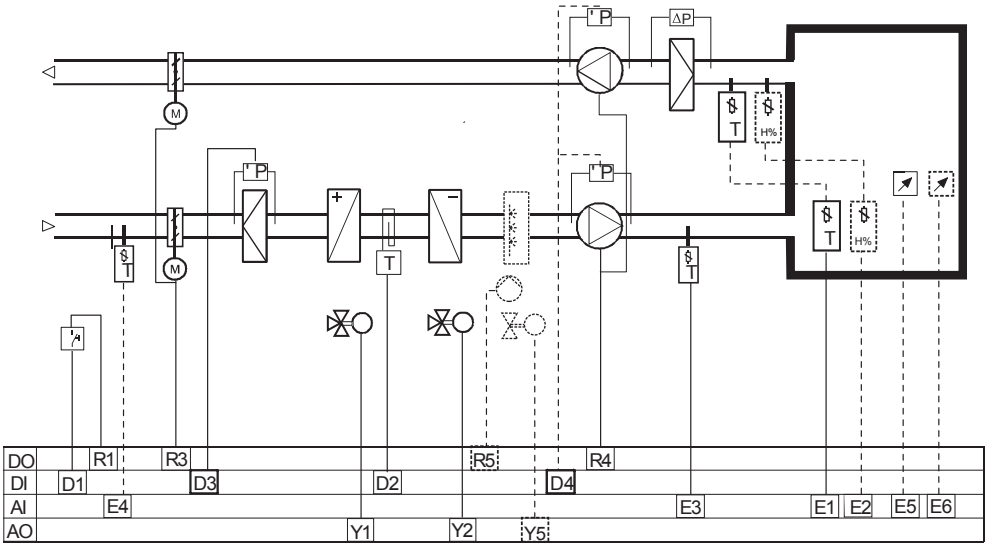
Supply air/return air cascade control, CTHR HCh, without/with humidification

Plant design:
- Outside and exhaust air damper
- Supply and return air fan
- Air heater, air cooler with control valve
- Supply air, return air or room temperature sensor
- Outside temperature sensor

Control functions:
- Temperature control, return air-supply air cascade with ta shift, or supply air, fixed value with ta shift (optional)
- Humidity control, return air or room fixed value

Control functions:
- Enable dampers
- Delay fan switching
- Main (plant) switch
- Frost protection function
- Stand-by mode (only with room temperature)
- Free night cooling
- Filter, differential pressure
- Fan, V-belt

Plant schematic:



Description:

Functions

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1 or cooling valve Y2 according to the control deviation. The supply air temperature is limited.The humidity control, when enabled, compares the room or return air humidity with the setpoint and controls humidification pump R5 or valve

Y5 according to the control deviation.
When the plant is switched off from the main switch, the fans are switched off, and the heating valve and dampers are closed.

Options
External setpoint
According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via the setpoint adjuster, XPESF001.

Setpoint shift
The setpoint is changed in relation to the outside temperature, according to the adjusted influence.

Frost protection
The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. The heating valve is opened fully. The frost protection is still active when the plant is switched off.

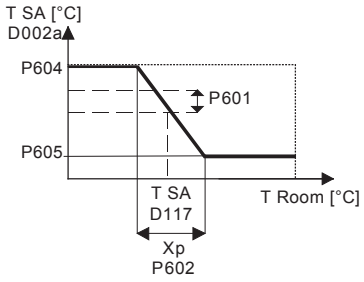
Humidity control
If humidity control is active, the controller compares the current humidity value with the setpoint and acts on relay R5 and analogue output Y5 according to the deviation.

External setpoint humidity
According to choice, an external setpoint adjuster can be used for the humidity setpoint.

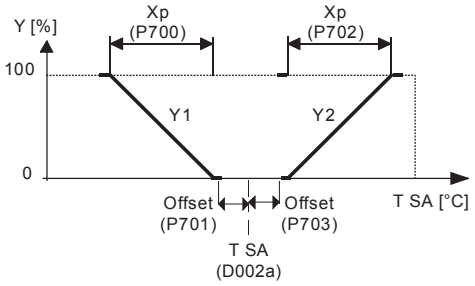
Reduced mode (timer) only with cascade controller or room temperature (fixed controller)
Channel 1
The timer programme switches the plant. In reduced mode, the plant remains switched off as long as the room temperature does not fall below the reduction setpoint (D112). Below this value, the plant switches on, heating valve Y1 is fully opened and continues to function as long as the room temperature is less than two degrees (P763) above the setpoint (D112).

Channel 2
If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2 provided that the conditions are met. In reduced mode, the plant remains off as long as the room temperature is not two degrees (P765) above the calculated setpoint D117, and is not more than five degrees (P765) above the outside temperature. If this value is reached, the plant switches on with closed valves. The plant switches off again if the room temperature falls below calculated setpoint D117, or if the different in relation to the outside temperature is one degree less than parameter P764. Free night cooling does not become active at an outside temperature below ten degrees (P766).

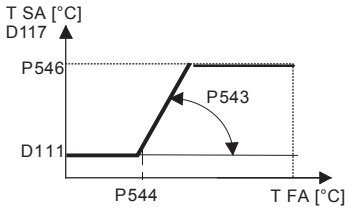
3.1.27.1 Functional diagrams



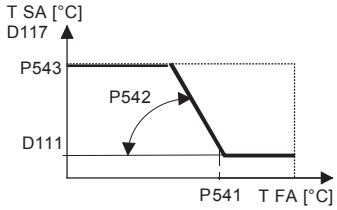
Return-supply air - cascade



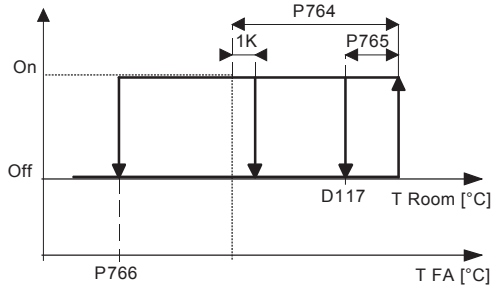
Heating-cooling sequence



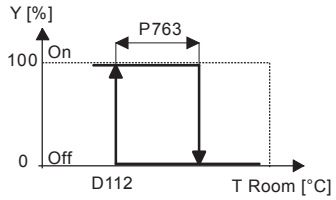
Summer setpoint shift, cascade, acc. to outside temperature (option)



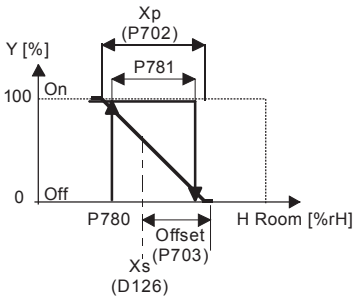
Winter setpoint shift, fixed value acc. t outside temperature (option)



Free night cooling



Stand-by mode with reduced setpoint (room temperature)



Return air, room humidity control

3.1.27.2 Parameter list

Supply air/return air cascade control, CTHR HCh, without/with humidification

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room setpoint			
Act. val	20.2°C	Actual room value			
Setp.sup	38.0°C	Supply air setpoint			
A.val su	27.2°C	Supply air - actual value			

Description

Number	Display	Function	Additional information	Factory setting	Setting
Setpoints					
D111	Setpoint 1	Setpoint 'Normal'		22.0°C	
D112	Setpoint 2	Setpoint 'Reduced'	Timer / room remote control	15.0°C	
D121	Setpoint 1	Setpoint, humidity		55% r.h.	
Timer					
D400	Clk chan.1	Timer channel 1		3	
D401	Clk C1 mode	Mode		1	
Basic configuration					
A001	Application	Application	CTHR HCh	912	
A002	Humidify	Humidification	Off	0	
	Options (described on the next page)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour	Cascade	2	
A013	Frost	Frost protection	On	1 (always active)	
A014	Red. mode	Night cooling (timer 2)	Off	0	
		Only with cascade controller or room temperature (fixed value controller)			
A020	Ext.setp.h	External setpoint	Off, humidity	0	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Room/return air temperature sensor	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication	Normal input (off)	0	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A120	E2 Function	Room humidity sensor	Humidity 0-10V	21	
A122	E2 Set Max	Upper range limit	Active sensor at 10V	100% r.h.	
A123	E2 Set min.	Lower range limit	Active sensor at 0V	0% r.h.	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Outside temp. sensor	Not used	0	
A150	E5 Function	Setpoint adjuster	Not used	0	
A160	E6 Function	Setpoint adjuster	Not used	0	
	Digital inputs				
A210	D1 Function	Main switch (off/reduced)	Active if high	102	
A220	D2 Function	Frost protection monitor	Active if low	101	
A230	D3 Function	Filter DD alarm	Active if low	101	
A240	D4 Function	Fan belt alarm	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve 'heating'	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A320	Y2 Function	Three-way valve 'cooling'	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A350	Y5 Function	Three-way valve 'humidification'	Analogue output	1	
A351	Y5 Action	Directional control	Normal 0-10VDC	0	
A352	Y5 Max	Maximum value	Output Y5	100.0%	
A353	Y5 Min	Minimum value	Output Y5	0.0%	
	Digital outputs				
A410	R1 Function	Timer channel 1 (off/reduced)	Digital (On)	2	
A411	R1 Action	Directional control	Normal NO	0	
A414	R1 Td on	Switch-on delay		0s	
A415	R1 Td off	Switch-off delay		0s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 Blocking	Blocking		0	
A430	R3 Function	Damper actuator	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	

Number	Display	Function	Additional information	Factory setting	Setting
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking		0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking		0	
A450	R5 Function	Humidification pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking		0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint	Humidity	80% r.h.	
P503	SP2 Min	Minimum setpoint	Humidity	40% r.h.	
Cascade controllers					
P601	C1 Offset	Setpoint offset (OfK)	Supply air at room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint		30.0°C	
P605	C1 Min	Minimum supply air setpoint		15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term	Outputs Y1 and Y2	300s	
P633	PID1 Tv	PID1 D-term	Outputs Y1 and Y2	0.0s	
P642	PID2 Tn	PID2 I-term, humidity controller	Output Y5	0s	
P643	PID2 Tv	PID2 D-term, humidity controller.	Output Y5	0s	
Sequences					
	Heating sequence Y1				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	5.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	-1.0K	
	Cooling sequence Y2				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	5.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	1.0K	
	Humidification Y5				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y5	5.0% r.h.	
P705	SEQ3 Offset	Offset (Of3)	Output Y5	-2.5% r.h.	
Switching points					
P780	2P1 sw.pt	Switching point, humidification pump	Relay R5	90 %	
P781	2P1 sw.diff	Switching difference, humidif. pump	Relay R5	80%	
Delays					
P801	TM1 time	Switch-on delay, fans	Relay R4	30s	
Options					
External setpoint					
A010	Ext.setp.	External setpoint	On	1	
	Input E5 setpoint adjuster (XPESF001)				
A150	E5 Function	Setpoint adjuster		51	
A152	E5 Set Max	Range maximum		30.0°C	
A153	E5 Set min.	Range minimum		10.0°C	
A154	E5 Cal.Max	Calibration of range maximum		°C	
A155	E5 Cal.Midd	Calibration of range midpoint	Possible only on device	°C	
A156	E5 Cal.Min	Calibration of range minimum		°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Shift					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Input E4 outside air temperature				
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
A141	E4 Scheme	Sensor multiplication	Normal input (off)	0	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		1.0	
P543	SPS1 Lim wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Controller					
A012	Control	Control behaviour	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection D2					
A013	Frost	Frost protection/overheating protection	Off	0	
			Frost protection	1	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Off	0	
			Stand-by mode	1	
			Night cooling	2	
			Stand-by mode.+Night cooling	3	
D500	Clk chan. 2	Timer channel 2		3	
D501	Clk C2 mode	Mode		1	
	Stand-by mode				
D112	Setpoint 2	Setpoint 'Reduced'		15.0°C	
P763	FC1 sw.diff	Switching difference SD	In stand-by mode	2.0K	
	Free night cooling				
P764	FC1 neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
External setpoint, humidity					
A020	Ext.setp.	External setpoint, humidity	On	1	
	Input E6 setpoint adjuster (XPESF001)				
A160	E6 Function	Setpoint adjuster		53	
A162	E6 Set Max	Range maximum		100.0% r.h.	
A163	E6 Set min.	Range minimum		0.0% r.h.	
A164	E6 Cal.Max	Calibration of range maximum		% r.h.	
A165	E6 Cal.Midd	Calibration of range midpoint	Possible only on device	% r.h.	
A166	E6 Cal.Min	Calibration of range minimum		% r.h.	
A168	E6 Sim.val.	Simulation value	In case of sensor error	55.0% r.h.	
Measuring points					
MP1		Active setpoint (D116)			
MP2		Main setpoint (D117)			
MP3		Auxiliary setpoint (D118)			
MP4		Positioning signal, main controller			
MP5		Stand-by mode (0/1)			
MP6		FNC mode (0/1)			
MP7		Control mode (0/1)			

3.1.28 Application 913

Supply air/return air cascade control, CTHR HCEh, without/with humidification

Plant design:

- Outside, recirculation and exhaust air damper with minimum outside air component
- Supply and return air fan
- Air heater, air cooler with control valve
- Supply air, return air or room temperature sensor
- Outside temperature sensor

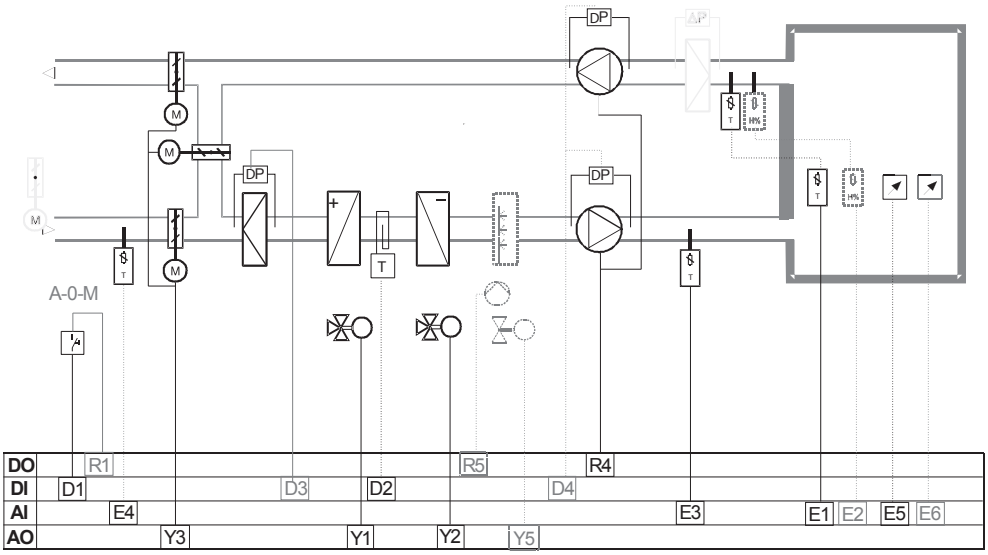
Control functions:

- Temperature control, return air-supply air, cascade with ta shift (optional) or supply air fixed value with ta shift (optional)
- Humidity control, return air or room fixed value

Control functions:

- Enable control
- Delay fan switching
- Enable damper sequence
- Main (plant) switch
- Frost protection function
- Stand-by mode (only with room temperature)
- Free night cooling
- Filter, differential pressure
- Fan, V-belt

Plant schematic:



Description:

Functions

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls

heating valve Y1 or cooling valve Y2 according to the control deviation. The supply air temperature is limited.
The humidity control, when enabled, compares the room or return air humidity with the setpoint and controls humidification pump R5 or valve Y5 according to the control deviation.
When the plant is switched off from the main switch, the fans are switched off, and the heating and cooling valve and the dampers are closed.

Options
External setpoint
According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via the setpoint adjuster, XPESF001.

Setpoint shift
The setpoint is changed in relation to the outside temperature, according to the adjusted influence.

Frost protection
The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. The heating valve is opened fully. The frost protection is still active when the plant is switched off.

Humidity control
If humidity control is active, the controller compares the current humidity value with the setpoint and acts on relay R5 and analogue output Y5 according to the deviation.

External setpoint humidity
According to choice, an external setpoint adjuster can be used for the humidity setpoint.

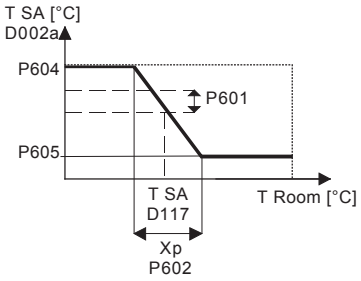
Minimum outside air component
When the plant is switched off, the dampers are closed.

Reduced mode (timer) only with cascade controller or room temperature (fixed value controller)
Channel 1
The timer programme switches the plant off until stand-by mode becomes active. In reduced mode, the plant remains switched off as long as the room temperature does not fall below the reduction setpoint (D112). Below this value, the plant switches on, heating valve Y1 is fully opened and continues to function as long as the room temperature is less than two degrees (P763) above the setpoint (D112).

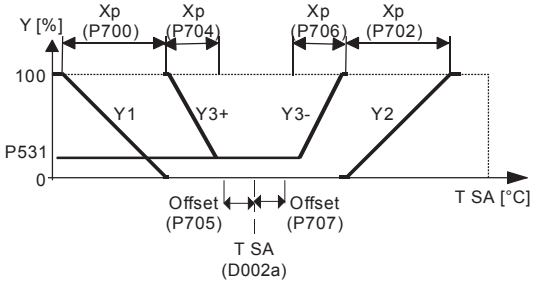
Channel 2
If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2 provided that the conditions are met. In reduced mode, the plant remains off as long as the room temperature is not two degrees (P765) above the calculated setpoint D117, and is not more than five degrees (P765) above the outside temperature. If this value is reached, the plant switches on with closed valves. The plant switches off again if the room temperature falls below

calculated setpoint D117, or if the different in relation to the outside temperature is one degree less than parameter P764. Free night cooling does not become active at an outside temperature below ten degrees (P766).

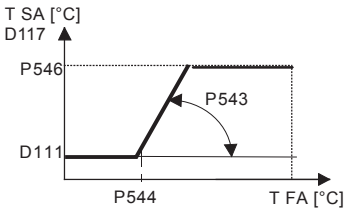
3.1.28.1 Functional diagrams



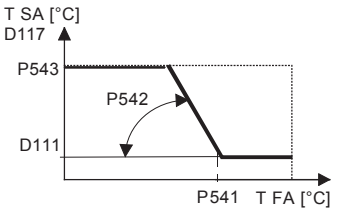
Return-supply air - cascade



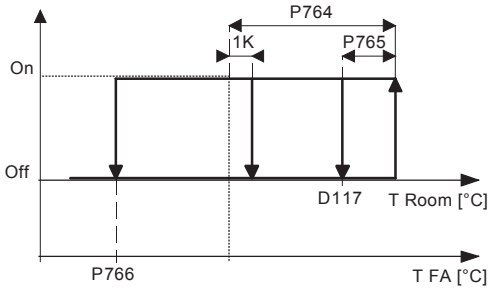
Heating-cooling damper sequence



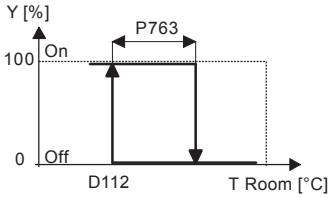
Summer setpoint shift, cascade, acc. to outside temperature (option)



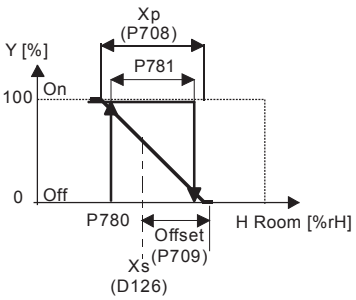
Winter setpoint shift, fixed value, acc. to outside temperature (option)



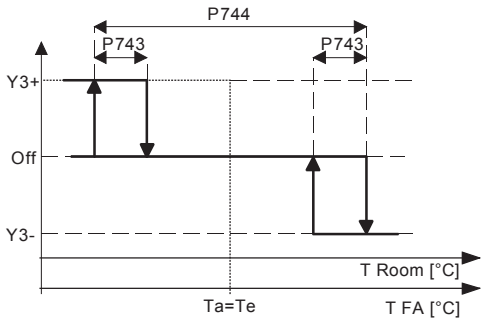
Free night cooling



Stand-by mode with reduced setpoint (room temperature)



Return air, room humidity control



Energy recovery

3.1.28.2 Parameter list

Supply air/return air cascade control, CTHR HCEh, without/with humidification

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room setpoint			
Act. val	20.2°C	Actual room value			
Setp sup	38.0°C	Supply air setpoint			
A.val su	27.2°C	Supply air - actual value			
Setpoints					
D111	Setpoint 1	Setpoint 'Normal'		22.0°C	
D112	Setpoint 2	Setpoint 'Reduced'	Timer /	15°C	
D121	Setpoint 1	Setpoint, humidity		55% r.h.	
Timer					
D400	Clk chan. 1	Timer channel 1		3	
D401	Clk C1 mode	Mode		1	
Basic configuration					
A001	Application	Application	CTHR HCEh	913	
A002	Humidify	Humidification	Off	0	
	Options (described on the next page)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour	Cascade	2	
A013	Frost	Frost protection	On	1 (always active)	
A014	Red. mode	Night cooling (timer)	Off	0	
		Only with cascade controller or room temperature (fixed value controller)			
A020	Ext.setp.	External setpoint	Off, humidity	0	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Room/return air temperature sensor	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication	Normal input (off)	0	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A120	E2 Function	Room humidity sensor	Humidity 0-10V	21	
A122	E2 Set Max	Upper range limit	Active sensor at 10V	100% r.h.	
A123	E2 Set min.	Lower range limit	Active sensor at 0V	0.0% r.h.	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Outside temp. sensor	Not used	0	
A150	E5 Function	Setpoint adjuster	Not used	0	
A160	E6 Function	Setpoint adjuster	Not used	0	
	Digital inputs				
A210	D1 Function	Main switch	Active if high	102	
A220	D2 Function	Frost protection monitor.	Active if low	101	
A230	D3 Function	Filter DD Alarm.	Active if low	101	
A240	D4 Function	Fan belt alarm	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve 'heating'	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A320	Y2 Function	Three-way valve 'cooling'	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A330	Y3 Function	Damper actuator	Analogue output	1	
A331	Y3 Action	Directional control	Normal 0-10VDC	0	

Number	Display	Function	Additional information	Factory setting	Setting
A332	Y3 Max	Maximum value	Output Y3	100.0%	
A333	Y3 Min	Minimum value	Output Y3	0.0%	
A350	Y5 Function	Three-way valve 'humidification'	Analogue output	1	
A351	Y5 Action	Directional control	Normal 0-10VDC	0	
A352	Y5 Max	Maximum value	Output Y5	100.0%	
A353	Y5 Min	Minimum value	Output Y5	0.0%	
	Digital outputs				
A410	R1 Function	Timer channel 1	Digital (On)	2	
A411	R1 Action	Directional control	Normal NO	0	
A414	R1 Td on	Switch-on delay		0s	
A415	R1 Td off	Switch-off delay		0s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 Blocking	Blocking		0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking		0	
A450	R5 Function	Humidification pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking		0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint	Humidity	80% r.h.	
P503	SP2 Min	Minimum setpoint	Humidity	40% r.h.	
P531	LIM6 Min	Minimum outside air component	Output Y3	25.0%	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK)	Supply air at room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint		30.0°C	
P605	C1 Min	Minimum supply air setpoint		15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term	Outputs Y1 and Y2	300s	
P633	PID1 Tv	PID1 D-term	Outputs Y1 and Y2	0.0s	
P642	PID2 Tn	PID2 I-term, humidity controller	Output Y5	0.0s	
P643	PID2 Tv	PID2 D-term, humidity controller.	Output Y5	0.0s	
Sequences					
	Heating sequence Y1				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	5.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	0.0K	
	Cooling sequence Y2				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	5.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	0.0K	
	Damper sequence, heat recovery, 'heating' Y3				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y3	2.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y3	-1.0K	
	Damper sequence, heat recovery, 'cooling' Y3				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y3	2.0K	
P707	SEQ4 Offset	Offset (Of4)	Output Y3	1.0K	
	Humidification Y5				
P708	SEQ5 P-band	Proportional band (Xp5)	Output Y5	5.0% r.h.	
P709	SEQ5 Offset	Offset (Of5)	Output Y5	2.5% r.h.	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Energy recovery					
P741	ER1 exh.±	Correction - return air		0.0K	
P742	ER1 room ±	Correction - room air		0.0K	
P743	ER1 sw.diff	Switching difference - energy supply		1.0K	
P744	ER1 neutral	Neutral zone - energy supply		3.0K	
Switching points					
P780	2P1 sw.pt	Switching point, humidification pump	Relay R5	90 %	
P781	2P1 sw.diff	Switching difference, humidif. pump	Relay R5	80%	
Delays					
P801	TM1 time	Switch-on delay, fans	Relay R4	30s	
Options					
External setpoint					
A010	Ext.setp.	External setpoint	On	1	
	Input E5 setpoint adjuster (XPESF001)				
A150	E5 Function	Setpoint adjuster		51	
A152	E5 Set Max	Range maximum		40.0°C	
A153	E5 Set min	Range minimum		0.0°C	
A154	E5 Cal.Max	Calibration of range maximum		°C	
A155	E5 Cal.Midd	Calibration of range midpoint	Possible only on device	°C	
A156	E5 Cal.Min	Calibration of range minimum		°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Input E4 outside air temperature				
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
A141	E4 Scheme	Sensor multiplication	Normal input (off)	0	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		1.0	
P543	SPS1 Lim wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Controller					
A012	Control	Control behaviour	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection D2					
A013	Frost	Frost protection/overheating protection	Off	0	
			Frost protection	1	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Off	0	
			Stand-by mode	1	
			Night cooling	2	
			Stand-by mode.+Night cooling	3	
D500	Clk chan. 2	Timer channel 2		3	
D501	Clk C2 mode	Mode		1	
	Stand-by mode				
D112	Setpoint 2	Setpoint 'Reduced'		15.0°C	
P763	FC1 sw.diff	Switching difference SD	In stand-by mode	2.0K	
	Free night cooling				
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	

Number	Display	Function	Additional information	Factory setting	Setting
External setpoint, humidity					
A020	Ext.setp.	External setpoint, humidity	On	1	
	Input E6 setpoint adjuster (XPESF001)				
A160	E6 Function	Setpoint adjuster		53	
A162	E6 Set Max	Range maximum		100.0% r.h.	
A163	E6 Set min	Range minimum		0.0% r.h.	
A164	E6 Cal.Max	Calibration of range maximum		% r.h.	
A165	E6 Cal.Midd	Calibration of range midpoint	Possible only on device	% r.h.	
A166	E6 Cal.Min	Calibration of range minimum		% r.h.	
A168	E6 Sim.val.	Simulation value	In case of sensor error	55.0% r.h.	
Measuring points					
MP1		Active setpoint (D116)			
MP2		Main setpoint (D117)			
MP3		Auxiliary setpoint (D118)			
MP4		Positioning signal, main controller			
MP5		Stand-by mode (0/1)			
MP6		FNC mode (0/1)			
MP7		Control mode (0/1)			

3.1.29 Application 915

Constant supply air control TS H 2Z

Plant design 2 zones:

- Outside and exhaust air damper
- Supply and return air fan
- Air heater with control valve
- Supply air or room temperature sensor
- Outside temperature sensor (option - without TA sensor, no alarm)

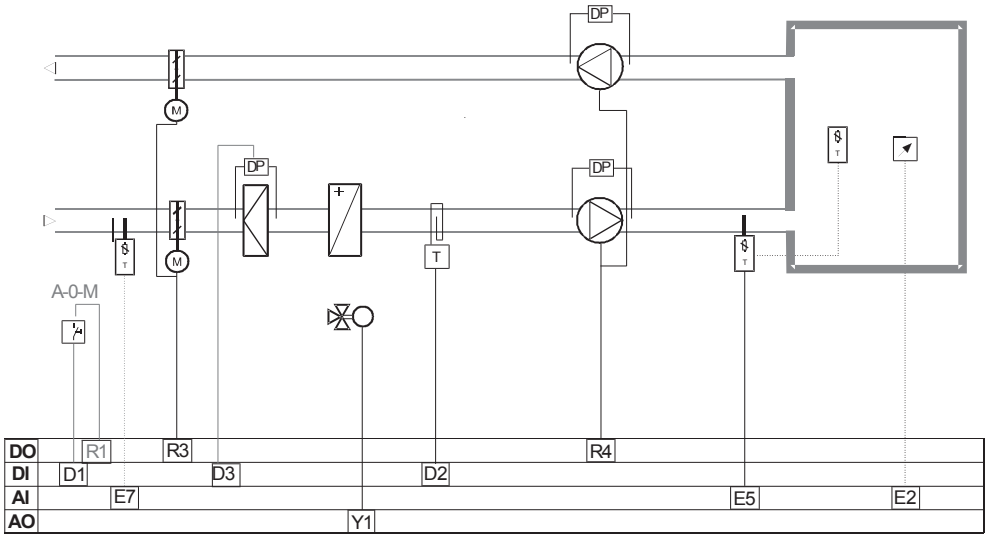
Control functions:

- Temperature control, supply air - fixed value with ta shift (optional)

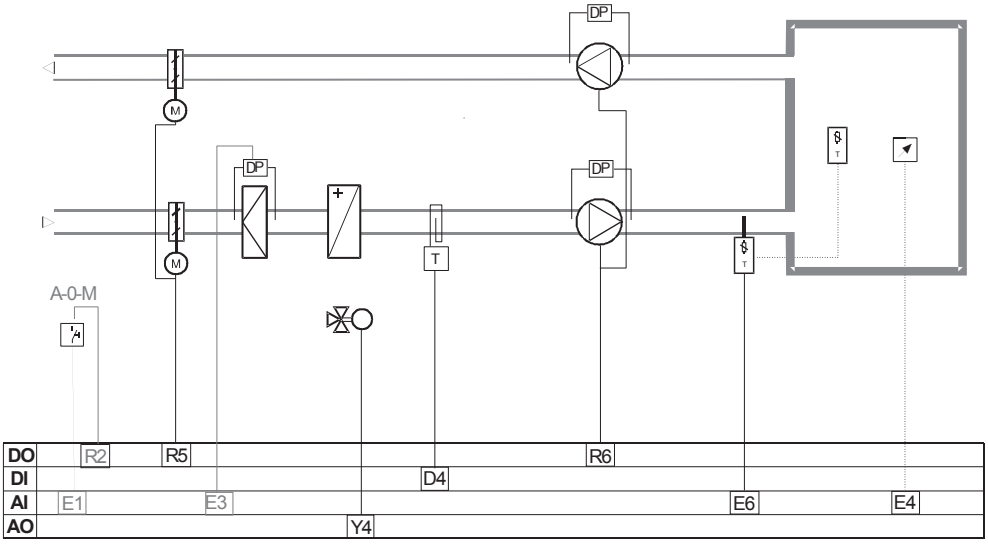
Control functions:

- Enable dampers
- Delay fan switching
- Main (plant) switch
- Frost protection function
- Stand-by mode (only with room temperature)

Plant schematic, zone 1:



Plant schematic, zone 2:



Description (2 zones):

Function

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the supply air or room temperature with the setpoint and controls the heating valve according to the control deviation. The supply air temperature is limited.

When the plant is switched off from the main switch, the fans are switched off, and the heating valve and dampers are closed.

Options

External setpoint

According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via the setpoint adjuster, XPESF001.

In addition, a room operating unit can be used to switch the plant over from automatic to continuous or stand-by mode.

Setpoint shift

The setpoint is changed in relation to the outside temperature according to the adjusted inflluence.

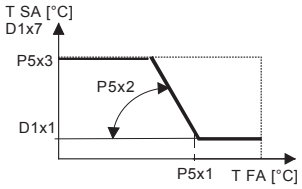
Frost protection

The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. The heating valve is opened fully. The frost protection is still active when the plant is switched off.

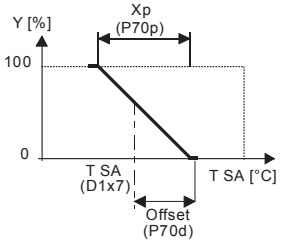
Reduced mode (timer)

The timer programme switches the plant off until stand-by mode becomes active. In reduced mode, the plant remains switched off as long as the room temperature does not fall below the reduction setpoint (D1x2). Below this value, the plant switches on, heating valve Y1 is fully opened and continues to function as long as the room temperature is less than two degrees (P7x3) above the setpoint (D1x2).

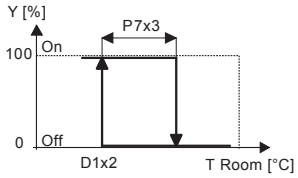
3.1.29.1 Functional diagrams



Setpoint shift acc. to outside temperature (option)



Heating sequence



Stand-by mode with reduced setpoint (room temperature)

3.1.29.2 Parameter list

Constant supply air control, TS H 2Z

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Z1 setp	22.0°C	Room setpoint	Zone 1		
A.val su	20.2°C	Actual room value	Zone 1		
Z2 setp	22.0°C	Room setpoint	Zone 2		
A.val su	20.2°C	Actual room value	Zone 2		
Setpoints					
D111	Setpoint 1	Setpoint ‘Normal’, zone 1		22.0°C	
D112	Setpoint 2	Setpoint ‘Reduced’, zone 1	Timer / room remote control	15.0°C	
D121	Z2 setp 1	Setpoint ‘Normal’, zone 2		22.0°C	
D122	Z2 setp 2	Setpoint ‘Reduced’, zone 2	Timer / room remote control	15.0°C	
Timer					
D400	Clk chan. 1	Timer channel 1		3	
D401	Clk C1 mode	Mode		1	
D500	Clk chan. 2	Timer channel 2		3	
D501	Clk C2 mode	Mode		1	
Basic configuration					
A001	Application	Application	TS H 2Z	915	
	Options (described on the following pages)				
A010	Z1 ext.setp	External setpoint, Z1	Off	0	
A011	Z1 shift	Setpoint shift, Z1	Off	0	
A013	Z1 Frost	Frost protection	On	1 (always active)	
A014	Z1 red.mod.	Reduced mode (timer) Only with room temperature	Off	0	
A020	Z2 ext.setp	External setpoint, Z2	Off	0	
A021	Z2 shift	Setpoint shift, Z2	Off	0	
A023	Z2 Frost	Frost protection	On	1 (always active)	
A024	Z2 red.mod.	Reduced mode (timer) Only with room temperature	Off	0	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Main switch, zone 2	Active if high	102	
A120	E2 Function	Setpoint adjuster, zone 1	Not used	0	
A130	E3 Function	Filter DD alarm	Active if low	101	
A140	E4 Function	Setpoint adjuster, zone 2	Not used	0	
A150	E5 Function	Supply air temperature sensor, zone 1	Temp. Ni1000	3	
A157	E5 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A160	E6 Function	Supply air temperature sensor, zone 2	Temp. Ni1000	3	
A167	E6 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A168	E6 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A170	E7 Function	Outside temp. sensor	Not used	0	

Number	Display	Function	Additional information	Factory setting	Setting
	Digital inputs				
A210	D1 Function	Main switch, zone 1	Active if high	102	
A220	D2 Function	Frost protection monitor, zone 1	Active if low	101	
A230	D3 Function	Filter DD alarm	Active if low	101	
A240	D4 Function	Frost protection monitor, zone 2	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve 'heating', zone 1	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A340	Y4 Function	Three-way valve 'heating', zone 2	Analogue output	1	
A341	Y4 Action	Directional control	Normal 0-10VDC	0	
A342	Y4 Max	Maximum value	Output Y4	100.0%	
A343	Y4 Min	Minimum value	Output Y4	0.0%	
	Digital outputs				
A410	R1 Function	Timer channel 1	Digital (On)	2	
A411	R1 Action	Directional control	Normal NO	0	
A414	R1 Td on	Switch-on delay		0s	
A415	R1 Td off	Switch-off delay		0s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 Blocking	Blocking		0	
A420	R2 Function	Timer channel 2	Digital (On)	2	
A421	R2 Action	Directional control	Normal NO	0	
A424	R2 Td on	Switch-on delay		0s	
A425	R2 Td off	Switch-off delay		0s	
A426	R2 min on	Minimum operating time		0s	
A427	R2 min off	Minimum idle time		0s	
A428	R2 Blocking	Blocking		0	
A430	R3 Function	Damper actuator, zone 1	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking		0	
A440	R4 Function	Fan, zone 1	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking		0	
A450	R5 Function	Damper actuator, zone 2	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking		0	
A460	R6 Function	Fan, zone 2	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking		0	
Limitations					
P500	SP1 Max	Maximum setpoint, zone 1	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint, zone 1	Room setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint, zone 2	Room setpoint	30.0°C	
P503	SP2 Min	Minimum setpoint, zone 2	Room setpoint	15.0°C	

Description

Number	Display	Function	Additional information	Factory setting	Setting
PID controller(s)					
P632	PID1 Tn	PID1 I-term, zone 1	Output Y1	160s	
P633	PID1 Tv	PID1 D-term, zone 1	Output Y1	0.0s	
P642	PID2 Tn	PID2 I-term, zone 2	Output Y4	160s	
P643	PID2 Tv	PID2 D-term, zone 2	Output Y4	0.0s	
Sequences					
	Heating sequence, zone 1				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	5.0K	
	Heating sequence, zone 2				
P702	SEQ2 P-band	Proportional band (Xp)	Output Y4	10.0K	
P703	SEQ2 Offset	Offset (Of)	Output Y4	5.0K	
Delays					
P801	TM1 time	Switch-on delay for fans, Z1	Relay R4	30s	
P802	TM2 time	Switch-on delay for fans, Z2	Relay R6	30s	
Options					
External setpoint					
A010	Z1 ext.setp	External setpoint, zone 1	On	1	
A020	Z2 ext.setp	External setpoint, zone 2	On	1	
	Input E2 setpoint adjuster, zone1				
A120	E2 Function	Setpoint adjuster		51	
A122	E2 Set Max	Range maximum		40.0°C	
A123	E2 Set min	Range minimum		0.0°C	
A124	E2 Cal.Max	Calibration of range maximum		°C	
A125	E2 Cal.Midd	Calibration of range midpoint	Possible only on device	°C	
A126	E2 Cal.Min	Calibration of range minimum		°C	
A128	E2 Sim.val.	Simulation value	In case of sensor error	22.0°C	
	Input E4 setpoint adjuster, zone 2				
A140	E4 Function	Setpoint adjuster	^	51	
A142	E4 Set Max	Range maximum		40.0°C	
A143	E4 Set min	Range minimum		0.0°C	
A144	E4 Cal.Max	Calibration of range maximum		°C	
A145	E4 Cal.Midd	Calibration of range midpoint	Possible only on device	°C	
A146	E4 Cal.Min	Calibration of range minimum		°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Z1 shift	Setpoint shift, zone 1	Winter	1	
			Summer	2	
			Winter + summer	3	
A021	Z2 shift	Setpoint shift, zone 2	Winter	1	
			Summer	2	
			Winter + summer	3	
	Input E7 outside air temperature				
A170	E7 Function	Outside temp. sensor	Temp. Ni1000	1	
A177	E7 Cal.temp	Temperature calibration		°C	
A178	E7 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Shift parameters, zone 1				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		1.0	
P543	SPS1 Lim wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
	Shift parameters, zone 2				
P551	SPS2 pt wi	Winter cut-in point		15.0°C	
P552	SPS2 inf wi	Winter influence		1.0	
P553	SPS2 Lim wi	Winter limitation		30.0°C	
P554	SPS2 pt su	Summer cut-in point		24.0°C	
P555	SPS2 inf su	Summer influence		0.5	
P556	SPS2 Lim su	Summer limitation		26.0°C	

Number	Display	Function	Additional information	Factory setting	Setting
Options					
Frost protection D2					
A013	Z1 Frost	Frost protection/overheating protection	Off	0	
			Frost protection	1	
Reduced mode (stand-by mode with timer)					
A014	Z1 red.mod.	Reduced mode, zone 1	Stand-by mode on	1	
A024	Z2 red.mod.	Reduced mode, zone 2	Stand-by mode on	1	
	Stand-by mode, zone 1				
D112	Setpoint 2	Setpoint (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Stand-by mode, zone 2				
D122	Z2 setpoint 2	Setpoint (reduced)	In stand-by mode	15.0°C	
D500	Clk chan. 2	Timer channel 2		1	
P773	FC2 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
Measuring points					
MP1		Active setpoint, zone 1 (D116)			
MP2		Main setpoint, zone 1 (D117)			
MP3		Positioning signal, main controller, zone 1			
MP4		Control mode, zone 1 (0/1)			
MP5		Active setpoint, zone 2 (D126)			
MP6		Main setpoint, zone 2 (D127)			
MP7		Positioning signal, main controller, zone 2			
MP8		Control mode, zone 2 (0/1)			

3.1.30 Application 916

Supply air/return air cascade control, 2 zones, CTR HC 2Z

Plant design (2 zones):

- Outside and exhaust air damper
- Supply and return air fan
- Air heater, air cooler with control valve
- Supply air, return air or room temperature sensor
- Outside temperature sensor (option: without TA sensor, no alarm)

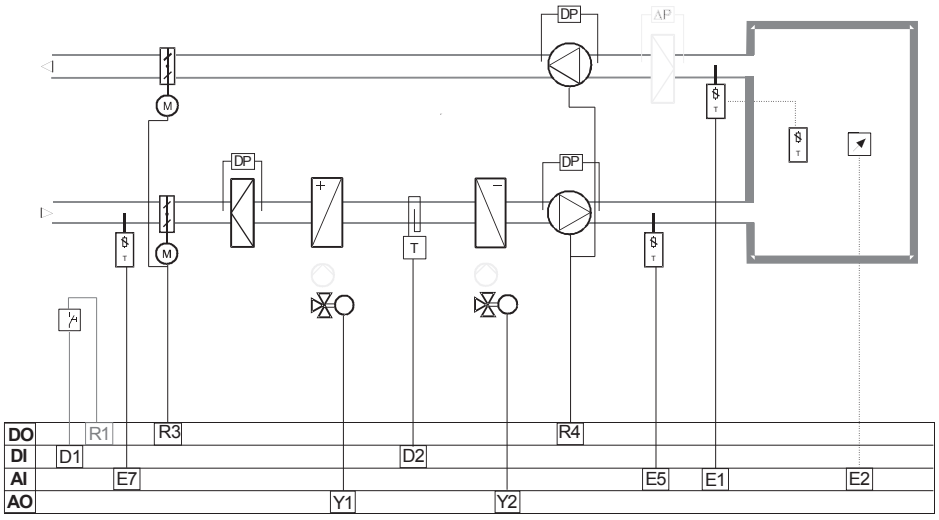
Control functions:

- Temperature control, return air-supply air, cascade with ta shift (optional) or supply air, fixed value with ta shift (optional)

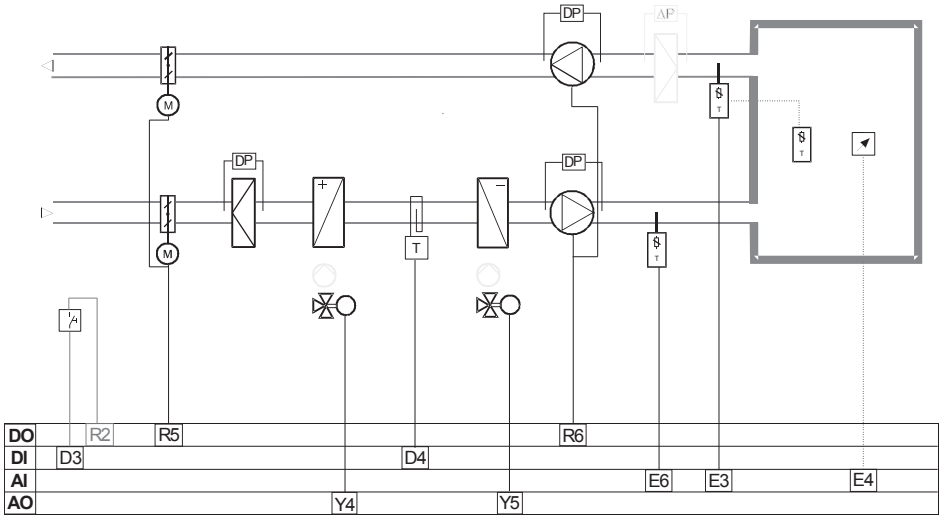
Control functions:

- Enable dampers
- Delay fan switching
- Main (plant) switch
- Frost protection function
- Stand-by mode
- Free night cooling

Plant schematic, zone 1:



Plant schematic, zone 2:



Description (2 zones):

Functions

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1 or cooling valve Y2 according to the control deviation. The supply air temperature is limited.

When the plant is switched off from the main switch, the fans are switched off, and the heating valve and dampers are closed.

Options

External setpoint

According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via the setpoint adjuster, XPESF001.

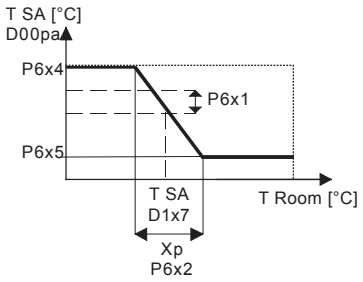
Setpoint shift
The setpoint is changed in relation to the outside temperature, according to the adjusted influence.

Frost protection
The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. The heating valve is opened fully and the air heater pump is switched on. The frost protection is still active when the plant is switched off.

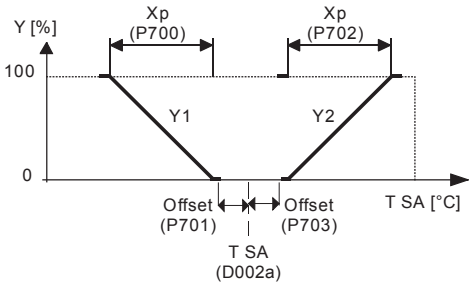
Reduced mode (timer) only with cascade or room temperature (fixed value controller)
Channel 1
The timer programme switches the plant off. In reduced mode, the plant remains switched off as long as the room temperature does not fall below the reduction setpoint (D112). Below this value, the plant switches on, heating valve Y1 is fully opened and continues to function as long as the room temperature is less than two degrees (P763) above the setpoint (D112).

Channel 2
If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2 provided that the conditions are met. In reduced mode, the plant remains off as long as the room temperature is not two degrees (P765) above the calculated setpoint D117, and is not more than five degrees (P765) above the outside temperature. If this value is reached, the plant switches on with closed valves. The plant switches off again if the room temperature falls below calculated setpoint D117, or if the different in relation to the outside temperature is one degree less than parameter P764. Free night cooling does not become active at an outside temperature below ten degrees (P766).

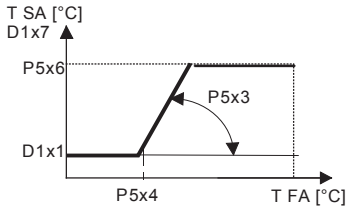
3.1.30.1 Functional diagrams



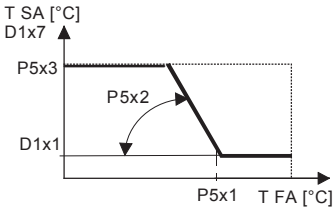
Return-supply air cascade



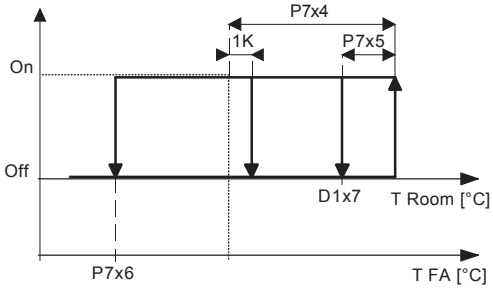
Heating-cooling sequence



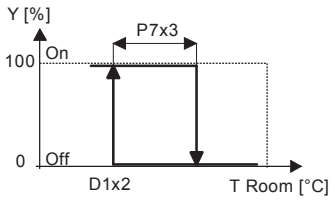
Summer setpoint shift, cascade,
acc. to outside temperature (option)



Winter setpoint shift, fixed value,
acc. to outside temperature (option)



Free night cooling



Stand-by mode with reduced
setpoint (room temperature)

3.1.30.2 Parameter list

Supply air/return air cascade control, CTR HC 2Z

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Z1 setp	22.0°C	Room setpoint	Zone 1		
Act. val	20.2°C	Actual room value	Zone 1		
Z1 setp	29.0°C	Supply air setpoint	Zone 1		
A.val su	28.2°C	Supply air - actual value	Zone 1		
Z2 setp	22.0°C	Room setpoint	Zone 2		
Act. val	28.2°C	Actual room value	Zone 2		
Z2 setp	29.0°C	Supply air setpoint	Zone 2		
A.val su.	28.2°C	Supply air - actual value	Zone 2		
Setpoints					
D111	Setpoint 1	Setpoint ‘Normal’, zone 1		20.0°C	
D112	Setpoint 2	Setpoint ‘Reduced’, zone 1	Timer / room remote control	15.0°C	
D121	Z2 setp 1	Setpoint ‘Normal’, zone 2		20.0°C	
D122	Z2 setp 2	Setpoint ‘Reduced’, zone 2	Timer / room remote control	15.0°C	

Number	Display	Function	Additional information	Factory setting	Setting
Timers					
D400	Clk chan. 1	Timer channel 1		3	
D401	Clk C1 mode	Mode		1	
D500	Clk chan. 2	Timer channel 2		3	
D501	Clk C2 mode	Mode		1	
Basic configuration					
A001	Application	Application	CTR HC 2Z	916	
	Options (described on the following pages)				
A010	Z1 ext.setp	External setpoint, zone 1	Off	0	
A011	Z1 shift	Setpoint shift, zone 1	Off	0	
A012	Z1 Control	Control behaviour	Cascade	2	
A013	Z1 protect.	Frost protection, zone 1	On	1 (always active)	
A014	Z1 red.mod.	Night cooling (timer), zone 1	Off	0	
		Only with cascade controller or room temperature (fixed value controller)			
A020	Z2 ext.setp	External setpoint, zone 2	Off	0	
A021	Z2 shift	Setpoint shift, zone 2	Off	0	
A022	Z2 Control	Control behaviour, zone 2	Cascade	2	
A023	Z2 protect.	Frost protection, zone 2	On	1 (always active)	
A024	Z2 red.mod.	Night cooling (timer), zone 2	Off	0	
		Only with cascade controller or room temperature (fixed value controller)			
I/O configuration					
	Analogue inputs				
A110	E1 Function	Return air temperature sensor, zone 1	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication	Normal input (off)	0	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A120	E2 Function	Setpoint adjuster, zone 1	Not used	0	
A130	E3 Function	Return air temperature sensor, zone 2	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Setpoint adjuster, zone 2	Not used	0	
A150	E5 Function	Supply air temperature sensor, zone 1	Temp. Ni1000	3	
A157	E5 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A160	E6 Function	Supply air temperature sensor, zone 2	Temp. Ni1000	3	
A167	E6 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A168	E6 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A170	E7 Function	Outside temp. sensor	Not used	0	
	Digital inputs				
A210	D1 Function	Main switch, zone 1	Active if high	102	
A220	D2 Function	Frost protection mon./overheating th. Z1	Active if low	101	
A230	D3 Function	Main switch, zone 2	Active if high	102	
A240	D4 Function	Frost protection mon./overheating th. Z2	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve ‘heating’, zone 1	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A320	Y2 Function	Three-way valve ‘cooling’, zone 1	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A340	Y4 Function	Three-way valve ‘heating’, zone 2	Analogue output	1	
A341	Y4 Action	Directional control	Normal 0-10VDC	0	
A342	Y4 Max	Maximum value	Output Y4	100.0%	
A343	Y4 Min	Minimum value	Output Y4	0.0%	
A350	Y5 Function	Three-way valve ‘cooling’, zone 2	Analogue output	1	
A351	Y5 Action	Directional control	Normal 0-10VDC	0	
A352	Y5 Max	Maximum value	Output Y5	100.0%	
A353	Y5 Min	Minimum value	Output Y5	0.0%	

Description

Number	Display	Function	Additional information	Factory setting	Setting
	Digital outputs				
A410	R1 Function	Timer channel 1	Digital (On)	2	
A411	R1 Action	Directional control	Normal NO	0	
A414	R1 Td on	Switch-on delay		0s	
A415	R1 Td off	Switch-off delay		0s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 Blocking	Blocking		0	
A420	R2 Function	Timer channel 2	Digital (On)	2	
A421	R2 Action	Directional control	Normal NO	0	
A424	R2 Td on	Switch-on delay		0s	
A425	R2 Td off	Switch-off delay		0s	
A426	R2 min on	Minimum operating time		0s	
A427	R2 min off	Minimum idle time		0s	
A428	R2 Blocking	Blocking		0	
A430	R3 Function	Damper actuator, zone 1	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking		0	
A440	R4 Function	Fan, zone 1	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking		0	
A450	R5 Function	Damper actuator, zone 2	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking		0	
A460	R6 Function	Fan, zone 2	Digital (On)	2	
A461	R6 Action	Directional control	Normal NO	0	
A464	R6 Td on	Switch-on delay		0s	
A465	R6 Td off	Switch-off delay		0s	
A466	R6 min on	Minimum operating time		0s	
A467	R6 min off	Minimum idle time		0s	
A468	R6 Blocking	Blocking		0	
Limitations					
P500	SP1 Max	Maximum setpoint, zone 1	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint, zone 1	Room setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint, zone 2	Room setpoint	30.0°C	
P503	SP2 Min	Minimum setpoint, zone 2	Room setpoint	15.0°C	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK), zone 1	Supply air at room setpoint	5.0K	
P602	C1 P-band	P-band (XpK), zone 1		2.0K	
P603	C1 Tn	I-term, zone 1		0s	
P604	C1 Max	Maximum supply air setpoint, zone 1		30.0°C	
P605	C1 Min	Minimum supply air setpoint, zone 1		15.0°C	
P611	C2 Offset	Setpoint offset (OfK), zone 2	Supply air at room setpoint	5.0K	
P612	C2 P-band	P-band (XpK), zone 2		2.0K	
P613	C2 Tn	I-term, zone 2		0s	
P614	C2 Max	Maximum supply air setpoint, zone 2		30.0°C	
P615	C2 Min	Minimum supply air setpoint, zone 2		15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term, zone 1	Outputs Y1 and Y2	300s	
P633	PID1 Tv	PID1 D-term, zone 1	Outputs Y1 and Y2	0.0s	
P642	PID2 Tn	PID2 I-term, zone 2	Outputs Y4 and Y5	300s	
P643	PID2 Tv	PID2 D-term, zone 2	Outputs Y4 and Y5	0.0s	

Number	Display	Function	Additional information	Factory setting	Setting
Sequences					
	Heating sequence, zone 1				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	-2.0K	
	Cooling sequence, zone 1				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	2.0K	
	Heating sequence, zone 2				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y4	10.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y4	-2.0K	
	Cooling sequence, zone 2				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y5	10.0K	
P707	SEQ4 Offset	Offset (Of4)	Output Y5	2.0K	
Delays					
P801	TM1 time	Switch-on delay for fans, zone 1	Relay R4	30s	
P802	TM2 time	Switch-on delay for fans, zone 2	Relay R6	30s	
Options					
External setpoint					
A010	Z1 ext.setp	External setpoint, zone 1	On	1	
A020	Z2 ext.setp	External setpoint, zone 2	On	1	
	Input E2 setpoint adjuster, zone1				
A120	E2 Function	Setpoint adjuster		51	
A122	E2 Set Max	Range maximum		40.0°C	
A123	E2 Set min	Range minimum		0.0°C	
A124	E2 Cal.Max	Calibration of range maximum		°C	
A125	E2 Cal.Midd	Calibration of range midpoint	Possible only on device	°C	
A126	E2 Cal.Min	Calibration of range minimum		°C	
A128	E2 Sim.val.	Simulation value	In case of sensor error	22.0°C	
	Input E4 setpoint adjuster, zone 2				
A140	E4 Function	Setpoint adjuster		51	
A142	E4 Set Max	Range maximum		40.0°C	
A143	E4 Set min	Range minimum		0.0°C	
A144	E4 Cal.Max	Calibration of range maximum		°C	
A145	E4 Cal.Midd	Calibration of range midpoint	Possible only on device	°C	
A146	E4 Cal.Min	Calibration of range minimum		°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Z1 shift	Setpoint shift, zone 1	Winter	1	
			Summer	2	
			Winter + summer	3	
A021	Z2 shift	Setpoint shift, zone 2	Winter	1	
			Summer	2	
			Winter + summer	3	
	Input E7 outside air temperature				
A170	E7 Function	Outside temp. sensor	Temp. Ni1000	3	
A177	E7 Cal.temp	Temperature calibration		°C	
A178	E7 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Shift parameters, zone 1				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		1.0	
P543	SPS1 Lim wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim so	Summer limitation		26.0°C	
	Shift parameters, zone 2				
P551	SPS2 pt wi	Winter cut-in point		15.0°C	
P552	SPS2 inf wi	Winter influence		1.0	
P553	SPS2 Lim wi	Winter limitation		30.0°C	
P554	SPS2 pt su	Summer cut-in point		24.0°C	
P555	SPS2 inf su	Summer influence		0.5	
P556	SPS2 Lim su	Summer limitation		26.0°C	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Controller(s)					
A012	Z1 Control	Control behaviour, zone 1	Fixed value (supply air control)	1	
			Cascade (room control)	2	
A022	Z2 Control	Control behaviour, zone 2	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection/overheating protection					
A013	Z1 protect.	Frost protection, zone 1	Off	0	
			Frost protection	1	
A023	Z2 protect.	Frost protection, zone 2	Off	0	
			Frost protection	1	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Z1 red.mod.	Reduced mode, zone 1	Off	0	
			Stand-by mode	1	
			Night cooling	2	
			Stand-by mode + night cooling	3	
A024	Z2 red.mod.	Reduced mode, zone 2	Off	0	
			Stand-by mode	1	
			Night cooling	2	
			Stand-by mode + night cooling	3	
D600	Clk chan. 3	Timer channel 3	Free night cooling	3	
D601	Clk C3 mode	Mode		1	
	Stand-by mode, zone 1				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling, zone 1				
D600	Clk chan. 3	Timer channel 3		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
	Stand-by mode, zone 2				
D122	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D500	Clk chan. 2	Timer channel 2		1	
P773	FC2 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling, zone 2				
D600	Clk chan. 3	Timer channel 3		1	
P774	FC2 Neutral	Neutral range, night		5.0K	
P775	FC2 on offs	Cut-in point FNC/setpoint		2.0K	
P776	FC2 te min	Minimum outside temperature	Enable night cooling	10.0°C	
Measuring points					
MP1		Active setpoint, zone 1 (D116)			
MP2		Main setpoint, zone 1 (D117)			
MP3		Positioning signal, main controller, zone 1			
MP4		Control mode, zone 1 (0/1)			
MP5		Active setpoint, zone 2 (D126)			
MP6		Main setpoint, zone 2 (D127)			
MP7		Positioning signal, main controller, zone 2			
MP8		Control mode, zone 2 (0/1)			

3.1.31 Application 921

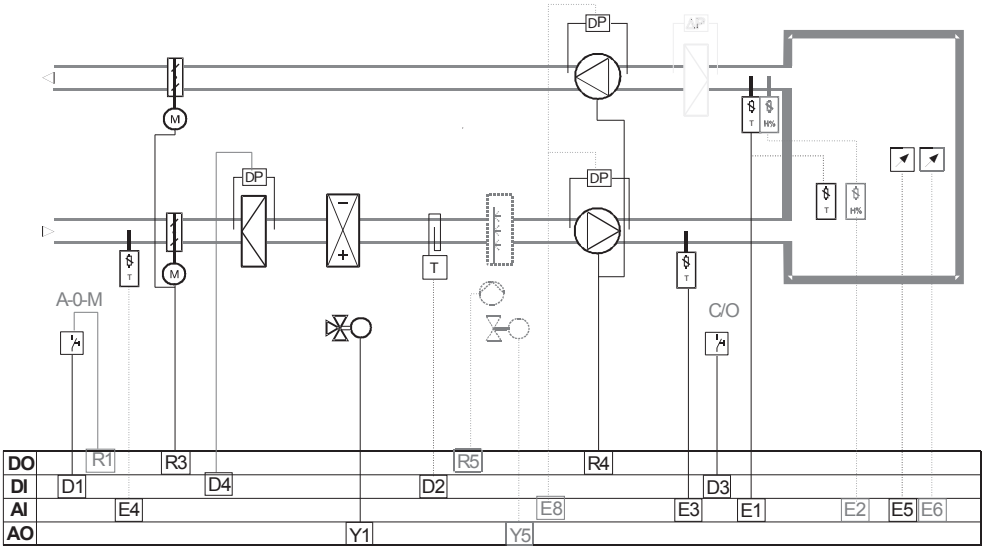
Supply air/return air cascade control with change-over, CTFR cB, without/with humidification

Plant design:
- Outside and exhaust air damper
- Supply and return air fan
- Heat exchanger, heating/cooling with control valve
- Supply air, return air or room temperature sensor
- Outside temperature sensor

Control functions:
- Temperature control, return air-supply air - cascade with ta shift (optional) or supply air, fixed value with ta shift (optional)
- Humidity control, return air or room fixed value

Control functions:
- Enable dampers
- Delay fan switching
- Change-over function
- Main (plant) switch
- Frost protection function
- Stand-by mode
- Free night cooling
- Fan, V-belt

Plant schematic:



Description:

Functions

When the plant is switched on, the dampers are opened initially. After a delay, the control is then enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1 according to the control deviation. If the digital input change-over is enabled, sequence Y1 heating changes to Y1 cooling.
The supply air temperature is limited.

The humidity control, when enabled, compares the room or return air humidity with the setpoint and controls humidification pump R5 or valve Y5 according to the control deviation.
When the plant is switched off from the main switch, the fans are switched off, and the valve and dampers are closed.

Options
External setpoint
According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via the setpoint adjuster, XPESF001.

Setpoint shift
The setpoint is changed in relation to the outside temperature, according to the adjusted influence (see the diagram).

Frost protection
The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. Valve Y1 is fully opened. The frost protection is still active when the plant is switched off, but in case of change-over cooling, the frost protection is not effective.

Humidity control
If humidity control is active, the controller compares the current humidity value with the setpoint and acts on relay R5 and analogue output Y5 according to the deviation.

Free night cooling
In reduced mode, the plant remains off as long as the room temperature is not two degrees (P765) above the calculated setpoint D117, and is not more than five degrees (P765) above the outside temperature. If this value is reached, the plant switches on with closed valves . The plant switches off again if the room temperature falls below calculated setpoint D117, or if the different in relation to the outside temperature is one degree less than parameter P764. Free night cooling does not become active at an outside temperature below ten degrees (P766)..

Reduced mode (timer) only with cascade or room temperature (fixed controller)
Channel 1
The timer programme switches the plant. In reduced mode, the plant remains switched off as long as the room temperature does not fall below the reduction setpoint (D112). Below this value, the plant switches on, heating valve Y1 is fully opened and continues to function as long as the room temperature is less than two degrees (P763) above the setpoint (D112).

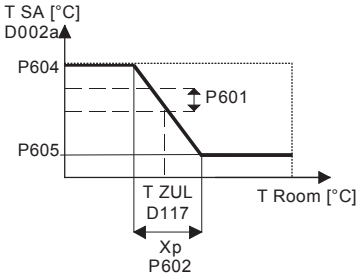
Channel 2
If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2 provided that the conditions are met. In reduced mode, the plant remains off as long as the room temperature is not two degrees (P765) above the calculated setpoint D117, and is not more than five degrees (P765) above the outside temperature. If this value is reached, the plant switches on with closed

valves. The plant switches off again if the room temperature falls below calculated setpoint D117, or if the different in relation to the outside temperature is one degree less than parameter P764. Free night cooling does not become active at an outside temperature below ten degrees (P766).

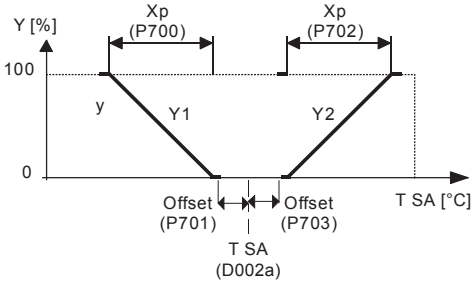
Enable change-over
Change-over cooling mode is enabled.

External setpoint humidity
According to choice an external setpoint for humidity can be used.

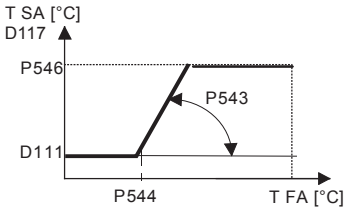
3.1.31.1 Functional diagrams



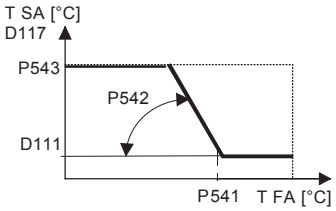
Return-supply air cascade



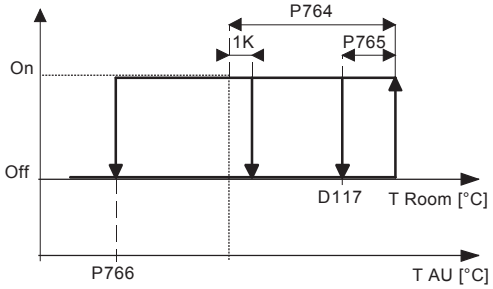
Heating-cooling sequence



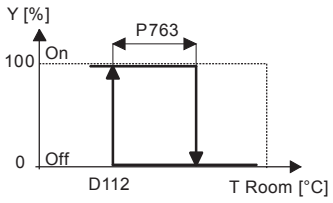
Summer setpoint shift, cascade,
acc. to outside temperature (option)



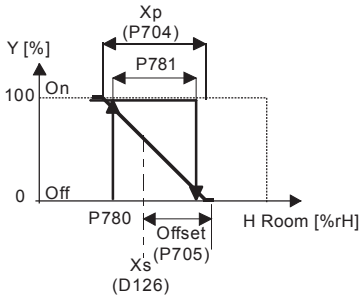
Winter setpoint shift, fixed value,
acc. to outside temperature (option)



Free night cooling



Stand-by mode with reduced
setpoint (room temperature)



Return air room humidity control

3.1.31.2 Parameter list

Supply air/return air cascade control with change-over, CTFR cB, without/with humidification

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room setpoint			
Act. val	20.2°C	Actual room value			
Setp. sup	38.0°C	Supply air setpoint			
A.val su	27.2°C	Supply air - actual value			
Setpoints					
D111	Setpoint 1	Setpoint 'Normal'		22.0°C	
D112	Setpoint 2	Setpoint 'Reduced'	Timer / room remote control	15.0°C	
D121	Setpoint 1	Setpoint humidity		55% r.h.	
Timer					
D400	Clk chan. 1	Timer channel 1		3	
D401	Clk C1 mode	Mode		1	
Basic configuration					
A001	Application	Application	CTFR cB	921	
A002	Humidify	Humidification	Off	0	
	Options (described on the next page)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour	Cascade	2	
A013	Frost	Frost protection	On	1 (always active)	
A014	Red. mode	Night cooling (timer)	Off	0	
		Only with cascade controller or room temperature (fixed controller)			
A015	Release C	Enable change-over	Off	0	
A020	Ext.setp.h	External setpoint	Off	0	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Return air temperature sensor	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication	Normal input (off)	0	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A120	E2 Function	Room humidity sensor	Humidity 0-10V	21	
A122	E2 Set Max	Upper range limit	Active sensor at 10V	100% r.h.	
A123	E2 Set min	Lower range limit	Active sensor at 0V	0.0% r.h.	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Outside temp. sensor	Not used	0	
A150	E5 Function	Setpoint adjuster	Not used	0	
A160	E6 Function	Setpoint adjuster	Not used	0	
A180	E8 Function	Fan belt alarm	Active if low	101	
	Digital inputs				
A210	D1 Function	Main switch	Active if high	102	
A220	D2 Function	Frost protection mon./overheating th.	Active if low	101	
A230	D3 Function	Change-over	Active if low	101	
A240	D4 Function	Filter DD alarm	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve 'heating' / 'cooling'	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A350	Y5 Function	Three-way valve 'humidification'	Analogue output	1	
A351	Y5 Action	Directional control	Normal 0-10VDC	0	
A352	Y5 Max	Maximum value	Output Y5	100.0%	
A353	Y5 Min	Minimum value	Output Y5	0.0%	

Number	Display	Function	Additional information	Factory setting	Setting
	Digital outputs				
A410	R1 Function	Timer channel 1	Digital (On)	2	
A411	R1 Action	Directional control	Normal NO	0	
A414	R1 Td on	Switch-on delay		0s	
A415	R1 Td off	Switch-off delay		0s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 Blocking	Blocking		0	
A430	R3 Function	Damper actuator	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking		0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking		0	
A450	R5 Function	Humidification pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking		0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint	Humidity	80% r.h.	
P503	SP2 Min	Minimum setpoint	Humidity	40% r.h.	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK)	Supply air at room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint		30.0°C	
P605	C1 Min	Minimum supply air setpoint		15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term	Output Y1	160s	
P633	PID1 Tv	PID1 D-term	Output Y1	0.0s	
P642	PID2 Tn	PID2 I-term, humidity controller	Output Y5	0s	
P643	PID2 Tv	PID2 D-term, humidity controller.	Output Y5	0.0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp1)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of1)	Output Y1	5.0K	
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y1	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y1	-5.0K	
	Humidification				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y5	5.0% r.h.	
P705	SEQ3 Offset	Offset (Of3)	Output Y5	-2.0% r.h.	
Switching points					
P780	2P1 sw.pt	Switching point, humidification pump	Relay R5	90 %	
P781	2P1 sw.diff	Switching difference, humidif. pump	Relay R5	80 %	
Delays					
P801	TM1 time	Switch-on delay, fans	Relay R4	30s	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Options					
External setpoint					
A010	Ext.setp.	External setpoint	On	1	
	Input E5 setpoint adjuster				
A150	E5 Function	Setpoint adjuster		51	
A152	E5 Set Max	Range maximum		40.0°C	
A153	E5 Set min	Range minimum		0.0°C	
A154	E5 Cal.Max	Calibration of range maximum		°C	
A155	E5 Cal.Midd	Calibration of range midpoint	Possible only on device	°C	
A156	E5 Cal.Min	Calibration of range minimum		°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Input E4 outside air temperature				
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
A141	E4 Scheme	Sensor multiplication	Normal input (off)	0	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Shift parameters				
P541	SWS1 pt wi	Winter cut-in point		15.0°C	
P542	SWS1 inf wi	Winter influence		1.0	
P543	SWS1 Lim wi	Winter limitation		30.0°C	
P544	SWS1 pt su	Summer cut-in point		24.0°C	
P545	SWS1 inf su	Summer influence		0.5	
P546	SWS1 Lim su	Summer limitation		26.0°C	
Controller					
A012	Control	Control behaviour	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection D2					
A013	Frost	Frost protection	Off	0	
			Frost protection	1	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Stand-by mode + night cooling	2	
Timer					
D500	Clk chan. 2	Timer channel 2		3	
D501	Clk C2 mode	Mode		1	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling				
D500	Clk chan. 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
Enable change-over					
A015	Release C	Enable change-over	On	1	
	Cut-in point				
P554	SPS2 pt su	Summer cut-in point	Enable cooling mode	25.0°C	

Number	Display	Function	Additional information	Factory setting	Setting
External setpoint					
A020	Ext.setp.	External setpoint, humidity	On	1	
	Input E6 setpoint adjuster				
A160	E6 Function	Setpoint adjuster		12	
A162	E6 Set Max	Range maximum		100.0% r.h.	
A163	E6 Set min	Range minimum		0.0% r.h.	
A164	E6 Cal.Max	Calibration of range maximum		% r.h.	
A165	E6 Cal.Midd	Calibration of range midpoint	Possible only on device	% r.h.	
A166	E6 Cal.Min	Calibration of range minimum		% r.h.	
A168	E6 Sim.val.	Simulation value	In case of sensor error	55.0% r.h.	
Measuring points					
MP1		Active setpoint (D116)			
MP2		Main setpoint (D117)			
MP3		Auxiliary setpoint (D118)			
MP4		Positioning signal, aux. controller			
MP5		Stand-by mode (0/1)			
MP6		FNC mode (0/1)			
MP7		Control mode (0/1)			

3.1.32 Application 924

Supply air/return air cascade control and constant pre-heater control without/with humidification and dehumidification, CTFR HCEHh

Plant design:

- Outside, recirculation and exhaust air damper with minimum outside air component
- Supply and return air fan
- Pre-heater, air heater, air cooler with control valve
- Supply air, return air or room temperature sensor
- Outside temperature sensor

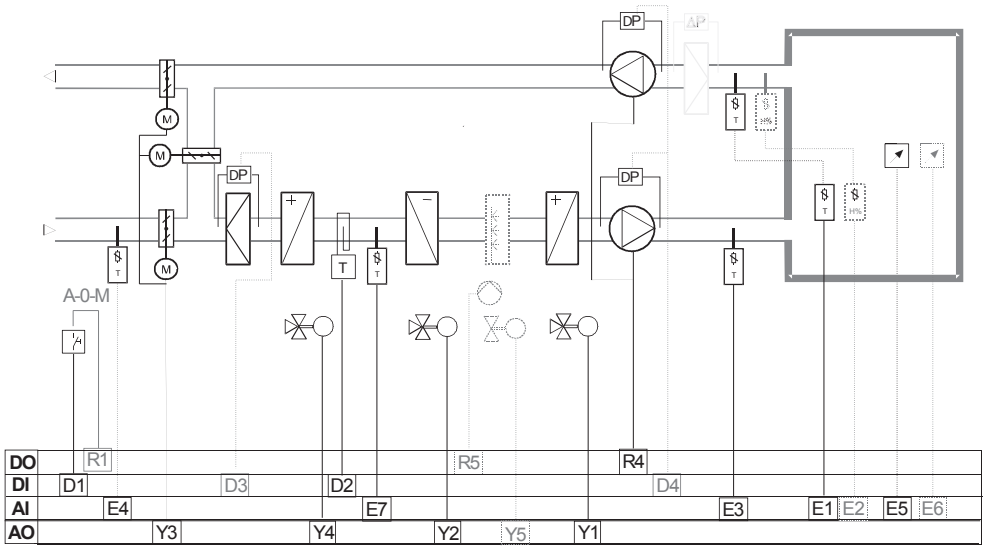
Control functions:

- Temperature control, pre-heater, fixed value
- Temperature control, return air-supply air - cascade with ta shift (optional) or supply air, fixed value with ta shift (optional)
- Humidity control, return air or room fixed value

Control functions:

- Enable dampers
- Delay fan switching
- Main (plant) switch
- Frost protection function
- Stand-by mode
- Free night cooling
- Filter, differential pressure
- Fan, V-belt

Plant schematic:



Description:

Functions

When the plant is switched on, the control is enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1, cooling valve Y2 or outside air dampers

Y3 according to the control deviation. The pre-heater temperature control controls heating valve Y4.
The supply air temperature is limited.
Damper sequence Y3 is enabled if the outside temperature in cooling mode is lower than the room or return air temperature, and in heating mode if it is higher than the room or return air temperature.
The humidity control, when enabled, compares the room or return air humidity with the setpoint and controls humidification pump R5 or valve Y5 and cooling valve Y2 (dehumidification) according to the control deviation.
When the plant is switched off from the main switch, the fans are switched off, and the valves and dampers are closed.

Options
External setpoint
According to choice, the setpoint can be changed or corrected (e.g. +/-3K) via setpoint adjuster XPESF001.

Setpoint shift
The setpoint is changed in relation to the outside temperature, according to the adjusted influence (see the diagram).

Frost protection
The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. Heating valve Y4 is fully opened. The frost protection is still active when the plant is switched off.
Minimum outside air component
When the plant is switched off, the dampers are closed.

Humidity control
If humidity control is active, the controller compares the current humidity value with the setpoint and acts on relay R5 and analogue output Y5 according to the deviation.

Free cooling
In reduced mode, the plant remains off as long as the room temperature is not two degrees (P765) above the calculated setpoint D117, and is not more than five degrees (P765) above the outside temperature. If this value is reached, the plant switches on with closed valves and opens recirculation air damper Y3. The plant switches off again if the room temperature falls below calculated setpoint D117, or if the different in relation to the outside temperature is one degree less than parameter P764. Free night cooling does not become active at an outside temperature below ten degrees (P766).

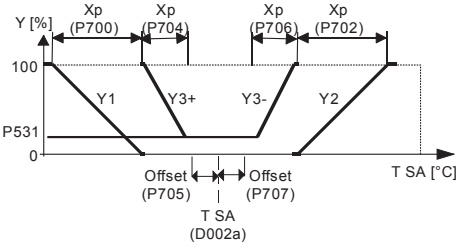
Reduced mode (timer) only with cascade or room temperature (fixed value controller)
Channel 1
The timer programme switches the plant off. In reduced mode, the plant remains switched off as long as the room temperature does not fall below the reduction setpoint (D112). Below this value, the plant switches on, heating valve Y1 is fully opened and continues to function as long as the room temperature is less than

two degrees (P763) above the setpoint (D112). In reduced mode, the recirculation air damper Y3 remains fully open, except in heating mode. Otherwise, the minimum outdoor air volume (P531) is set.

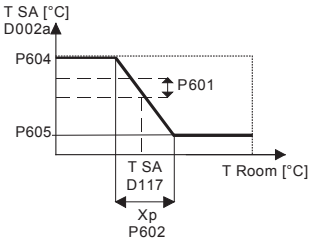
Channel 2

If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2 provided that the conditions are met. In reduced mode, the plant remains off as long as the room temperature is not two degrees (P765) above the calculated setpoint D117, and is not more than five degrees (P765) above the outside temperature. If this value is reached, the plant switches on with closed valves and open recirculation air damper Y3. The plant switches off again if the room temperature falls below calculated setpoint D117, or if the different in relation to the outside temperature is one degree less than parameter P764. Free night cooling does not become active at an outside temperature below ten degrees (P766).

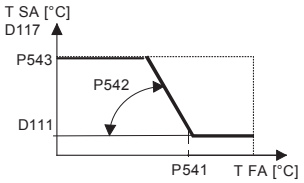
3.1.32.1 Functional diagrams



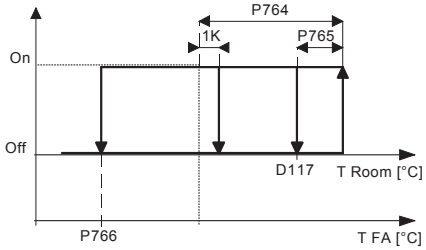
Heating - dampers - cooling sequence



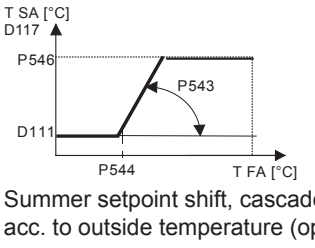
Exhaust air - supply air, cascade



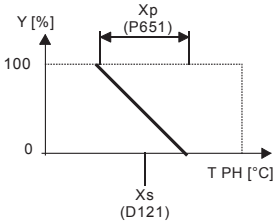
Winter setpoint shift, fixed value, acc. to outside temperature (option)



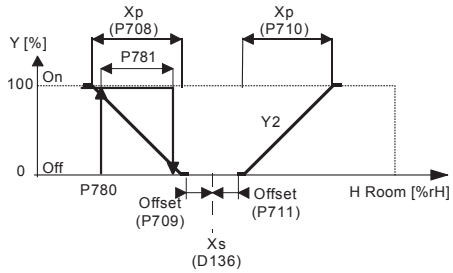
Free night cooling



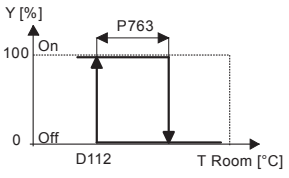
Summer setpoint shift, cascade, acc. to outside temperature (option)



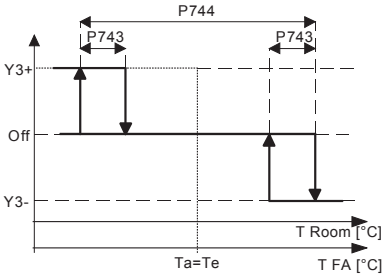
Pre-heater temperature control



Return air room humidity control



Stand-by mode with reduced setpoint (room temperature)



Energy recovery

3.1.32.2 Parameter list

Supply air/return air cascade control and constant pre-heating control without/with humidification/dehumidification, CTFR HCEHh

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room setpoint			
Act. val	20.2°C	Actual room value			
Setp.sup	38.0°C	Supply air setpoint			
A.val su	27.2°C	Supply air - actual value			
Pre.setp	28.0°C	Preheating setpoint			
Pre.val	26.2°C	Preheating actual value			
Setpoints					
D111	Setpoint 1	Setpoint 'Normal'		22.0°C	
D112	Setpoint 2	Setpoint 'Reduced'	Timer / room remote control	15.0°C	
D121	Setpoint 1	Preheating setpoint		20.0°C	
D131	Setpoint 1	Setpoint, humidity		55% r.h.	
Timer					
D400	Clk chan. 1	Timer channel 1		3	
D401	Clk C1 mode	Mode		1	
Basic configuration					
A001	Application	Application	CTFR HCEHh	924	
A002	Humidity	Humidification	Off=0 Humidification = 1 Dehumidification = 2 Humidification and dehumidification = 3	0	
	Options (described on the next page)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Cascade control behaviour	Cascade	2	
A013	Frost	Frost protection	On	1 (always active)	
A014	Red. mode	Night cooling (timer)	Off	0	
		Only with cascade controller or room temperature (fixed value controller)			
A020	Ext.setp.h	External setpoint, humidity	Off	0	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Return air temperature sensor	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication	Normal input (off)	0	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A120	E2 Function	Room humidity sensor	Humidity 0-10V	21	
A122	E2 Set Max	Upper range limit	Active sensor at 10V	100% r.h.	
A123	E2 Set min	Lower range limit	Active sensor at 0V	0.0% r.h.	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
A141	E4 Scheme	Sensor multiplication	Normal input (off)	0	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	0.0°C	
A150	E5 Function	Setpoint adjuster	Not used	0	
A160	E6 Function	Setpoint adjuster	Not used	0	
A170	E7 Function	Pre-heater temperature sensor	Temp. Ni1000	3	
A171	E7 Scheme	Sensor multiplication	Normal input (off)	0	
A177	E7 Cal.temp	Temperature calibration		°C	
A178	E7 Sim.val.	Simulation value	In case of sensor error	22.0°C	

Description

Number	Display	Function	Additional information	Factory setting	Setting
	Digital inputs				
A210	D1 Function	Main switch	Active if high	102	
A220	D2 Function	Frost protection mon.	Active if low	101	
A230	D3 Function	Filter DD alarm	Active if low	101	
A240	D4 Function	Fan belt alarm	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve ‘heating’	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A320	Y2 Function	Three-way valve ‘cooling’	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A330	Y3 Function	Dampers	Analogue output	1	
A331	Y3 Action	Directional control	Normal 0-10VDC	0	
A332	Y3 Max	Maximum value	Output Y3	100.0%	
A333	Y3 Min	Minimum value	Output Y3	0.0%	
A340	Y4 Function	Three-way valve ‘pre-heating’	Analogue output	1	
A341	Y4 Action	Directional control	Normal 0-10VDC	0	
A342	Y4 Max	Maximum value	Output Y4	100.0%	
A343	Y4 Min	Minimum value	Output Y4	0.0%	
A350	Y5 Function	Three-way valve ‘humidification’	Analogue output	1	
A351	Y5 Action	Directional control	Normal 0-10VDC	0	
A352	Y5 Max	Maximum value	Output Y5	100.0%	
A353	Y5 Min	Minimum value	Output Y5	0.0%	
	Digital outputs				
A410	R1 Function	Timer channel 1	Digital (On)	2	
A411	R1 Action	Directional control	Normal NO	0	
A414	R1 Td on	Switch-on delay		0s	
A415	R1 Td off	Switch-off delay		0s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 Blocking	Blocking		0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking		0	
A450	R5 Function	Humidification pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking		0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint	Humidity	80% r.h.	
P503	SP2 Min	Minimum setpoint	Humidity	40% r.h.	
P531	LIM6 Min	Minimum outside air component	Dampers Y3	25.0%	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK)	Supply air at room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint		30.0°C	
P605	C1 Min	Minimum supply air setpoint		15.0°C	

Number	Display	Function	Additional information	Factory setting	Setting
PID controller(s)					
P632	PID1 Tn	PID1 I-term, temperature controller	Output Y1...Y3	300s	
P633	PID1 Tv	PID1 D-term, temperature controller	Output Y1...Y3	0s	
P642	PID2 Tn	PID2 I-term, temperature controller, preh.	Output Y5	0s	
P643	PID2 Tv	PID2 D-term, humidity controller	Output Y5	0s	
P651	PID3 P-band	PID3 P-band, temperature controller, preh.	Output Y4	10K	
P652	PID3 Tn	PID3 I-term, temperature controller, preh.	Output Y4	160s	
P653	PID3 Tv	PID3 D-term, temperature controller, preh.	Output Y4	0.0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	5.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	0.0K	
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	5.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	0.0K	
	Damper sequence, heat recovery, 'heating'				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y3	2.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y3	-1.0K	
	Damper sequence, heat recovery, 'cooling'				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y3	2.0K	
P707	SEQ4 Offset	Offset (Of4)	Output Y3	1.0K	
	Humidification				
P708	SEQ5 P-band	Proportional band (Xp5)	Output Y5	4.0% r.h.	
P709	SEQ5 Offset	Offset (Of5)	Output Y5	-1.0% r.h.	
	Dehumidification				
P710	SEQ6 P-band	Proportional band (Xp6)	Output Y2	4.0% r.h.	
P711	SEQ6 Offset	Offset (Of6)	Output Y2	1.0% r.h.	
Energy recovery					
P741	ER1 exh.±	Correction - return air		0.0K	
P742	ER1 room ±	Correction - room air		0.0K	
P743	ER1 sw.diff	Switching difference - energy supply		1.0K	
P744	ER1 Neutral	Neutral zone - energy supply		3.0K	
Switching points					
P780	2P1 sw.pt	Switching point, humidif. pump	Relay R5	90 %	
P781	2P1 sw.diff	Switching difference, humidif. pump	Relay R5	80 %	
Options					
External setpoint					
A010	Ext.setp.	External setpoint	On	1	
	Input E5 setpoint adjuster				
A150	E5 Function	Setpoint adjuster		51	
A152	E5 Set Max	Range maximum		40.0°C	
A153	E5 Set min	Range minimum		0.0°C	
A154	E5 Cal.Max	Calibration of range maximum		°C	
A155	E5 Cal.Midd	Calibration of range midpoint	Possible only on device	°C	
A156	E5 Cal.Min	Calibration of range minimum		°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		1.0	
P543	SPS1 Lim wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Controller					
A012	Control	Cascade control behaviour	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection D2					
A013	Frost	Frost protection	Off	0	
			Frost protection	1	
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Night cooling	2	
			Stand-by mode + night cooling	3	
Timer					
D500	Clk chan. 2	Timer channel 2		3	
D501	Clk C2 mode	Mode		1	
	Stand-by mode				
D112	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling				
D500	Clk chan. 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	
External setpoint, humidity					
A020	Ext.setp.h	External setpoint, humidity	On	1	
	Input E6 setpoint adjuster				
A160	E6 Function	Setpoint adjuster		53	
A162	E6 Set Max	Range maximum		100.0% r.h.	
A163	E6 Set min	Range minimum		0.0% r.h.	
A164	E6 Cal.Max	Calibration of range maximum		% r.h.	
A165	E6 Cal.Midd	Calibration of range midpoint	Possible only on device	% r.h.	
A166	E6 Cal.Min	Calibration of range minimum		% r.h.	
A168	E6 Sim.val.	Simulation value	In case of sensor error	55.0% r.h.	

Measuring points	
MP1	Active setpoint (D116)
MP2	Main setpoint (D117)
MP3	Auxiliary setpoint (D118)
MP4	Positioning signal, aux. controller
MP5	Active setpoint - pre-heating
MP6	Positioning signal, controller - pre-heating
MP7	Active setpoint, humidity (D126
MP8	Positioning signal, humidity controller
MP9	Control mode (0/1)

3.1.33 Application 935

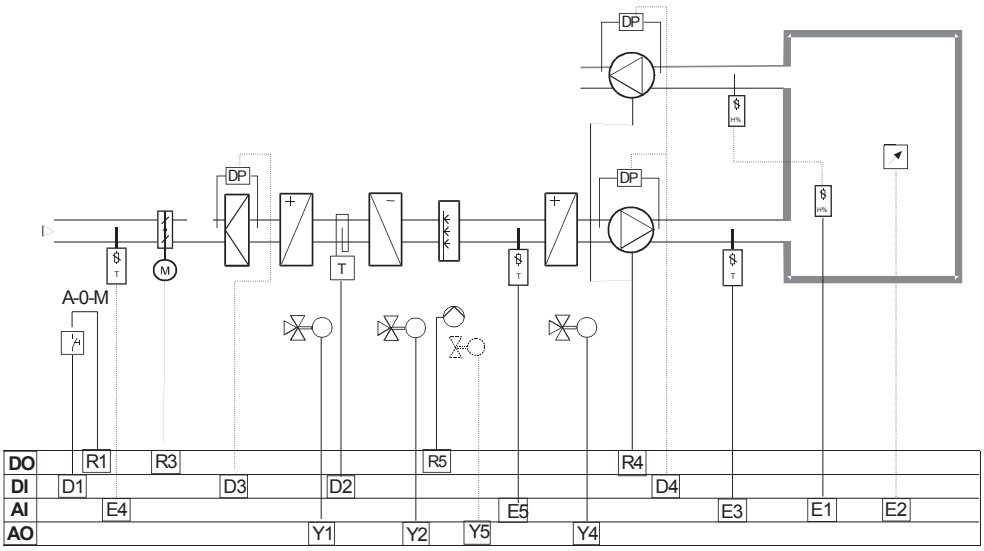
Constant saturation control and constant supply air control with humidification THSS HCHh

Plant design:
- Outside (air) damper
- Supply air fan
- Pre-heater, air heater, air cooler with control valve
- Supply air and saturation temperature sensor
- Return air or room humidity sensor
- Outside temperature sensor (optional)

Control functions:
- Temperature control, saturation, fixed value
- Supply air, fixed value with ta shift (optional)
- Humidity control, return air/room, fixed value

Control functions:
- Enable control
- Delay fan switching
- Main (plant) switch
- Frost protection function
- Filter, differential pressure
- Fan, V-belt

Plant schematic:



Description:

Functions

When the plant is switched on, the damper is opened initially. After a delay, the control is then enabled and the fans are switched on. The saturation temperature control compares the temperature with the setpoint and controls pre-heater valve Y1 and cooling valve Y2 according to the control deviation. The supply air temperature control compares the temperature with the setpoint and controls heating valve Y4 according to the control deviation. The supply air temperature is limited.

The humidity control compares the room or return air humidity with the setpoint and controls humidification pump or humidification valve Y5 according to the control deviation.
The main switch is used to switch off the fan and the humidification pump, and to close the valves and the damper.

Options
External setpoint
According to choice, the setpoints for temperature and humidity can be changed or corrected via setpoint adjuster XPESF001.

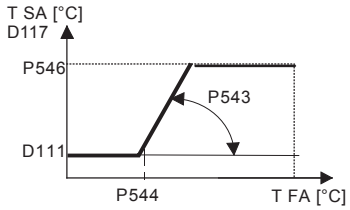
Setpoint shift
The setpoint is changed in relation to the outside temperature, according to the adjusted influence (see the diagram).

Frost protection
The frost protection monitor switches the plant off, i.e. the fan and the humidification pump are stopped and the damper is closed. Pre-heater valve Y1 is opened fully and heating valve Y4 remains closed. The frost protection is still active when the plant is switched off.

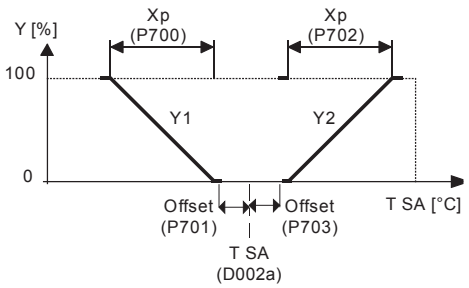
Reduced mode (timer)
Channel 1
The timer programme switches the plant off.

External setpoint humidity
According to choice an external setpoint for humidity can be used.

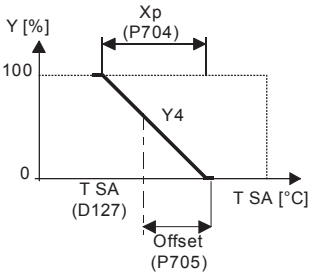
3.1.33.1 Functional diagrams



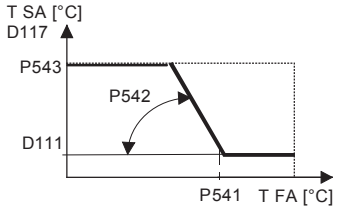
Summer setpoint shift acc. to outside temperature



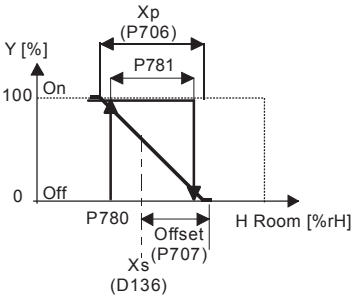
Heating-cooling sequence



Supply air temperature control



Winter setpoint shift acc. to outside temperature



Return air room humidity control

3.1.33.2 Parameter list

Constant saturation control LE/LK and constant supply air control with humidification THSS HCHh

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	15.0	Saturation temperature setpoint			
Act. val	20.2°C	Saturation temperature actual value			
Setp. sup	21.0°C	Supply air temperature setpoint			
A.val su	27.2°C	Supply air temperature actual value			
Setpoint	55.0% r.h.	Room humidity setpoint			
Act. val	40.2% r.h.	Room humidity actual value			
Setpoints					
D111	Setpoint 1	Saturation temperature setpoint		15.0°C	
D121	Setpoint 1	Supply air temperature setpoint		22.0°C	
D131	Setpoint 1	Humidity setpoint		55.0% r.h.	
Timers					
D400	Clk chan. 1	Timer channel 1		3	
D401	Clk C1 mode	Mode		1	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Basic configuration					
A001	Application	Application	THSS HCHh	935	
	Options (described on the following pages)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A013	Frost	Frost protection	On	1	
A020	Ext.setp.h	External setpoint, humidity	Off	0	
I/O configuration					
	Analogue inputs				
A120	E2 Function	Room humidity sensor	Humidity 0-10V	21	
A122	E2 Set Max	Upper range limit	Active sensor at 10V	100% r.h.	
A123	E2 Set min.	Lower range limit	Active sensor at 0V	0.0% r.h.	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Outside temp. sensor	Not used	0	
A150	E5 Function	Setpoint adjuster	Not used	0	
A160	E6 Function	Setpoint adjuster, humidity	Not used	0	
A180	E3 Function	Dew-point sensor	Temp. Ni1000	3	
A187	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A188	E3 Sim.val.	Simulation value	In case of sensor error	15.0°C	
	Digital inputs				
A210	D1 Function	Main switch	Active if high	102	
A220	D2 Function	Frost protection mon.	Active if low	101	
A230	D3 Function	Filter DD alarm	Active if low	101	
A240	D4 Function	Fan belt alarm	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve ‘pre-heater’	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A320	Y2 Function	Three-way valve ‘cooling’	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A340	Y5 Function	Valve: ‘humidification’	Analogue output	1	
A341	Y5 Action	Directional control	Normal 0-10VDC	0	
A342	Y5 Max	Maximum value	Output Y4	100.0%	
A343	Y5 Min	Minimum value	Output Y4	0.0%	
	Digital outputs				
A410	R1 Function	Timer channel 1	Digital (On)	2	
A411	R1 Action	Directional control	Normal NO	0	
A414	R1 Td on	Switch-on delay		0s	
A415	R1 Td off	Switch-off delay		0s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 Blocking	Blocking		0	
A430	R3 Function	Air damper actuator	Digital (On)	2	
A431	R3 Action	Directional control	Normal NO	0	
A434	R3 Td on	Switch-on delay		0s	
A435	R3 Td off	Switch-off delay		0s	
A436	R3 min on	Minimum operating time		0s	
A437	R3 min off	Minimum idle time		0s	
A438	R3 Blocking	Blocking		0s	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking		0s	
A450	R5 Function	Humidification pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	

Number	Display	Function	Additional information	Factory setting	Setting
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking		0s	
Limitations					
P500	SP1 Max	Maximum setpoint	Room temperature setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room temperature setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint	Humidity	80% r.h.	
P503	SP2 Min	Minimum setpoint	Humidity	40% r.h.	
PID controller(s)					
P632	PID1 Tn	PID1 I-term, temperature controller	Outputs Y1 and Y2 160s		
P633	PID1 Tv	PID1 D-term, temperature controller	Outputs Y1 and Y2 0.0s		
P642	PID2 Tn	PID2 I-term, temperature controller	Output Y4	160s	
P643	PID2 Tv	PID2 D-term, temperature controller	Output Y4	0.0s	
P652	PID3 Tn	PID3 I-term, humidity controller	Output Y5	0.0s	
P653	PID3 Tv	PID3 D-term, humidity controller	Output Y5 or R5	0.0s	
Sequences					
	Pre-heater heating sequence				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	5.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	-1.0K	
	Pre-heater cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	5.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	1.0K	
	Supply air heating sequence				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y4	10.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y4	5.0K	
	Pre-heater cooling sequence[HOD1]				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y5	5.0 % r.h.	
P707	SEQ4 Offset	Offset (Of4)	Output Y5	2.5 % r.h.	
Switching points					
P780	2P1 sw.pt	Switching point, humidif. pump	Relay R5	90 %	
P781	2P1 sw.diff	Switching difference, humidif. pump	Relay R5	80 %	
Delays					
P801	TM1 time	Switch-on delay, fans	Relay R4	30s	
Options					
External setpoint					
A010	Ext.setp.	External setpoint	On	1	
	Input E5 setpoint adjuster				
A150	E5 Function	Setpoint adjuster		51	
A152	E5 Set Max	Range maximum		40.0°C	
A153	E5 Set min	Range minimum		0.0°C	
A154	E5 Cal.Max	Calibration of range maximum		°C	
A155	E5 Cal.Midd	Calibration of range midpoint	Possible only on device	°C	
A156	E5 Cal.Min	Calibration of range minimum		°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift, room temperature setpoint					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
A141	E4 Scheme	Sensor multiplication	Normal input (off)	0	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	0.0°C	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		1.0	
P543	SPS1 Lim wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	

Description

Number	Display	Function	Additional information	Factory setting	Setting
External setpoint, humidity					
A020	Ext.setp.h	External setpoint humidity	Humidity on	1	
	Input E6 setpoint adjuster				
A160	E6 Function	Setpoint adjuster		53	
A162	E6 Set Max	Range maximum		100.0% r.h.	
A163	E6 Set min	Range minimum		0.0% r.h.	
A164	E6 Cal.Max	Calibration of range maximum		% r.h.	
A165	E6 Cal.Midd	Calibration of range midpoint	Possible only on device	% r.h.	
A166	E6 Cal.Min	Calibration of range minimum		% r.h.	
A168	E6 Sim.val.	Simulation value	In case of sensor error	55.0% r.h.	

Measuring points	
MP1	Active setpoint (D126)
MP2	Main setpoint (D127)
MP3	Active setpoint, dew-point control
MP4	Positioning signal, controller - dew-point control
MP5	Active setpoint, humidity (D136)
MP6	Control mode (0/1)

3.1.34 Application 936

Constant saturation control and supply air/return air cascade control, with humidification and dehumidification, CTHRS HCHh

Plant design:

- Outside and exhaust air damper with minimum outside air component
- Supply and return air fan
- Pre-heater, air heater, air cooler with control valve
- Humidifier
- Saturation - supply air, return air or room temperature sensor
- Outside temperature sensor
- Return air or room humidity sensor

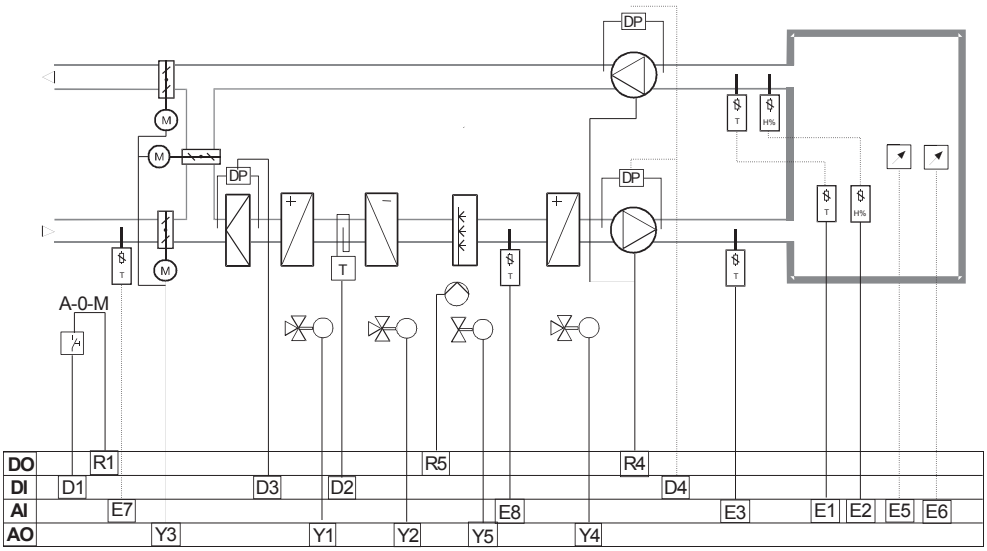
Control functions:

- Fixed value saturation control
- Temperature control, return air-supply air - cascade with ta shift, or supply air - fixed value with ta shift (optional)
- Humidity control, return air or room fixed value

Control functions:

- Enable control
- Delay fan switching
- Main (plant) switch
- Frost protection function
- Stand-by mode
- Free night cooling
- Filter, differential pressure
- Fan, V-belt

Plant schematic:



Description:

Functions

When the plant is switched on, the control is enabled and the fans are switched on. The saturation temperature control compares the temperature with the set-point and controls pre-heater valve Y1, cooling valve Y2 and outside air dampers Y3 according to the control deviation. The cascade temperature control compares the room or return air temperature with the setpoint, and controls heating valve Y4 according to the control deviation. The supply air temperature is limited.
Damper sequence Y3 is enabled if the outside temperature in cooling mode is lower than the room or return air temperature, and in heating mode if it is higher than the room or return air temperature.
The humidity control compares the room or return air humidity with the setpoint and controls humidification pump R5 or valve Y5 (humidification) and cooling valve Y2 (dehumidification) according to the control deviation.
When the plant is switched off from the main switch, the fans and the humidification pump are switched off, and the valves and dampers are closed.

Options

External setpoint

Setpoint adjuster XPESF001 can be used to change or correct the setpoint for the temperature and/or the humidity, according to choice.

Setpoint shift

The setpoint is changed in relation to the outside temperature, according to the adjusted influence (see the diagram).

Frost protection

The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. Heating valve Y1 is opened fully, and heating valve Y4 remains closed. The frost protection is still active when the plant is switched off.

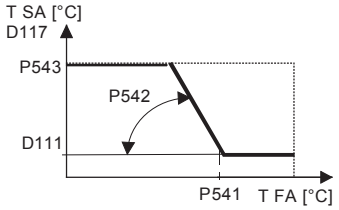
Minimum outside air component
When the plant is switched off, the dampers are closed.

Dehumidification
When humidity control is activated, the humidity controller acts on relay R5, analogue output Y5 and valve Y2.

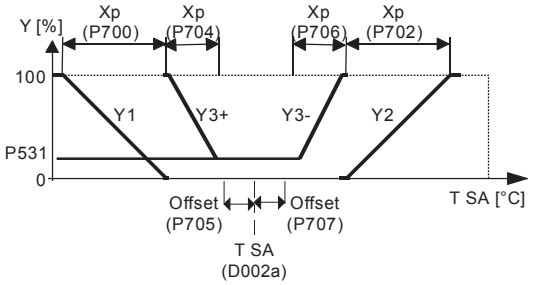
Reduced mode (timer) only with cascade or room temperature (fixed value controller)
Channel 1
The timer programme switches the plant off. In reduced mode, the plant remains switched off as long as the room temperature does not fall below the reduction setpoint (D112). Below this value, the plant switches on, heating valve Y1 is fully opened and continues to function as long as the room temperature is less than two degrees (P763) above the setpoint (D112). In reduced mode, the recirculation air damper Y3 remains fully open, except in heating mode. Otherwise, the minimum outdoor air volume (P531) is set.

Channel 2
If the plant is switched off via timer channel 1, free night cooling is enabled via channel 2 provided that the conditions are met. In reduced mode, the plant remains off as long as the room temperature is not two degrees (P765) above the calculated setpoint D117, and is not more than five degrees (P765) above the outside temperature. If this value is reached, the plant switches on with closed valves and open recirculation air damper Y3. The plant switches off again if the room temperature falls below calculated setpoint D117, or if the different in relation to the outside temperature is one degree less than parameter P764. Free night cooling does not become active at an outside temperature below ten degrees (P766).
The fans are switched on and the outside air dampers are opened.

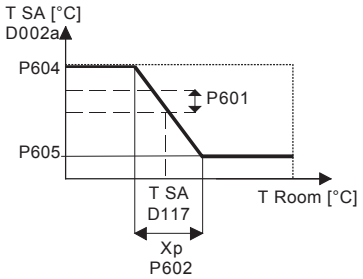
3.1.34.1 Functional diagrams



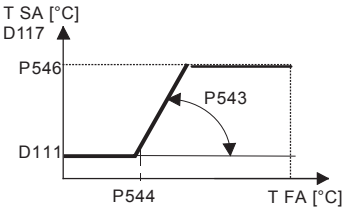
Winter setpoint shift acc. to outside temperature



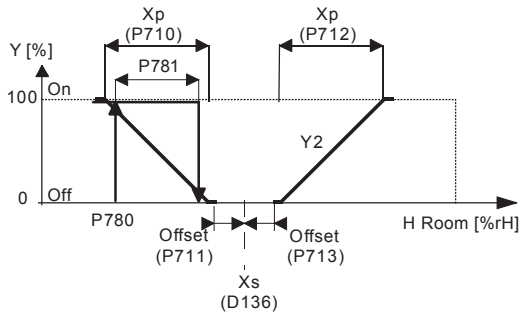
Heating-cooling mixing chamber sequence



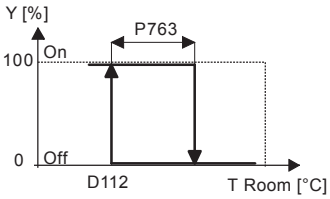
Return air - supply air cascade



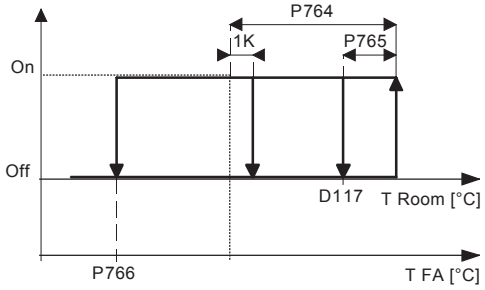
Setpoint shift acc. to outside temperature



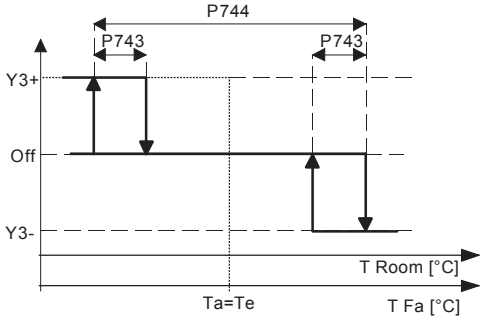
Return air room humidity control



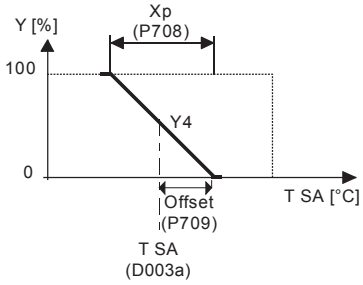
Stand-by mode with reduced setpoint (room temperature)



Free night cooling



Energy recovery



Post heating

3.1.34.2 Parameter list

Constant saturation control and supply air/return air cascade control, with humidification and dehumidification, CTHRS HCHh

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Saturation temperature setpoint			
Act. val	20.2°C	Saturation temperature actual value			
Setpoint	20.0°C	Room temperature setpoint			
Act. val	20.2°C	Room temperature actual value			
Setp.sup	38.0°C	Supply air temperature setpoint			
A.val su	27.2°C	Supply air temperature actual value			
Setpoint	55.0% r.h.	Room humidity setpoint			
Act. val	40.2% r.h.	Room humidity actual value			
Setpoints					
D111	Setpoint 1	Saturation temperature setpoint		15.0°C	
D121	Setpoint 1	Temperature setpoint		22.0°C	
D131	Setpoint 1	Humidity setpoint		55.0% r.h.	
Timer(s)					
D400	Clk chan. 1	Timer channel 1		3	
D401	Clk C1 mode	Mode		1	
Basic configuration					
A001	Application	Application	CTHRS HCHh	936	
A002	Dehumidify	Dehumidification (cooling)	Off	0	
	Options (described on the following pages)				
A010	Ext.setp.	External setpoint	Off	0	
A011	Shift	Setpoint shift	Off	0	
A012	Control	Control behaviour, saturation temp.	Cascade	2	
A013	Frost	Frost protection	On	1	
A014	Red. mode	Night cooling (timer)	Off	0	
		Only with cascade controller or room temperature (fixed value controller)			
A020	Ext.setp.h	External setpoint, humidity	Off	0	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Room/return air temperature sensor	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication	Normal input (off)	0	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A120	E2 Function	Room humidity sensor	Humidity 0-10V	21	
A122	E2 Set Max	Upper range limit	Active sensor at 10V	95.0% r.h.	
A123	E2 Set min	Lower range limit	Active sensor at 0V	10.0% r.h.	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	22.0°C	
A140	E4 Function	Outside temp. sensor	Temp. Ni1000	3	
A147	E4 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A148	E4 Sim.val.	Simulation value	In case of sensor error	0.0°C	
A150	E5 Function	Setpoint adjuster, temperature	Not used	0	
A160	E6 Function	Setpoint adjuster humidity	Not used	0	
A180	E8 Function	Saturation temp. sensor, pre-heating	Temp. Ni1000	3	
A187	E8 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A188	E8 Sim.val.	Simulation value	In case of sensor error	15.0°C	
	Digital inputs				
A210	D1 Function	Main switch	Active if high	102	
A220	D2 Function	Frost protection mon.	Active if low	101	
A230	D3 Function	Filter DP alarm	Active if low	101	
A240	D4 Function	Fan belt alarm	Active if low	101	

Number	Display	Function	Additional information	Factory setting	Setting
	Analogue outputs				
A310	Y1 Function	Three-way valve ‘ pre-heating ‘	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A320	Y2 Function	Three-way valve ‘cooling’	Analogue output	1	
A321	Y2 Action	Directional control	Normal 0-10VDC	0	
A322	Y2 Max	Maximum value	Output Y2	100.0%	
A323	Y2 Min	Minimum value	Output Y2	0.0%	
A330	Y3 Function	Damper actuator	Analogue output	1	
A331	Y3 Action	Directional control	Normal 0-10VDC	0	
A332	Y3 Max	Maximum value	Output Y3	100.0%	
A333	Y3 Min	Minimum value	Output Y3	0.0%	
A340	Y4 Function	Valve ‘heating’	Analogue output	1	
A341	Y4 Action	Directional control	Normal 0-10VDC	0	
A342	Y4 Max	Maximum value	Output Y4	100.0%	
A343	Y4 Min	Minimum value	Output Y4	0.0%	
A350	Y5 Function	Three-way valve ‘humidification’	Analogue output	1	
A351	Y5 Action	Directional control	Normal 0-10VDC	0	
A352	Y5 Max	Maximum value	Output Y5	100.0%	
A353	Y5 Min	Minimum value	Output Y5	0.0%	
	Digital outputs				
A410	R1 Function	Timer channel 1	Digital (On)	2	
A411	R1 Action	Directional control	Normal NO	0	
A414	R1 Td on	Switch-on delay		0s	
A415	R1 Td off	Switch-off delay		0s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 Blocking	Blocking		0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking		0	
A450	R5 Function	Humidification pump	Digital (On)	2	
A451	R5 Action	Directional control	Normal NO	0	
A454	R5 Td on	Switch-on delay		0s	
A455	R5 Td off	Switch-off delay		0s	
A456	R5 min on	Minimum operating time		0s	
A457	R5 min off	Minimum idle time		0s	
A458	R5 Blocking	Blocking		0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room temperature setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room temperature setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint	Humidity	80% r.h.	
P503	SP2 Min	Minimum setpoint	Humidity	40% r.h.	
P531	LIM6 Min	Minimum outside air component	Output Y3	25.0%	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK) supply air temp.	At room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint	Temperature	30.0°C	
P605	C1 Min	Minimum supply air setpoint	Temperature	15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term, saturation temp controller	Outputs Y1..Y3	160s	
P633	PID1 Tv	PID1 D-term, saturation temp controller	Outputs Y1..Y3	0.0s	
P642	PID2 Tn	PID2 I-term, room temp controller	Output Y4	300s	
P643	PID2 Tv	PID2 D-term, room temp controller	Output Y4	0.0s	
P652	PID3 Tn	PID3 I-term, humidity controller	Output Y5	0.0s	
P653	PID3 Tv	PID3 D-term, humidity controller	Output Y5	0.0s	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Sequences					
	Pre-heating sequence				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	0.0K	
	Cooling sequence				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y2	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y2	0.0K	
	Damper sequence, heat recovery, 'heating'				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y3	2.0K	
P705	SEQ3 Offset	Offset (Of3)	Output Y3	-1.0K	
	Damper sequence, heat recovery, 'cooling'				
P706	SEQ4 P-band	Proportional band (Xp4)	Output Y3	2.0K	
P707	SEQ4 Offset	Offset (Of4)	Output Y3	1.0K	
	Heating sequence (re-heating)				
P708	SEQ5 P-band	Proportional band (Xp5)	Output Y4	10.0K	
P709	SEQ5 Offset	Offset (Of5)	Output Y4	5.0K	
	Humidification				
P710	SEQ6 P-band	Proportional band (Xp6)	Output Y5	4.0% r.h.	
P711	SEQ6 Offset	Offset (Of6)	Output Y5	-1.0% r.h.	
	Dehumidification				
P712	SEQ7 P-band	Proportional band (Xp7)	Output Y2	4.0% r.h.	
P713	SEQ7 Offset	Offset (Of7)	Output Y2	1.0% r.h.	
Energy recovery					
P741	ER1 exh.±	Correction - return air		0.0K	
P742	ER1 room ±	Correction - room air		0.0K	
P743	ER1 sw.diff	Switching difference - energy supply		1.0K	
P744	ER1 neutral	Neutral zone - energy supply		3.0K	
Switching points					
P780	2P1 sw.pt	Switching point humidif. pump	Relay R5	90 %	
P781	2P1 sw.iff	Switching difference humidif. pump	Relay R5	40 %	
Options					
External setpoint, temperature					
A010	Ext.setp.	External setpoint	Temperature on	1	
	Input E5 setpoint adjuster				
A150	E5 Function	Setpoint adjuster		51	
A152	E5 Set Max	Range maximum		40.0°C	
A153	E5 Set min	Range minimum		0.0°C	
A154	E5 Cal.Max	Calibration of range maximum		°C	
A155	E5 Cal.Midd	Calibration of range midpoint	Possible only on device	°C	
A156	E5 Cal.Min	Calibration of range minimum		°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	22.0°C	
Shift, room temperature setpoint					
A011	Shift	Setpoint shift	Winter	1	
			Summer	2	
			Winter + summer	3	
	Shift parameters				
P541	SPS1 pt wi	Winter cut-in point		15.0°C	
P542	SPS1 inf wi	Winter influence		1.0	
P543	SPS1 Lim wi	Winter limitation		30.0°C	
P544	SPS1 pt su	Summer cut-in point		24.0°C	
P545	SPS1 inf su	Summer influence		0.5	
P546	SPS1 Lim su	Summer limitation		26.0°C	
Controller					
A012	Control	Cascade control behaviour	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection D2					
A013	Frost	Frost protection	Off	0	
			Frost protection	1	

Number	Display	Function	Additional information	Factory setting	Setting
Reduced mode (stand-by mode/free night cooling with timer)					
A014	Red. mode	Reduced mode	Stand-by mode	1	
			Night cooling	2	
			Stand-by mode + night cooling	3	
Timer(s)					
D500	Clk chan. 2	Timer channel 2		3	
D501	Clk C2 mode	Mode		1	
	Stand-by mode				
D122	Setpoint 2	Setpoint wred (reduced)	In stand-by mode	15.0°C	
D400	Clk chan. 1	Timer channel 1		1	
P763	FC1 sw.diff	Switching difference (SD)	In stand-by mode	2.0K	
	Free night cooling				
D500	Clk chan. 2	Timer channel 2		1	
P764	FC1 Neutral	Neutral range, night		5.0K	
P765	FC1 on offs	Cut-in point, setpoint - offset FNC		2.0K	
P766	FC1 te min	Minimum outside temperature	Enable night cooling	10.0°C	

Measuring points	
MP1	Active setpoint (D126)
MP2	Main setpoint (D127)
MP3	Auxiliary setpoint (D128)
MP4	Positioning signal, aux. controller
MP5	Active setpoint saturation temperature
MP6	Positioning signal, controller, saturation temperature
MP7	Active setpoint, humidity (D136)
MP8	Positioning signal, humidity controller
MP8	Control mode (0/1)

3.1.35 Application 937

Supply air/return air cascade control with humidity control for swimming pool, CTHRW HE

Plant design:

- Outside and exhaust air damper with minimum outside air component
- Supply and return air fan
- Air heater with control valve
- Window, supply air, return air temperature sensors
- Return air humidity sensor

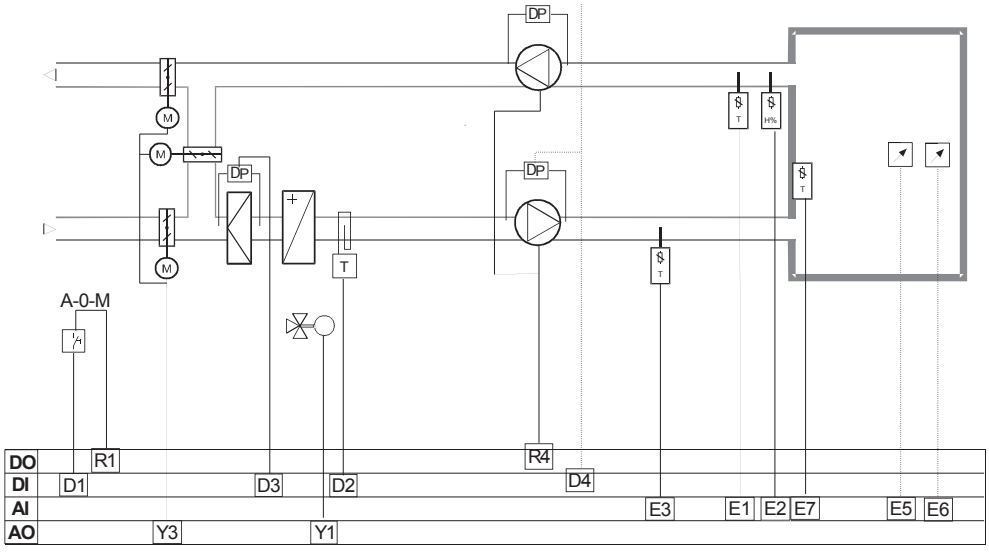
Control functions:

- Temperature control, return air-supply air cascade
- Humidity control, return air, fixed value with shift of humidity setpoint dependent on window temperature

Control functions:

- Enable control
- Enable mixing chamber
- Main (plant) switch
- Frost protection function
- Filter, differential pressure
- Fan, V-belt

Plant schematic:



Description:

Functions

When the plant is switched on, the control is enabled and the fans are switched on. The temperature control compares the room or return air temperature with the setpoint and controls heating valve Y1 according to the control deviation. The supply air temperature is limited.

The humidity control compares the return air humidity with the setpoint and controls damper sequence Y3 according to the control deviation. The setpoint is changed in relation to the window temperature, according to the adjusted influence.
When the plant is switched off from the main switch, the fans are switched off, and the valve and dampers are closed.

Options
External setpoint
Setpoint adjuster XPESF001 can be used to change or correct the setpoint for the temperature and/or the humidity, according to choice.

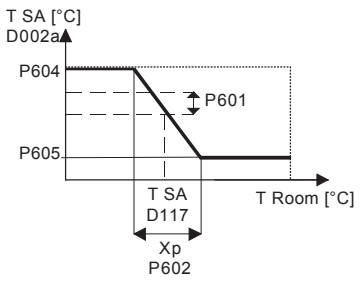
Frost protection
The frost protection monitor switches the plant off, i.e. the fans are stopped and the dampers are closed. Heating valve Y1 is opened fully. The frost protection is still active when the plant is switched off.

Minimum outside air component
When the plant is switched off, the dampers are closed.

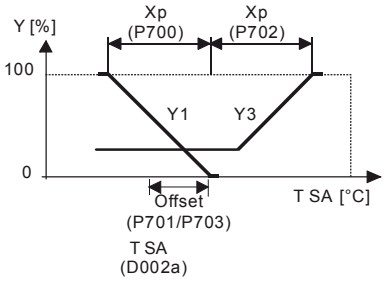
Reduced mode (timer)
Channel 1
The timer programme switches the plant off.

External setpoint humidity
On choice an external setpoint can be used for the humidity.

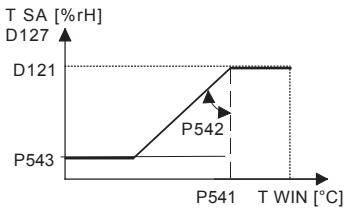
3.1.35.1 Functional diagrams



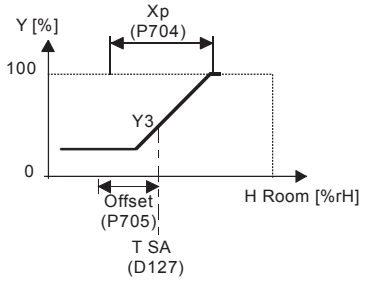
Return-supply air cascade



Heating-cooling sequence



Setpoint shift acc. to window temperature



Damper sequence

3.1.35.2 Parameter list

Supply air/return air cascade control with humidity control for swimming pool CTHRW HE

Number	Display	Function	Additional information	Factory setting	Setting
Basic display					
Setpoint	20.0°C	Room temperature setpoint			
Act. val	20.2°C	Room temperature actual value			
Setp. su	38.0°C	Supply air temperature setpoint			
A.val sup	27.2°C	Supply air temperature actual value			
Setpoint	55%rH	Room humidity setpoint			
Act. val	40.2% r.h.	Room humidity actual value			
Setpoints					
D111	Setpoint 1	Temperature setpoint		25.0°C	
D121	Setpoint 1	Humidity setpoint		60.0% r.h.	
Timer(s)					
D400	Clk chan. 1	Timer channel 1		3	
D401	Clk C1 mode	Mode		1	
Basic configuration					
A001	Application	Application	CTHRW HE	937	
A002	Cooling	Cooling with outside air	Off	0	
	Options (described on the following pages)				
A010	Ext.setp.	External setpoint	Off	0	
A012	Control	Control behaviour, room temp.	Cascade	2	
A013	Frost	Frost protection	On	1	
A020	Ext.setp.h	External setpoint, humidity	Off	0	
I/O configuration					
	Analogue inputs				
A110	E1 Function	Room/return air temperature sensor	Temp. Ni1000	3	
A111	E1 Scheme	Sensor multiplication	Normal input (off)	0	
A117	E1 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A118	E1 Sim.val.	Simulation value	In case of sensor error	25.0°C	
A120	E2 Function	Return air humidity sensor	Humidity 0-10V	21	
A122	E2 Set Max	Upper range limit	Active sensor at 10V	100.0% r.h.	
A123	E2 Set min	Lower range limit	Active sensor at 0V	0.0% r.h.	
A130	E3 Function	Supply air temperature sensor	Temp. Ni1000	3	
A131	E3 Scheme	Sensor multiplication	Normal input (off)	0	
A137	E3 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A138	E3 Sim.val.	Simulation value	In case of sensor error	25.0°C	
A150	E5 Function	Setpoint adjuster, temperature	Not used	0	
A160	E6 Function	Setpoint adjuster humidity	Not used	0	
A170	E7 Function	Window temperature sensor	Temp. Ni1000	3	
A177	E7 Cal.temp	Temperature calibration	Input: meas. val.	°C	
A178	E7 Sim.val.	Simulation value	In case of sensor error	18.0°C	
	Digital inputs				
A210	D1 Function	Main switch	Active if high	102	
A220	D2 Function	Frost protection mon.	Active if low	101	
A230	D3 Function	Filter DD alarm	Active if low	101	
A240	D4 Function	Fan belt alarm	Active if low	101	
	Analogue outputs				
A310	Y1 Function	Three-way valve ‘heating’	Analogue output	1	
A311	Y1 Action	Directional control	Normal 0-10VDC	0	
A312	Y1 Max	Maximum value	Output Y1	100.0%	
A313	Y1 Min	Minimum value	Output Y1	0.0%	
A330	Y3 Function	Damper actuator	Analogue output	1	
A331	Y3 Action	Directional control	Normal 0-10VDC	0	
A332	Y3 Max	Maximum value	Output Y3	100.0%	
A333	Y3 Min	Minimum value	Output Y3	0.0%	

Number	Display	Function	Additional information	Factory setting	Setting
	Digital outputs				
A410	R1 Function	Timer channel 1	Digital (On)	2	
A411	R1 Action	Directional control	Normal NO	0	
A414	R1 Td on	Switch-on delay		0s	
A415	R1 Td off	Switch-off delay		0s	
A416	R1 min on	Minimum operating time		0s	
A417	R1 min off	Minimum idle time		0s	
A418	R1 Blocking	Blocking		0	
A440	R4 Function	Fan	Digital (On)	2	
A441	R4 Action	Directional control	Normal NO	0	
A444	R4 Td on	Switch-on delay		0s	
A445	R4 Td off	Switch-off delay		0s	
A446	R4 min on	Minimum operating time		0s	
A447	R4 min off	Minimum idle time		0s	
A448	R4 Blocking	Blocking		0	
Limitations					
P500	SP1 Max	Maximum setpoint	Room temperature setpoint	30.0°C	
P501	SP1 Min	Minimum setpoint	Room temperature setpoint	15.0°C	
P502	SP2 Max	Maximum setpoint	Humidity	80% r.h.	
P503	SP2 Min	Minimum setpoint	Humidity	40% r.h.	
P531	LIM6 Min	Minimum outside air component	Output Y3	25.0%	
Setpoint shift humidity					
P541	SPS1 pt wi	Winter cut-in point		18.0°C	
P542	SPS1 inf wi	Winter influence		-4.0°C	
P543	SPS1 Lim wi	Winter limitation		40% r.h.	
Cascade controller(s)					
P601	C1 Offset	Setpoint offset (OfK) supply air temp	At room setpoint	5.0K	
P602	C1 P-band	P-band (XpK)		2.0K	
P603	C1 Tn	I-term		0s	
P604	C1 Max	Maximum supply air setpoint	Temperature	30.0°C	
P605	C1 Min	Minimum supply air setpoint	Temperature	15.0°C	
PID controller(s)					
P632	PID1 Tn	PID1 I-term, temperature controller	Output Y1	160s	
P633	PID1 Tv	PID1 D-term, temperature controller	Output Y1	0s	
P642	PID2 Tn	PID2 I-term, humidity controller	Output Y3	0s	
P643	PID2 Tv	PID2 D-term, humidity controller	Output Y3	0s	
Sequences					
	Heating sequence				
P700	SEQ1 P-band	Proportional band (Xp)	Output Y1	10.0K	
P701	SEQ1 Offset	Offset (Of)	Output Y1	5.0K	
	Damper sequence, 'cooling'				
P702	SEQ2 P-band	Proportional band (Xp2)	Output Y3	10.0K	
P703	SEQ2 Offset	Offset (Of2)	Output Y3	5.0K	
	Damper sequence, 'dehumidification'				
P704	SEQ3 P-band	Proportional band (Xp3)	Output Y3	5.0% r.h.	
P705	SEQ3 Offset	Offset (Of3)	Output Y3	-2.5rF	
Options					
External setpoint, temperature					
A010	Ext.setp.	External setpoint	Temperature on	1	
	Input E5 setpoint adjuster				
A150	E5 Function	Setpoint adjuster		51	
A152	E5 Set Max	Range maximum		40.0°C	
A153	E5 Set min	Range minimum		0.0°C	
A154	E5 Cal.Max	Calibration of range maximum		°C	
A155	E5 Cal.Midd	Calibration of range midpoint	Possible only on device	°C	
A156	E5 Cal.Min	Calibration of range minimum		°C	
A158	E5 Sim.val.	Simulation value	In case of sensor error	25.0°C	

Description

Number	Display	Function	Additional information	Factory setting	Setting
Controller					
A012	Control	Cascade control behaviour	Fixed value (supply air control)	1	
			Cascade (room control)	2	
Frost protection D2					
A013	Frost	Frost protection	Off	0	
			Frost protection	1	
External setpoint, humidity					
A020	Ext.setp.h	External setpoint	Humidity on	1	
	Input E6 setpoint adjuster				
A160	E6 Function	Setpoint adjuster		53	
A162	E6 Set Max	Range maximum		100.0% r.h.	
A163	E6 Set min	Range minimum		0.0% r.h.	
A164	E6 Cal.Max	Calibration of range maximum		% r.h.	
A165	E6 Cal.Midd	Calibration of range midpoint	Possible only on device	% r.h.	
A166	E6 Cal.Min	Calibration of range minimum		% r.h.	
A168	E6 Sim.val.	Simulation value	In case of sensor error	60.0% r.h.	
Measuring points					
MP1		Active setpoint (D116)			
MP2		Auxiliary setpoint (D118)			
MP3		Positioning signal, aux. controller			
MP4		Active setpoint, humidity (D126)			
MP5		Main setpoint, humidity (D127)			
MP6		Positioning signal, main controller humidity			
MP7		Control mode (0/1)			

Table of content

Im Surinam 55
CH-4016 Basel
Tel. +41 61 - 695 55 55
Fax +41 61 - 695 55 10
www.sauter-controls.com
info@sauter-controls.com

Printed in Switzerland