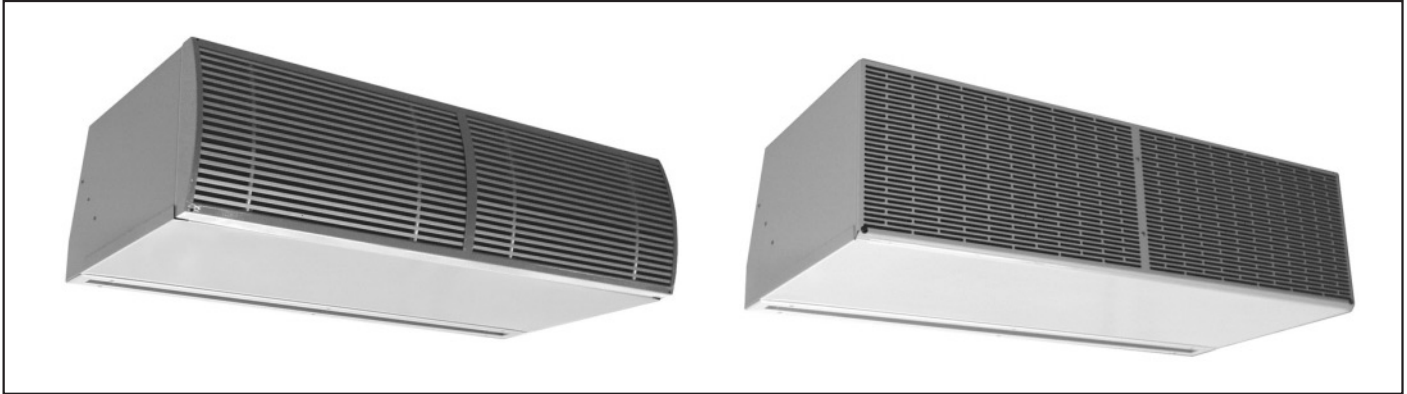


AIR CURTAINS

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USE

STANDESSE VCS-03 air curtains are used for barrier-free separation of two spaces of different climatic parameters. Air stream going from upstairs down its separates the inside clean and air-conditioned space from outside environment and prevent the heat or cold losses, draught throw door and penetration of dust or insect. Air curtains can be used also as an effective heat source. Also in case of opened doors up to 85% of the heat output of the air curtain can be used for heating of the protected area.

The air curtains can be used namely in supermarkets, banks, hotels, restaurants, administration buildings, stores, production halls, etc. Construction of **STANDESSE** air curtains ensures high curtaining effect and reasonable price. The project of air curtain must be solved always by the designer of HVAC.

DESCRIPTION

STANDESSE air curtains are designed as a component system. After choose of the suitable size and output of the air curtain the air curtain can be equipped with such accessories to suit best to specific application and requirements of a Customer (e.g. it is possible to choose the shape of inlet cover, way of control, filtration insert and, for surcharge there is possible to choose a surface color).

STANDESSE air curtains have been designed with a special impact to high quality of all used components, to easy installation and use. Painted sheets protected with protective film are used for production for better protection of the air curtains at transport and handling at installation.

Each air curtain is being tested before dispatch in all operation modes. Standard warranty period for **STANDESSE** air curtains is 24 months.

BRIEF CHARACTERISTICS

- ↘ Air curtains are manufactured in five output ranges capable to protect the openings up to height if 10,7 m. The available lengths of the air curtains are 1,0m, 1.5m, 2m.
- ↘ **STANDESSE** air curtains are designed for installation both to open space and into hanged ceilings (with optional equipment)
- ↘ It is possible to choose water heat exchanger, electric heat exchanger or no heat exchanger.
- ↘ Adjustable air output and electric heater output.
- ↘ Very quiet operation. Major part of the internal space of the air curtain is covered with noise insulation layer.
- ↘ Outlet construction enables to adjust the air stream direction
- ↘ Easy installation of the air curtain in almost any space.
- ↘ Optional controls of the air curtain enable automatic control of the air curtains in dependence on outer and inner temperatures, opened doors and time switch. Some of the controls enable to control the operation of several chained air curtains in the same .

CONSTRUCTION

Casing of the air curtain is made from galvanised steel sheet. Visible parts of the casing are white (RAL 9002) painted. Other RAL colors are optional. Casing of the air curtain are equipped with four M8 nuts in upper part for hanging thereof.

The fans used conform to ISO 9001 requirements. They are fitted with self-lubricated ball bearings, what ensures their high durability and maintenance-free operation. There are two safety thermostats in the air curtain in case the electric heat exchanger is used. There are two safety thermostats in the air curtain in case of use of electric heat exchanger. Operation one, which keeps the air temperature on the outlet on the value of up to 35°C and a safety one, which switches the whole equipment off in case the temperature inside the air curtain exceeds 90°C. Stainless steel resistor heating elements are used in the electric heat exchanger. Water heat exchanger Cu/Al is designed for maximum water temperature 100°C and corresponding maximum work overpressure 1.6 MPa (test overpressure 3.0 MPa). There is a pit in the casing of the air curtain for possible inserting of temperature sensor.

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Fig.1a Dimensions of *STANDESSE VCS-03-A, B, C* air curtains

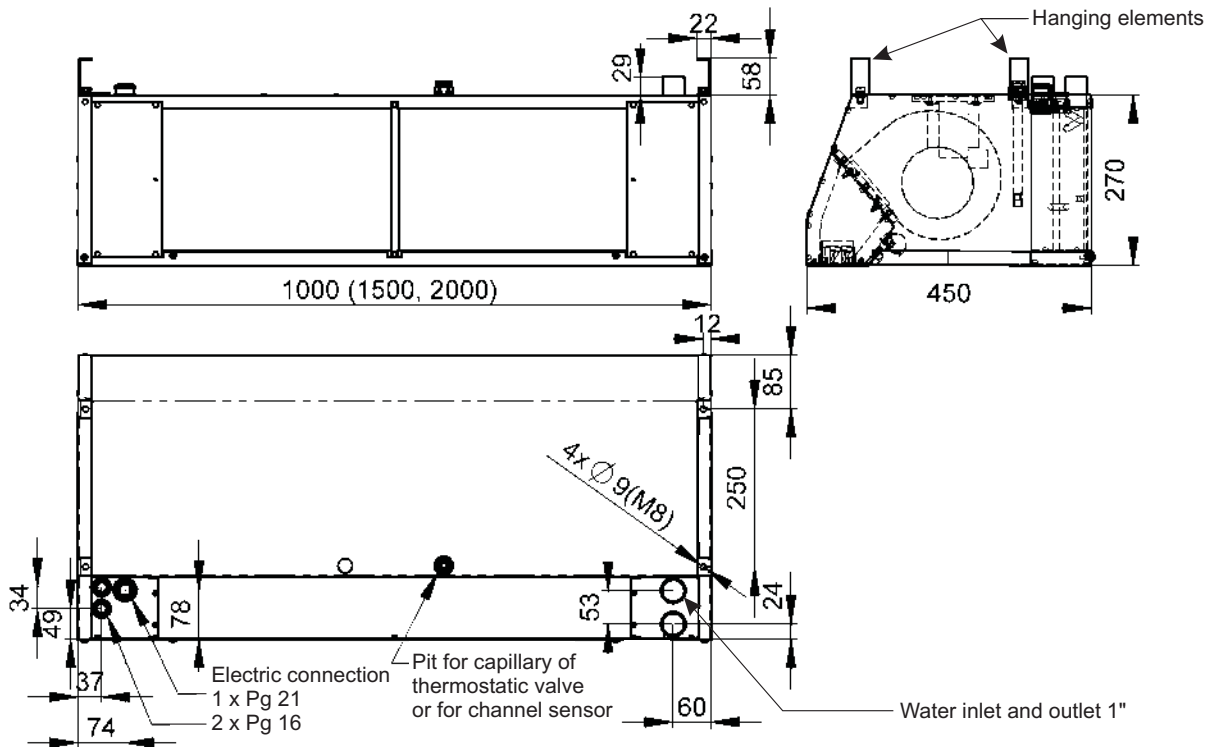
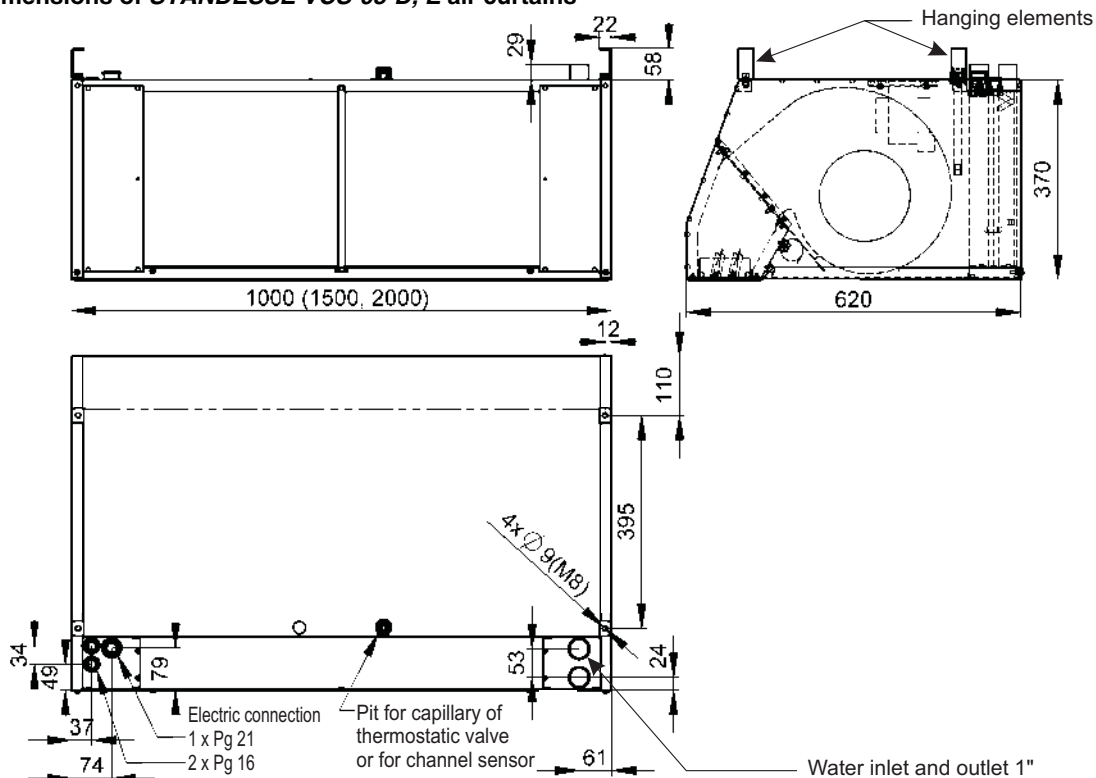


Fig.1b Dimensions of *STANDESSE VCS-03-D, E* air curtains



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Tab.1a Basic parameters of *STANDESSE* air curtains with SM control

Type	Max door height [m] *	Air flow volume [m ³ .h ⁻¹] speed**					Sound power level *** [dB(A)] speed**					Motors power supply 230V/50Hz		Weight [kg]
		5	4	3	2	1	5	4	3	2	1	Input [kW]	Current [A]	
VCS3A-10S-	2,8	1550	1280	1010	670	540	55,8	44,8	42,1	29,1	22,8	0,30	1,30	27
VCS3A-15S-		2320	1920	1510	1010	810	60,6	49,6	46,9	33,9	27,6	0,45	1,95	38
VCS3A-20S-		3100	2560	2020	1350	1080	61,8	50,8	48,1	35,1	28,8	0,60	2,60	50
VCS3A-10E-		1520	1250	990	660	530	55,8	44,8	42,1	29,1	22,8	0,30	1,30	31
VCS3A-15E-		2280	1880	1490	990	790	60,6	49,6	46,9	33,9	27,6	0,45	1,95	45
VCS3A-20E-		3040	2510	1980	1320	1060	61,8	50,8	48,1	35,1	28,8	0,60	2,60	58
VCS3A-10V-		1460	1210	950	630	510	52,2	47,5	40,7	28,8	22,5	0,30	1,30	34
VCS3A-15V-		2190	1810	1430	950	760	57,0	52,3	45,5	33,6	27,3	0,45	1,95	48
VCS3A-20V-		2920	2410	1900	1270	1020	58,2	53,5	46,7	34,8	28,5	0,60	2,60	63
VCS3A-10W-		1430	1180	930	620	500	52,2	47,5	40,7	28,8	22,5	0,30	1,30	36
VCS3A-15W-		2150	1770	1400	930	750	57,0	52,3	45,5	33,6	27,3	0,45	1,95	52
VCS3A-20W-		2860	2360	1870	1240	1000	58,2	53,5	46,7	34,8	28,5	0,60	2,60	66
VCS3B-10S-	3,9	2020	1670	1320	880	700	57,9	54,2	47,3	35,0	28,2	0,46	2,00	28
VCS3B-15S-		3030	2500	1970	1320	1050	62,7	59,0	52,1	39,8	33,0	0,69	3,00	40
VCS3B-20S-		4040	3340	2630	1760	1400	63,9	60,2	53,3	41,0	34,2	0,92	4,00	54
VCS3B-10E-		2000	1650	1300	870	700	57,9	54,2	47,3	35,0	28,2	0,46	2,00	32
VCS3B-15E-		3000	2480	1960	1300	1040	62,7	59,0	52,1	39,8	33,0	0,69	3,00	47
VCS3B-20E-		4000	3300	2610	1740	1390	63,9	60,2	53,3	41,0	34,2	0,92	4,00	61
VCS3B-10V-		1960	1620	1280	850	680	54,3	56,9	45,9	34,7	27,9	0,46	2,00	35
VCS3B-15V-		2940	2430	1920	1280	1020	59,1	61,7	50,7	39,5	32,7	0,69	3,00	50
VCS3B-20V-		3920	3240	2560	1700	1360	60,3	62,9	51,9	40,7	33,9	0,92	4,00	66
VCS3B-10W-		1940	1600	1270	840	670	54,3	56,9	45,9	34,7	27,9	0,46	2,00	37
VCS3B-15W-		2910	2400	1900	1270	1010	59,1	61,7	50,7	39,5	32,7	0,69	3,00	54
VCS3B-20W-		3880	3210	2530	1690	1350	60,3	62,9	51,9	40,7	33,9	0,92	4,00	70
VCS3C-10S-	7,0	2620	2160	1710	1140	910	54,6	49,0	47,4	34,6	27,6	0,69	3,00	33
VCS3C-15S-		3490	2880	2270	1520	1210	63,8	53,7	51,1	38,4	31,4	0,92	4,00	46
VCS3C-20S-		5230	4320	3410	2270	1820	59,0	49,4	51,8	36,5	31,4	1,38	6,00	63
VCS3C-10E-		2540	2100	1660	1110	880	54,6	49,0	47,4	34,6	27,6	0,69	3,00	37
VCS3C-15E-		3390	2800	2210	1470	1180	63,8	53,7	51,1	38,4	31,4	0,92	4,00	53
VCS3C-20E-		5090	4200	3320	2210	1770	59,0	49,4	51,8	36,5	31,4	1,38	6,00	70
VCS3C-10V-		2400	1980	1570	1040	830	51,0	51,7	46,0	34,3	27,3	0,69	3,00	39
VCS3C-15V-		3200	2640	2090	1390	1110	60,2	56,4	49,7	38,1	31,1	0,92	4,00	56
VCS3C-20V-		4800	3970	3130	2090	1670	55,4	52,1	50,4	36,2	31,1	1,38	6,00	75
VCS3C-10W-		2330	1920	1520	1010	810	51,0	51,7	46,0	34,3	27,3	0,69	3,00	42
VCS3C-15W-		3100	2560	2020	1350	1080	60,2	56,4	49,7	38,1	31,1	0,92	4,00	60
VCS3C-20W-		4660	3850	3040	2020	1620	55,4	52,1	50,4	36,2	31,1	1,38	6,00	79
VCS3D-10S-	9,4	4580	3780	2980	1990	1590	55,1	54,0	50,8	37,4	29,5	0,98	4,20	49
VCS3D-15S-		6860	5670	4480	2980	2390	59,9	58,8	55,6	42,2	34,3	1,47	6,30	71
VCS3D-20S-		8910	7360	5810	3870	3100	61,1	60,0	56,8	43,4	35,5	1,96	8,40	93
VCS3D-10V-		4460	3680	2910	1940	1550	55,1	54,0	50,8	37,4	29,5	0,98	4,20	58
VCS3D-15V-		6080	5020	3960	2640	2110	59,9	58,8	55,6	42,2	34,3	1,47	6,30	84
VCS3D-20V-		8100	6690	5280	3520	2820	61,1	60,0	56,8	43,4	35,5	1,96	8,40	110
VCS3E-10S-	10,7	5360	4420	3490	2330	1860	57,5	56,1	52,7	38,8	30,9	1,44	6,20	55
VCS3E-15S-		8030	6640	5240	3490	2790	62,3	60,9	57,5	43,6	35,7	2,16	9,30	79
VCS3E-20S-		10430	8610	6800	4530	3630	63,5	62,1	58,7	44,8	36,9	2,88	12,40	102
VCS3E-10V-		5210	4310	3400	2270	1810	57,5	56,1	52,7	38,8	30,9	1,44	6,20	64
VCS3E-15V-		7110	5870	4640	3090	2470	62,3	60,9	57,5	43,6	35,7	2,16	9,30	92
VCS3E-20V-		9480	7830	6180	4120	3300	63,5	62,1	58,7	44,8	36,9	2,88	12,40	119

*) Figures of maximum height of doors mentioned in the above table are to be used as informative ones only (to be used for comparing with other air curtains manufacturers) and correspond to the reach of air stream at drop of its mean air velocity to 2m/s in an environment without draught.

***) Fan speed set on the controller. The data correspond to the air curtain without air filter.

****) Sound power level in distance of 3 m from intake side of the air curtain pursuant to EN ISO 3743-1 and EN ISO 3744.

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Tab.1b Basic parameters of *STANDESSE* air curtains with DM control and DA control

Type	Max door height [m] *	Air flow volume [m ³ .h ⁻¹] speed**			Sound power level *** [dB(A)] speed**			Motors power supply 230V/50Hz		Weight [kg]
		3	2	1	3	2	1	Input [kW]	Current [A]	
VCS3A-10S-	2,8	1550	1140	670	55,8	44,0	29,1	0,30	1,30	27
VCS3A-15S-		2320	1720	1010	60,6	48,8	33,9	0,45	1,95	38
VCS3A-20S-		3100	2290	1350	61,8	50,0	35,1	0,60	2,60	50
VCS3A-10E-		1520	1120	660	55,8	44,0	29,1	0,30	1,30	31
VCS3A-15E-		2280	1680	990	60,6	48,8	33,9	0,45	1,95	45
VCS3A-20E-		3040	2240	1320	61,8	50,0	35,1	0,60	2,60	58
VCS3A-10V-		1460	1080	630	52,2	44,2	28,8	0,30	1,30	34
VCS3A-15V-		2190	1620	950	57,0	49,0	33,6	0,45	1,95	48
VCS3A-20V-		2920	2160	1270	58,2	50,2	34,8	0,60	2,60	63
VCS3A-10W-		1430	1060	620	52,2	44,2	28,8	0,30	1,30	36
VCS3A-15W-		2150	1590	930	57,0	49,0	33,6	0,45	1,95	52
VCS3A-20W-		2860	2120	1240	58,2	50,2	34,8	0,60	2,60	66
VCS3B-10S-		3,9	2020	1490	880	57,9	51,3	35,0	0,46	2,00
VCS3B-15S-	3030		2240	1320	62,7	56,1	39,8	0,69	3,00	40
VCS3B-20S-	4040		2980	1760	63,9	57,3	41,0	0,92	4,00	54
VCS3B-10E-	2000		1480	870	57,9	51,3	35,0	0,46	2,00	32
VCS3B-15E-	3000		2220	1300	62,7	56,1	39,8	0,69	3,00	47
VCS3B-20E-	4000		2960	1740	63,9	57,3	41,0	0,92	4,00	61
VCS3B-10V-	1960		1450	850	54,3	51,5	34,7	0,46	2,00	35
VCS3B-15V-	2940		2170	1280	59,1	56,3	39,5	0,69	3,00	50
VCS3B-20V-	3920		2900	1700	60,3	57,5	40,7	0,92	4,00	66
VCS3B-10W-	1940		1430	840	54,3	51,5	34,7	0,46	2,00	37
VCS3B-15W-	2910		2150	1270	59,1	56,3	39,5	0,69	3,00	54
VCS3B-20W-	3880		2870	1690	60,3	57,5	40,7	0,92	4,00	70
VCS3C-10S-	7,0		2620	1930	1140	54,6	47,6	34,6	0,69	3,00
VCS3C-15S-		3490	2580	1520	63,8	53,1	38,4	0,92	4,00	46
VCS3C-20S-		5230	3870	2270	59,0	50,5	36,5	1,38	6,00	63
VCS3C-10E-		2540	1880	1110	54,6	47,6	34,6	0,69	3,00	37
VCS3C-15E-		3390	2510	1470	63,8	53,1	38,4	0,92	4,00	53
VCS3C-20E-		5090	3760	2210	59,0	50,5	36,5	1,38	6,00	70
VCS3C-10V-		2400	1770	1040	51,0	47,8	34,3	0,69	3,00	39
VCS3C-15V-		3200	2370	1390	60,2	53,3	38,1	0,92	4,00	56
VCS3C-20V-		4800	3550	2090	55,4	50,7	36,2	1,38	6,00	75
VCS3C-10W-		2330	1720	1010	51,0	47,8	34,3	0,69	3,00	42
VCS3C-15W-		3100	2290	1350	60,2	53,3	38,1	0,92	4,00	60
VCS3C-20W-		4660	3440	2020	55,4	50,7	36,2	1,38	6,00	79
VCS3D-10S-		9,4	4580	3380	1990	55,1	52,8	37,4	0,98	4,20
VCS3D-15S-	6860		5070	2980	59,9	57,6	42,2	1,47	6,30	71
VCS3D-20S-	8910		6590	3870	61,1	58,8	43,4	1,96	8,40	93
VCS3D-10V-	4460		3290	1940	55,1	52,8	37,4	0,98	4,20	58
VCS3D-15V-	6080		4490	2640	59,9	57,6	42,2	1,47	6,30	84
VCS3D-20V-	8100		5990	3520	61,1	58,8	43,4	1,96	8,40	110
VCS3E-10S-	10,7	5360	3960	2330	57,5	54,8	38,8	1,44	6,20	55
VCS3E-15S-		8030	5940	3490	62,3	59,6	43,6	2,16	9,30	79
VCS3E-20S-		10430	7710	4530	63,5	60,8	44,8	2,88	12,40	102
VCS3E-10V-		5210	3850	2270	57,5	54,8	38,8	1,44	6,20	64
VCS3E-15V-		7110	5260	3090	62,3	59,6	43,6	2,16	9,30	92
VCS3E-20V-		9480	7010	4120	63,5	60,8	44,8	2,88	12,40	119

*) Figures of maximum height of doors mentioned in the above table are to be used as informative ones only (to be used for comparing with other air curtains manufacturers) and correspond to the reach of air stream at drop of its mean air velocity to 2m/s in an environment without draught.

***) Fan speed set on the controller. The data correspond to the air curtain without air filter.

****) Sound power level in distance of 3 m from intake side of the air curtain pursuant to EN ISO 3743-1 and EN ISO 3744.

AIR CURTAINS

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OPERATION CONDITIONS

Air curtains have been designed for operation in indoor and dry environment with ambient temperatures within 0 to +40°C (standard environment pursuant to CSN 33 2320) for transport of air free of coarse dust, fat, chemicals vapours and other impurities. Air curtain equipped with face cover has the overall protection degree IP20.

The air curtain needs no special maintenance. We do recommend the service inspection after each half year of operation, which is to include cleaning of air filter (if applicable) and cleaning of internal spaces from dust.



PACKING, TRANSPORT AND STORAGE

Air curtains are packed on wooden pallets. Ordered accessories is added on the pallet, too.

The air curtain must be handled with care. At the transport the air curtain must be secured against shocks and overturn. Air curtains may be transported on their own pallets only.

The air curtains may be stacked for transport and storage up to maximum height of 1.5m. The air curtains must be stored in closed dry and clean space.



REGULATING

Air output is adjusted by three or five-step fan speed control, according to the control type used. Single speed steps are set manually on remote control unit or automatically according to the certain type of air curtain and controller.

Control of heat output of air curtain with electric heat exchanger:

1) **single-step control** - by switching the resistor heating elements on and off - air curtain and SM-type controller

2) **two-step control** - switching the heating bars in two sections - air curtain and controller type DM or DA

Overheat protection of the electric heating elements is secured by two independent thermostats. Operation thermostat switches the electric heating elements off in case the outlet air temperature reaches 35°C. In case the operation thermostat would not react, the safety thermostat switches the heating elements off in case the internal temperature reaches 90°C.

Tables with theoretical values inform the designers on the parameters of electric heat exchangers.

Table 2a Heating of air at *STANDESSE* air curtains with electric heat exchanger with SM control

Type	Max. heat output [kW]	Power supply 400V/50Hz Current [A]	* Increase of air temperature for Δt [°C] Speed				
			5	4	3	2	1
VCS3A-10E-	9	13,0	17,4	21,2	26,7	40,1	49,9
VCS3A-15E-	12	17,3	15,5	18,8	23,7	35,7	44,7
VCS3A-20E-	18	26,0	17,4	21,1	26,7	40,1	49,9
VCS3B-10E-	9	13,0	13,2	16,0	20,4	30,4	37,8
VCS3B-15E-	12	17,3	11,8	14,2	18,0	27,1	33,9
VCS3B-20E-	18	26,0	13,2	16,0	20,3	30,4	38,1
VCS3C-10E-	9	13,0	10,4	12,6	15,9	23,8	30,1
VCS3C-15E-	12	17,3	10,4	12,6	16,0	24,0	29,9
VCS3C-20E-	18	26,0	10,4	12,6	15,9	24,0	29,9

* The measured values correspond to inlet air temperature 18°C. Outlet air temperature is limited by the operation thermostat to +35°C.

Table 2b Heating of air at *STANDESSE* air curtains with DM control and DA control

Type	Max. heat output 1st level [kW]	Power supply 400V/50Hz Current [A]	*Increase of air temperature for Δt [°C] Speed			Max. heat output 2nd level [kW]	Power supply 400V/50Hz Current [A]	*Increase of air temperature for Δt [°C] Speed		
			3	2	1			3	2	1
VCS3A-10E-	6	8,7	11,6	15,8	26,7	9	13,0	17,6	23,4	40,1
VCS3A-15E-	6	8,7	7,7	10,5	17,8	12	17,3	15,5	21,0	35,7
VCS3A-20E-	9	13,0	8,7	11,8	20,1	18	26,0	17,4	23,6	40,1
VCS3B-10E-	6	8,7	8,8	11,9	20,3	9	13,0	13,2	17,9	30,4
VCS3B-15E-	6	8,7	5,9	7,9	13,6	12	17,3	11,8	15,9	27,1
VCS3B-20E-	9	13,0	6,6	8,9	15,2	18	26,0	13,2	17,9	30,4
VCS3C-10E-	6	8,7	6,9	9,4	15,9	9	13,0	10,4	14,1	23,8
VCS3C-15E-	6	8,7	5,2	7,0	12,0	12	17,3	10,4	14,1	24,0
VCS3C-20E-	9	13,0	5,2	7,0	12,0	18	26,0	10,4	14,1	24,0

* The measured values correspond to inlet air temperature 18°C. Outlet air temperature is limited by the operation thermostat to +35°C.

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Control of heat output of air curtains with water heat-exchangers:

In case the outlet air temperature will reach 45 to 50°C the motors will be switched off due to their overheat protection and re-started automatically after being cooled down. Because of this it is necessary to control the heating output of the heat exchanger. Based on this fact and tables with theoretical data the designer should design the way of control.

Control of heat output of air curtains with water heat exchangers must be solved by one of the following ways:

- **by throttling** - setting of capillary thermostatic throttle valve on the heating water inlet. Capillary sensor is placed into a pit, which is a standard part of air curtains with water heat exchangers and is placed in the space behind the heat exchanger (so it follows the outlet air temperature). One valve is to be used for each air curtain. Use of this way of adjustment is also not suitable for connection of air curtain to existing central heating network, which are usually not dimensioned for connection of additional appliances. The valve creates a significant pressure loss in positions close to OFF position, which change the pressure conditions in the network. For example of installation see Fig. 2. Capillary thermostat is an optional accessories coded TV1-1/1 (see Accessories).
- **by mixing of inlet and outlet heating water by mixing valve** - the best and recommended type of adjustment. For the example of installation see Fig. 3. The mixer is an optional accessories coded SMU. It is equipped with its own pump to recover the pressure losses in heater (heaters) circuit and reacts quickly and exactly enough on the changes of measured temperature. This way of control enables to control the output of the heat exchangers either in accordance with the temperature of the outlet air (in case the channel temperature sensor is used set to pit in space behind the heat exchanger) or in accordance with the temperature in the space (in case the space temperature sensor is set on a suitable place in the room). This second possibility is suitable namely in case the air curtain is used also for heating. Mixer is to be controlled by OSMU controller. One mixer can be used for more curtains in case of parallel connection to central heating. Channel and space temperature sensor are also included in optional accessories. A detailed description of the function of all optional components can be found in "Accessories" part.

Fig.2 Example of control the two air curtains by throttling

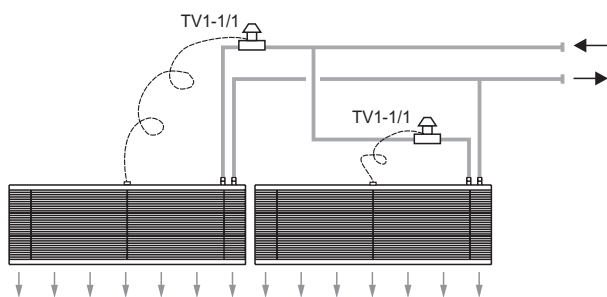
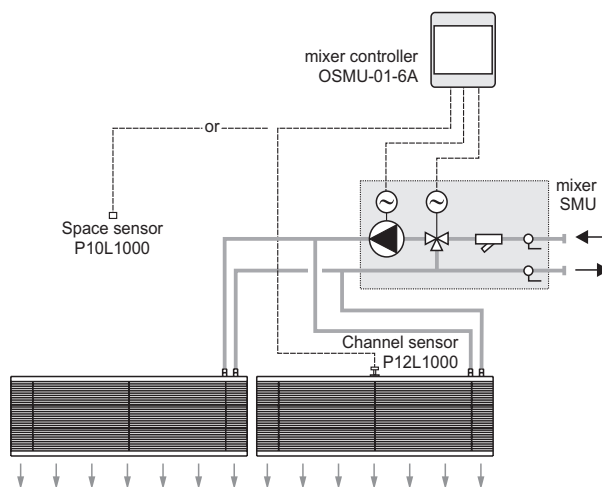


Fig.3 Example of control of two air curtains by mixing



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Tables with theoretical values inform the designers on the parameters of water heat exchangers.

Table 3a Heating of air at *STANDESSE* air curtains with water heat exchanger (temperature drop 70/50°C) with SM control

Type	Water heat exchanger at temperature drop 70/50°C											Water flow rate [l/s]	Water pressure loss [kPa]
	*Increase of air temperature for Δt [°C] Speed					Heat output [kW] Speed							
	5	4	3	2	1	5	4	3	2	1			
VCS3A-10V-	18,8	21,0	24,0	29,4	32,2	9,3	8,6	7,7	6,3	5,6	0,111	1,36	
VCS3A-15V-	20,0	22,4	25,4	30,8	33,8	14,9	13,7	12,3	9,9	8,7	0,178	1,54	
VCS3A-20V-	21,0	23,3	26,4	31,8	34,7	20,7	19,1	17,0	13,7	12,0	0,248	2,39	
VCS3A-10W-	25,8	28,5	31,9	37,6	40,4	12,5	11,4	10,1	7,9	6,8	0,149	0,71	
VCS3A-15W-	28,3	31,1	34,4	39,9	42,4	20,7	18,7	16,4	12,6	10,8	0,247	2,41	
VCS3A-20W-	28,4	31,2	34,5	39,9	42,5	27,5	24,9	21,8	16,8	14,4	0,329	4,00	
VCS3B-10V-	16,6	18,6	21,3	26,3	29,2	11,0	10,2	9,2	7,6	6,7	0,132	1,85	
VCS3B-15V-	17,7	19,8	22,6	27,7	30,7	17,6	16,3	14,7	12,0	10,6	0,211	2,10	
VCS3B-20V-	18,5	20,7	23,5	28,7	31,6	24,6	22,7	20,4	16,6	14,6	0,294	3,25	
VCS3B-10W-	23,0	25,6	28,8	34,5	37,6	15,1	13,9	12,4	9,8	8,5	0,181	1,01	
VCS3B-15W-	25,4	28,1	31,3	36,8	39,7	25,1	22,8	20,2	15,8	13,6	0,300	3,42	
VCS3B-20W-	25,5	28,1	31,4	36,8	39,7	33,5	30,6	26,9	21,1	18,2	0,401	5,71	
VCS3C-10V-	15,1	17,0	19,5	24,3	27,2	12,3	11,4	10,4	8,6	7,6	0,147	2,25	
VCS3C-15V-	17,0	19,1	21,8	26,9	29,8	18,5	17,1	15,5	12,7	11,2	0,221	2,28	
VCS3C-20V-	17,0	19,0	21,7	26,6	29,5	27,6	25,5	23,0	18,9	16,7	0,330	4,00	
VCS3C-10W-	21,4	23,8	27,0	32,6	35,6	16,9	15,5	13,9	11,2	9,8	0,202	1,23	
VCS3C-15W-	24,8	27,4	30,7	36,1	39,0	26,1	23,8	21,0	16,5	14,3	0,312	3,67	
VCS3C-20W-	23,8	26,3	29,5	35,0	37,9	37,6	34,3	30,4	24,0	20,8	0,449	7,00	
VCS3D-10V-	11,2	12,7	14,6	18,3	20,6	17,0	15,8	14,4	12,0	10,8	0,203	1,94	
VCS3D-15V-	12,8	14,3	16,4	20,5	22,9	26,4	24,4	22,1	18,3	16,4	0,315	2,86	
VCS3D-20V-	13,1	14,7	16,9	20,9	23,4	36,0	33,4	30,2	25,0	22,4	0,431	2,88	
VCS3E-10V-	10,5	11,8	13,6	17,1	19,3	18,5	17,2	15,7	13,2	11,9	0,221	2,26	
VCS3E-15V-	11,9	11,9	15,4	19,2	21,5	28,7	28,7	24,2	20,1	18,0	0,343	3,34	
VCS3E-20V-	12,2	13,7	15,8	19,6	22,0	39,3	36,5	33,0	27,4	24,6	0,470	3,37	

* The measured values correspond to inlet air temperature 18°C.

Table 3b Heating of air at *STANDESSE* air curtains with water heat exchanger (temperature drop 80/60°C) with SM control

Type	Water heat exchanger at temperature drop 80/60°C											Water flow rate [l/s]	Water pressure loss [kPa]
	*Increase of air temperature for Δt [°C] Speed					Heat output [kW] Speed							
	5	4	3	2	1	5	4	3	2	1			
VCS3A-10V-	24,2	26,8	30,4	36,6	39,9	12,0	11,0	9,8	7,8	6,9	0,143	2,07	
VCS3A-15V-	25,7	28,4	32,0	38,3	41,7	19,1	17,4	15,5	12,3	10,7	0,228	2,33	
VCS3A-20V-	26,7	29,5	33,1	39,3	42,6	26,4	24,1	21,3	16,9	14,7	0,316	3,58	
VCS3A-10W-	32,9	36,1	40,0	46,4	49,5	16,0	14,4	12,6	9,8	8,4	0,191	1,08	
VCS3A-15W-	35,7	38,9	42,6	48,7	51,6	26,0	23,3	20,2	15,4	13,1	0,311	3,53	
VCS3A-20W-	35,7	38,9	42,7	48,8	51,6	34,7	31,1	27,0	20,5	17,5	0,414	5,85	
VCS3B-10V-	21,4	23,8	27,0	33,0	36,3	14,2	13,1	11,7	9,5	8,4	0,170	2,83	
VCS3B-15V-	22,7	25,3	28,6	34,6	38,0	22,7	20,8	18,6	15,0	13,1	0,271	3,19	
VCS3B-20V-	23,7	26,2	29,6	35,6	39,0	31,5	28,8	25,7	20,5	18,0	0,376	4,90	
VCS3B-10W-	29,5	32,5	36,2	42,8	46,2	19,4	17,6	15,6	12,2	10,5	0,232	1,53	
VCS3B-15W-	32,1	35,2	38,9	45,1	48,4	31,7	28,6	25,1	19,4	16,6	0,379	5,04	
VCS3B-20W-	32,2	35,2	39,0	45,2	48,4	42,3	38,3	33,4	25,9	22,1	0,506	8,40	
VCS3C-10V-	19,5	21,8	24,8	30,5	33,8	15,9	14,7	13,2	10,8	9,5	0,190	3,46	
VCS3C-15V-	21,9	24,4	27,6	33,5	36,9	23,8	21,8	19,6	15,8	13,9	0,284	3,47	
VCS3C-20V-	21,7	24,1	27,3	33,1	36,4	35,3	32,5	29,0	23,5	20,6	0,422	6,03	
VCS3C-10W-	27,4	30,4	34,0	40,5	43,9	21,7	19,8	17,5	13,9	12,0	0,259	1,87	
VCS3C-15W-	31,4	34,4	38,1	44,4	47,6	33,0	29,9	26,1	20,3	17,4	0,394	5,41	
VCS3C-20W-	30,1	33,0	36,7	43,0	46,3	47,5	43,1	37,8	29,5	25,4	0,568	10,34	
VCS3D-10V-	14,6	16,3	18,6	23,1	25,8	22,1	20,4	18,4	15,2	13,5	0,264	3,01	
VCS3D-15V-	16,4	18,3	20,8	25,6	28,4	33,9	31,2	28,0	22,9	20,3	0,405	4,36	
VCS3D-20V-	16,9	18,8	21,3	26,1	29,0	46,3	42,6	38,2	31,2	27,7	0,553	4,37	
VCS3E-10V-	13,6	15,2	17,4	21,6	24,2	24,1	22,3	20,1	16,6	14,9	0,288	3,52	
VCS3E-15V-	15,4	17,1	19,5	24,0	26,7	37,0	34,1	30,6	25,1	22,4	0,442	5,10	
VCS3E-20V-	15,7	17,6	20,0	24,6	27,3	50,6	46,6	41,8	34,3	30,5	0,605	5,14	

* The measured values correspond to inlet air temperature 18°C.

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Table 3c Heating of air at *STANDESSE* air curtains with water heat exchanger (temperature drop 90/70°C) with SM control

Type	Water heat exchanger at temperature drop 90/70°C											Water flow rate [l/s]	Water pressure loss [kPa]
	*Increase of air temperature for Δt [°C]					Heat output [kW]							
	Speed					Speed							
	5	4	3	2	1	5	4	3	2	1			
VCS3A-10V-	29,6	32,6	36,7	43,8	47,5	14,7	13,4	11,8	9,4	8,2	0,175	2,89	
VCS3A-15V-	31,3	34,5	38,5	45,6	49,5	23,3	21,1	18,7	14,7	12,7	0,278	3,23	
VCS3A-20V-	32,4	35,6	39,7	46,7	50,4	32,1	29,1	25,6	20,1	17,4	0,383	4,91	
VCS3A-10W-	40,0	43,6	48,0	55,1	58,5	19,4	17,4	15,1	11,6	9,9	0,232	1,48	
VCS3A-15W-	42,9	46,5	50,7	57,5	60,6	31,3	27,9	24,1	18,1	15,4	0,374	4,77	
VCS3A-20W-	43,0	46,6	50,8	57,6	60,6	41,7	37,3	32,2	24,2	20,6	0,499	7,94	
VCS3B-10V-	26,2	29,0	32,7	39,5	43,3	17,4	15,9	14,2	11,4	10,0	0,208	3,95	
VCS3B-15V-	27,7	30,7	34,4	41,3	45,2	27,7	25,3	22,4	17,9	15,6	0,330	4,41	
VCS3B-20V-	28,8	31,7	35,6	42,5	46,3	38,2	34,9	30,9	24,5	21,3	0,457	6,75	
VCS3B-10W-	35,9	39,3	43,5	50,9	54,7	23,6	21,3	18,7	14,5	12,4	0,282	2,11	
VCS3B-15W-	38,8	42,2	46,4	53,3	57,0	38,2	34,3	29,9	23,0	19,5	0,457	6,85	
VCS3B-20W-	38,8	42,2	46,5	53,4	57,0	51,1	46,0	39,9	30,6	26,1	0,610	11,40	
VCS3C-10V-	24,0	26,6	30,1	36,6	40,4	19,5	17,9	16,0	12,9	11,4	0,233	4,85	
VCS3C-15V-	26,8	29,6	33,3	40,1	43,9	29,0	26,5	23,6	18,9	16,5	0,347	4,82	
VCS3C-20V-	26,4	29,2	32,9	39,5	43,3	43,0	39,3	34,9	28,0	24,5	0,514	8,34	
VCS3C-10W-	33,5	36,8	41,0	48,3	52,0	26,5	24,0	21,1	16,5	14,3	0,316	2,59	
VCS3C-15W-	37,9	41,3	45,5	52,5	56,1	39,8	35,8	31,2	24,0	20,5	0,476	7,37	
VCS3C-20W-	36,3	39,7	43,9	51,0	54,6	57,4	51,8	45,2	34,9	30,0	0,686	14,08	
VCS3D-10V-	18,0	20,0	22,7	27,8	30,9	27,2	24,9	22,4	18,3	16,2	0,325	4,25	
VCS3D-15V-	20,1	22,3	25,2	30,6	33,9	41,4	37,9	33,8	27,4	24,3	0,495	6,07	
VCS3D-20V-	20,6	22,8	25,8	31,3	34,6	56,5	51,7	46,1	37,4	33,1	0,675	6,06	
VCS3E-10V-	16,8	18,7	21,2	26,1	29,0	29,6	27,3	24,4	20,1	17,8	0,354	4,95	
VCS3E-15V-	18,8	20,8	23,6	28,8	31,9	45,3	41,5	37,1	30,2	26,7	0,541	7,12	
VCS3E-20V-	19,2	21,3	24,1	29,4	32,6	61,8	56,6	50,6	41,1	36,4	0,738	7,12	

* The measured values correspond to inlet air temperature 18°C.

Table 4a Heating of air at *STANDESSE* air curtains with water heat exchanger (temperature drop 70/50°C) with DM control and DA control

Type	Water heat exchanger at temperature drop 70/50°C						Water flow rate [l/s]	Water pressure loss [kPa]
	*Increase of air temperature for Δt [°C]			Heat output [kW]				
	Speed			Speed				
	3	2	1	3	2	1		
VCS3A-10V-	18,8	22,4	29,4	9,3	8,2	6,3	0,111	1,36
VCS3A-15V-	20,0	23,8	30,8	14,9	13,0	9,9	0,178	1,54
VCS3A-20V-	21,0	24,7	31,8	20,7	18,1	13,7	0,248	2,39
VCS3A-10W-	25,8	30,0	37,6	12,5	10,8	7,9	0,149	0,71
VCS3A-15W-	28,3	32,7	39,9	20,7	17,6	12,6	0,247	2,41
VCS3A-20W-	28,4	32,7	39,9	27,5	23,5	16,8	0,329	4,00
VCS3B-10V-	16,6	19,8	26,3	11,0	9,7	7,6	0,132	1,85
VCS3B-15V-	17,7	21,1	27,7	17,6	15,5	12,0	0,211	2,10
VCS3B-20V-	18,5	22,0	28,7	24,6	21,6	16,6	0,294	3,25
VCS3B-10W-	23,0	27,1	34,5	15,1	13,1	9,8	0,181	1,01
VCS3B-15W-	25,4	29,6	36,8	25,1	21,6	15,8	0,300	3,42
VCS3B-20W-	25,5	29,6	36,8	33,5	28,8	21,1	0,401	5,71
VCS3C-10V-	15,1	18,2	24,3	12,3	10,9	8,6	0,147	2,25
VCS3C-15V-	17,0	20,3	26,9	18,5	16,3	12,7	0,221	2,28
VCS3C-20V-	17,0	20,2	26,6	27,6	24,3	18,9	0,330	4,00
VCS3C-10W-	21,4	25,3	32,6	16,9	14,8	11,2	0,202	1,23
VCS3C-15W-	24,8	29,0	36,1	26,1	22,5	16,5	0,312	3,67
VCS3C-20W-	23,8	27,8	35,0	37,6	32,4	24,0	0,449	7,00
VCS3D-10V-	11,2	13,6	18,3	17,0	15,1	12,0	0,203	1,94
VCS3D-15V-	12,8	15,3	20,5	26,4	23,3	18,3	0,315	2,86
VCS3D-20V-	13,1	15,7	20,9	36,0	31,9	25,0	0,431	2,88
VCS3E-10V-	10,5	12,6	17,1	18,5	16,5	13,2	0,221	2,26
VCS3E-15V-	11,9	14,3	19,2	28,7	25,5	20,1	0,343	3,34
VCS3E-20V-	12,2	14,7	19,6	39,3	34,8	27,4	0,470	3,37

* The measured values correspond to inlet air temperature 18°C.

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Table 4b Heating of air at *STANDESSE* air curtains with water heat exchanger (temperature drop 80/60°C) with DM control and DA control

Type	Water heat exchanger at temperature drop 80/60°C						Water flow rate [l/s]	Water pressure loss [kPa]
	*Increase of air temperature for Δt [°C]			Heat output [kW]				
	Speed			Speed				
	3	2	1	3	2	1		
VCS3A-10V-	24,2	28,5	36,6	12,0	10,4	7,8	0,143	2,07
VCS3A-15V-	25,7	30,1	38,3	19,1	16,5	12,3	0,228	2,33
VCS3A-20V-	26,7	31,1	39,3	26,4	22,8	16,9	0,316	3,58
VCS3A-10W-	32,9	37,9	46,4	16,0	13,6	9,8	0,191	1,08
VCS3A-15W-	35,7	40,6	48,7	26,0	21,9	15,4	0,311	3,53
VCS3A-20W-	35,7	40,6	48,8	34,7	29,2	20,5	0,414	5,85
VCS3B-10V-	21,4	25,3	33,0	14,2	12,4	9,5	0,170	2,83
VCS3B-15V-	22,7	26,8	34,6	22,7	19,7	15,0	0,271	3,19
VCS3B-20V-	23,7	27,8	35,6	31,5	27,3	20,5	0,376	4,90
VCS3B-10W-	29,5	34,3	42,8	19,4	16,6	12,2	0,232	1,53
VCS3B-15W-	32,1	36,9	45,1	31,7	26,9	19,4	0,379	5,04
VCS3B-20W-	32,2	37,0	45,2	42,3	36,0	25,9	0,506	8,40
VCS3C-10V-	19,5	23,2	30,5	15,9	14,0	10,8	0,190	3,46
VCS3C-15V-	21,9	25,9	33,5	23,8	20,8	15,8	0,284	3,47
VCS3C-20V-	21,7	25,6	33,1	35,3	30,8	23,5	0,422	6,03
VCS3C-10W-	27,4	32,1	40,5	21,7	18,7	13,9	0,259	1,87
VCS3C-15W-	31,4	36,2	44,4	33,0	28,1	20,3	0,394	5,41
VCS3C-20W-	30,1	34,8	43,0	47,5	40,6	29,5	0,568	10,34
VCS3D-10V-	14,6	17,4	23,1	22,1	19,4	15,2	0,264	3,01
VCS3D-15V-	16,4	19,5	25,6	33,9	29,6	22,9	0,405	4,36
VCS3D-20V-	16,9	19,9	26,1	46,3	40,5	31,2	0,553	4,37
VCS3E-10V-	13,6	16,3	21,6	24,1	21,2	16,6	0,288	3,52
VCS3E-15V-	15,4	18,2	24,0	37,0	32,5	25,1	0,442	5,10
VCS3E-20V-	15,7	18,7	24,6	50,6	44,3	34,3	0,605	5,14

* The measured values correspond to inlet air temperature 18°C.

Table 4c Heating of air at *STANDESSE* air curtains with water heat exchanger (temperature drop 90/70°C) with DM control and DA control

Type	Water heat exchanger at temperature drop 90/70°C						Water flow rate [l/s]	Water pressure loss [kPa]
	*Increase of air temperature for Δt [°C]			Heat output [kW]				
	Speed			Speed				
	3	2	1	3	2	1		
VCS3A-10V-	29,6	34,5	43,8	14,7	12,6	9,4	0,175	2,89
VCS3A-15V-	31,3	36,3	45,6	23,3	20,0	14,7	0,278	3,23
VCS3A-20V-	32,4	37,5	46,7	32,1	27,4	20,1	0,383	4,91
VCS3A-10W-	40,0	45,6	55,1	19,4	16,4	11,6	0,232	1,48
VCS3A-15W-	42,9	48,5	57,5	31,3	26,1	18,1	0,374	4,77
VCS3A-20W-	43,0	48,5	57,6	41,7	34,9	24,2	0,499	7,94
VCS3B-10V-	26,2	30,7	39,5	17,4	15,1	11,4	0,208	3,95
VCS3B-15V-	27,7	32,5	41,3	27,7	23,9	17,9	0,330	4,41
VCS3B-20V-	28,8	33,5	42,5	38,2	33,0	24,5	0,457	6,75
VCS3B-10W-	35,9	41,4	50,9	23,6	20,1	14,5	0,282	2,11
VCS3B-15W-	38,8	44,2	53,3	38,2	32,2	23,0	0,457	6,85
VCS3B-20W-	38,8	44,2	53,4	51,1	43,0	30,6	0,610	11,40
VCS3C-10V-	24,0	28,3	36,6	19,5	17,0	12,9	0,233	4,85
VCS3C-15V-	26,8	31,3	40,1	29,0	25,2	18,9	0,347	4,82
VCS3C-20V-	26,4	30,9	39,5	43,0	37,2	28,0	0,514	8,34
VCS3C-10W-	33,5	38,8	48,3	26,5	22,6	16,5	0,316	2,59
VCS3C-15W-	37,9	43,3	52,5	39,8	33,6	24,0	0,476	7,37
VCS3C-20W-	36,3	41,7	51,0	57,4	48,6	34,9	0,686	14,08
VCS3D-10V-	18,0	21,2	27,8	27,2	23,7	18,3	0,325	4,25
VCS3D-15V-	20,1	23,6	30,6	41,4	35,9	27,4	0,495	6,07
VCS3D-20V-	20,6	24,2	31,3	56,5	49,1	37,4	0,675	6,06
VCS3E-10V-	16,8	19,8	26,1	29,6	25,9	20,1	0,354	4,95
VCS3E-15V-	18,8	22,1	28,8	45,3	39,4	30,2	0,541	7,12
VCS3E-20V-	19,2	22,6	29,4	61,8	53,7	41,1	0,738	7,12

* The measured values correspond to inlet air temperature 18°C.

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CONTROL

STANDESSE air curtains are controlled by an separate controller unit, which is connected to the air curtain by a cable. Choice of concrete controller depends on the heat exchanger used in the air curtain and on the requirements set to the air curtain by the user. Controllers can be used for automatic, semi-automatic and manual control modes. For basic differences see the following table.

Tab.5 Comparing of controllers

Possibilities	Controller type		
	SM type Code 1 at order	DM type Code 2 at order	DA type Code 3 at order
Way of control	Manual	Manual	Manual / Automatic
Connection of external switching devices (door switch, thermostat, time switch, etc.)	1 switch (any type)	1 switch (any type)	3 various switches
Delay at switch off of the external sensor	-	30 s	30 s
Number of speed steps	5	3	3
Light signal of the set function	ON	All functions	All functions
Filter clogging signalling	-	-	Yes
Chaining possibility	-	Up to 6 pcs	Up to 6 pcs
Interconnection with the air curtain	Power cable of max. length 100m	Low-voltage cable of max. length 50m	Low-voltage cable of max. length 50m
Fixing of the controller	4 pcs screws 6x30mm	2pcs screws 4x30mm	2pcs screws 4x30mm

KEY CODE:

- **PANEL-x/xx-x - Control panel** is used for control of the air curtains output and it is necessary for all air curtains! The possibilities of single panes, their description, dimensions and parameters are stated in the CONTROL article above. The Panel is fixed to the wall and it is interconnected with the air curtain by a cable (not included) according to the appropriate wiring diagram.

PANEL-V/SM-A

Output (stated just for SM panel)

A - for air curtains A, B, C of lower output (max. current load 8A)

D - for air curtains D, E of higher output (max. current 18A)

Control

SM - power manual control

DM - semi-automatic control

DA - automatic control

Heat exchanger

V - water heat exchanger or no heat exchanger

E - electric heat exchanger

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SM CONTROL (code 1 at order of air curtain)

The simplest control. Just one air curtain can be controlled by this controller. The controllers are delivered in two basic types, each of them in two output variants. A-type is designed for smaller air curtains A, B, C series, D-type is designed for air curtains D, E series. Both types are equipped with signalling of fans run by yellow LED indicator.

E/SM-x type is for air curtains with electric heater. It is equipped with two rotary switches. One switch is six-positional and sets the speed of the fan in five steps and switches the run as well as the electric heating off, the second, two-positional one selects the function of electric heat exchanger.

V/SM-x type is for air curtains with water heat exchanger or without heat exchanger. It is equipped just with one six-positional switch, which sets the speed of the fan in five steps and switches the air curtain off.

In case the door switch is used, it overtakes the function of switching the air curtain on and off. The air curtain is switched on after the doors are opened (in case the rotary switch is in any other position than "0") and the air output of the air curtain corresponds to that set by the rotary switch. In case the heating switch (at the electric heat exchanger version) is in the ON position, the air curtain will heat as well. When the doors are closed, the air curtain is switched off.

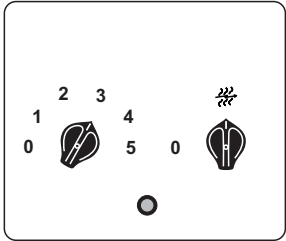
The other two possible switching devices - time switch and thermostat - have the same function as the door switch. They also overtake the function of switching the air curtain on and off. The used switch must have at least the same or higher current load than is the current of the air curtain motors.

For wiring diagram see Fig. 15 and 16.

In case of use the V/SM controller for control of air curtain with water heat exchanger, any type of heating output adjustments described in "REGULATING" article above can be used.

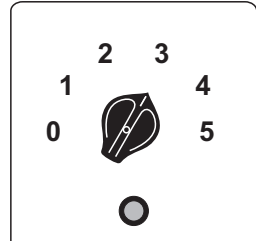
Controller is to be hanged on the wall.

Controller for air curtains with electric heating E/SM



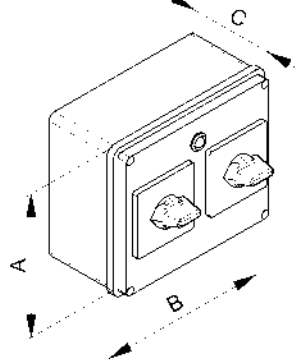
Meaning of symbols	
0	OFF
1	Air output 1 st step (minimum)
2	Air output 2 nd step
3	Air output 3 rd step
4	Air output 4 th step
5	Air output 5 th step (maximum)
	Light signal of operation
	Heat exchanger output 100%

Controller for air curtains with water/no heating V/SM



Meaning of symbols	
0	OFF
1	Air output 1 st step (minimum)
2	Air output 2 nd step
3	Air output 3 rd step
4	Air output 4 th step
5	Air output 5 th step (maximum)
	Light signal of operation

Fig.4 Dimensions of the SM controller



Type of controller	Dimensions		
	A [mm]	B [mm]	C [mm]
E/SM-A, V/SM-A	135	160	77
E/SM-D, V/SM-D	135	160	150

Fig. 5 SM controller for air curtains with water heat exchanger - output range A, B, C



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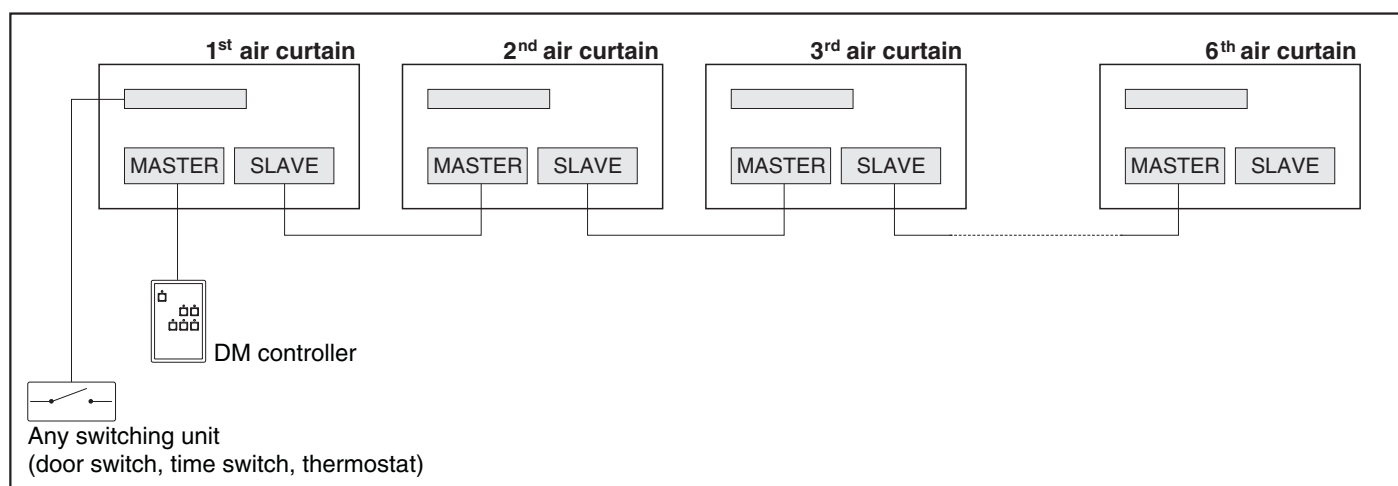
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DM control (code 2 at order of air curtain)

From the function point of view, the DM controller is similar to SM one, but it is equipped with the electronic system with microprocessor and enables the connection of one external switching element (thermostat, time switch, door switch). In case an external switch is used it switches the air curtain on and off in pre-set mode. The pre-set mode is set by corresponding push buttons marked with the symbols. The program of the processor will not allow to react on inappropriate combination. DM controller enables to set three speeds of the fan and two output steps of the electric heat exchanger. Switching the air curtain on, set speed of the fans and output step of the electric heater are signalled by LED above each push button. The version of the controller for electric heat exchanger has an extra built in feature of post-cooling of the heat exchangers. It means that after the OFF signal is sent just the electric heat exchanger is switched off. The fans will be switched off with 30 seconds delay. The output of the water exchanger must be controlled by any of the ways described in "Regulating" article above. It is not possible to control the output of water heat exchanger by DM controller!

Chaining of air curtains

DM control enables so called chaining of air curtains, when it is possible to control up to 6 air curtains all at once and in the same mode. It means that any of them is connected to the controller as a "master" one. Other ones are then chained to it as "slave" ones. See following Fig.

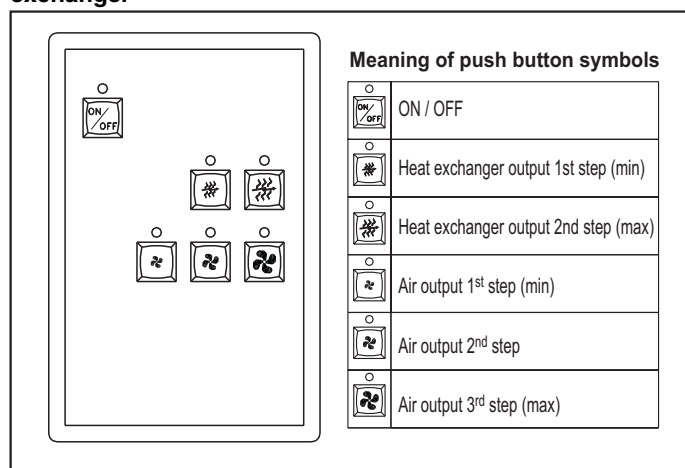


Chained air curtains can be controlled by external switch. In case it is used, it must be connected to the MASTER air curtain. The MASTER air curtain is understood that one connected to control panel. External switch controls all chained air curtains all at once. The same cable is used for interconnection of the air curtains and the connection to the controller. Telephone connectors are fixed to the ends of the cable so the connection is a matter of few moments and any misconnection is avoided.

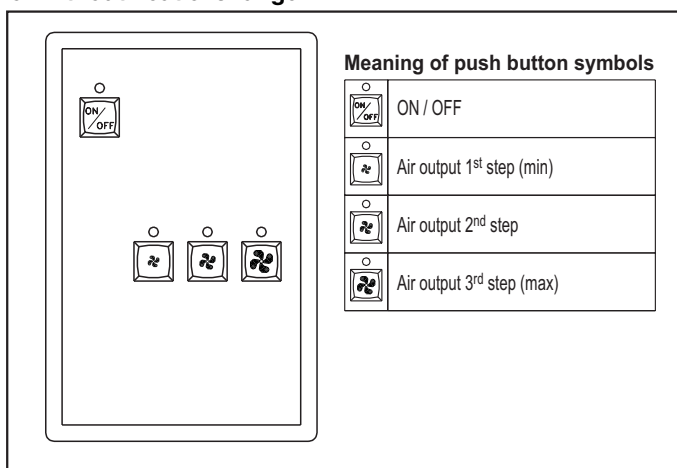
In case any motor overheats and the overheat protection switches it off, the remaining motors remain in operation. In case any electric heat exchanger gets overheated, the safety thermostat switches it off. All remaining heat exchangers remain in operation.

For the dimensions of the controller see Fig. 6. The Controller is to be hanged on the wall.

E-DM controller for air curtains with electric heat exchanger

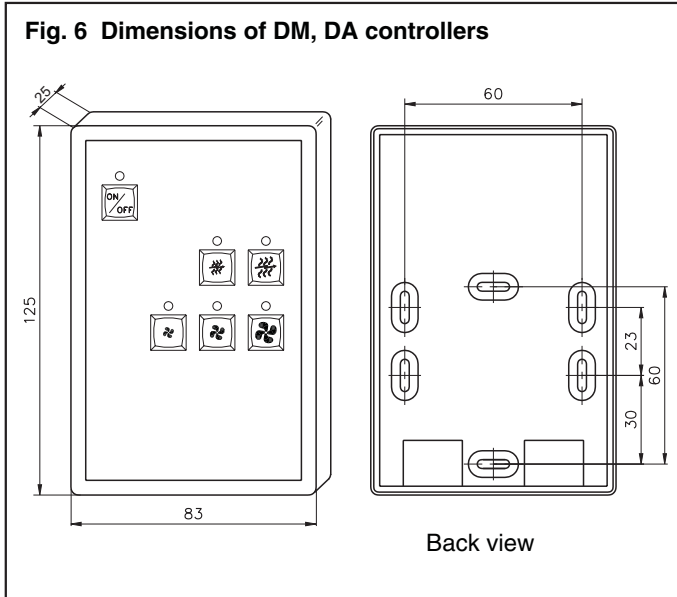


V-DM controller for air curtains with water heat exchanger or without heat exchanger



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Fig. 6 Dimensions of DM, DA controllers

Fig. 7 E-DM controller


DA control (code 3 at order of air curtain)

DA controller is equipped with electronic system with microprocessor with enhanced functions compared to DM-type. Controller enables to set both automatic and manual operation modes. This controller can work with three external switches (door switch, time switch and thermostat) all at once. Outdoor temperature sensor is included in the standard delivery; information of this sensor are used by the electronic system to choose the optimal air output. Air curtain equipped with this type of control at using of all three external switches will choose the suitable speed of fans and output of the electric heater with respect to the outdoor and indoor temperature, door opening and closing, as well as to the time program.

DA controller is equipped with the filter clogging signal (FILTER pilot lamp), at the versions with electric heat exchanger also with signalling of air curtain heat exchanger overheating (ALARM pilot lamp).

Manual mode

In manual mode (set by MAN push button) the functions are selected by respective push buttons marked with the symbols. Connected external switches and outer temperature sensors are ignored in this mode. The program of the processor will not allow to react on inappropriate combination. DM controller enables to set three speeds of the fan and two output steps of the electric heat exchanger. Switching the air curtain on, set speed of the fans and output step of the electric heater are signalled by LED above each push button. The version of the controller for electric heat exchanger has an extra built in feature of post-cooling of the heat exchangers. It means that after the OFF signal is sent just the electric heat exchanger is switched off. The fans will be switched off with 30 seconds delay. The output of the water exchanger must be controlled by any of the ways described in "Regulating" article above. It is not possible to control the output of water heat exchanger by DA controller!

Automatic mode

In automatic operation mode (set by AUT push button) is the operation of the air curtain depending on the connected sensors and switches. Dependence of the automatic system function on connection of external sensors for the air curtain with electric heat exchangers is mentioned in the following Tables. In case of use of water heat exchanger the tables are valid as well, but only for the air output of the air curtain. The output of the water exchanger must be controlled by any of the ways described in "Regulating" article above.

It is not possible to control the output of water heat exchanger by DA controller!

Description of the operation of the air curtain in the automatic mode:

Function of the controller with connected outer temperature sensor and without connection of additional switching elements

The electronic system controls the speed of fans and output of the electric heater according to the outer temperature - see Tab. Reading accuracy $\pm 3^{\circ}\text{C}$.

Tab.6 Operation mode parameters

Outer temperature				
< 5 °C	5 ÷ 10 °C	10 ÷ 15 °C	15 ÷ 20 °C	> 20 °C
Fan speed / Electric heater output				
3. / 2.	2. / 2.	2. / 1.	1. / 0	2. / 0

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Function of the controller with connected outer temperature sensor and door switch

Using the door switch the electronic system respects if the door is opened or closed - see Tab. 7. In case the door is closed the electronic system sets the lowest heat and air outputs. In case the door is opened, the system immediately increases the speed of fans and the output of the electric heat exchanger according to the outer temperature. When the door is closed, the system switches the fans to the original speed with about 30 sec delay. In case the door is re-opened anytime during this interval, the delay function is cancelled and it is switched on again after the door is closed. In case of switching into manual mode the both door switch and the outer temperature sensor are ignored. Reading accuracy $\pm 3^{\circ}\text{C}$.

Tab. 7 Parameters of operation mode with connected door switch

Door state	Outer temperature				
	<5 °C	5 ÷ 10 °C	10 ÷ 15 °C	15 ÷ 20 °C	> 20 °C
	Fan speed / Electric heater output				
Door opened	3. / 2.	2. / 2.	2. / 1.	1. / 0	2. / 0
Door closed	2. / 2.	1. / 1.	1. / 1.	0 / 0	0 / 0

Function of the air curtain with connected outer temperature sensor, door switch and room thermostat

Optimal function of the air curtain and maximum power saving are ensured in case of use of door switch in combination with room thermostat and outer temperature sensor. Thermostat can be used also for the air curtains with the water heat exchanger; it does not control their output, but ensures switching the air curtain off in case the required temperature in the protected space has been reached. Air output as well as the electric heat exchanger output are controlled by the electronic system, which evaluates the information provided by the external switches and sensors - see Tab. 8. Reading accuracy $\pm 3^{\circ}\text{C}$.

Tab. 8 Parameters of operation state with connected door switch and room thermostat.

Temperature set on the thermostat	Door	Outer temperature				
		<5 °C	5 ÷ 10 °C	10 ÷ 15 °C	15 ÷ 20 °C	> 20 °C
		Fan speed / Electric heater output				
reached	opened	3. / 1.	2. / 1.	2. / 1.	1. / 0	2. / 0
reached not	opened	3. / 2.	2. / 2.	2. / 1.	1. / 0	2. / 0
reached	closed	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
reached not	closed	2. / 2.	1. / 1.	1. / 1.	1. / 1.	0 / 0

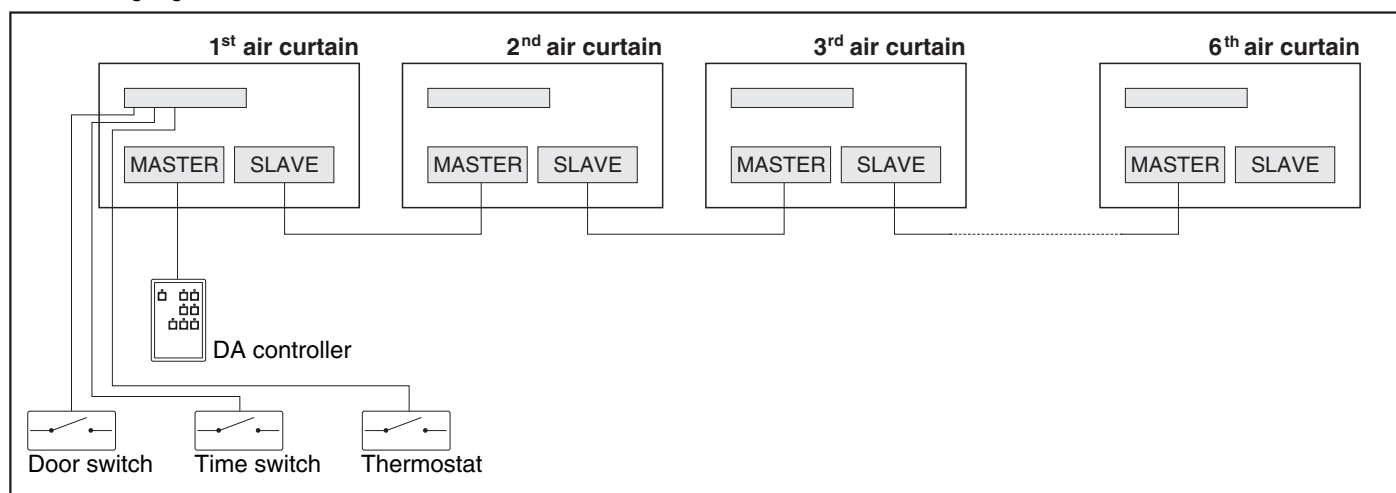
In case the thermostat is connected it is necessary to activate the interconnection on the electronic mainboard by its removal from one pin and re-setting to the two protruding messing pins (for detail see Fig. 9). (The interconnection is set by the manufacturer to one pin only.)

Function of the air curtain with the time switch

The air curtain can be also connected to the time switch (SH) the any of the above combinations; it can be used for switching the air curtain on and off in the pre-set time intervals.

Chaining of the air curtains

It is possible to chain the air curtains in the same way as in case of DM controls. The interconnection of the air curtains is clear from the following Fig.



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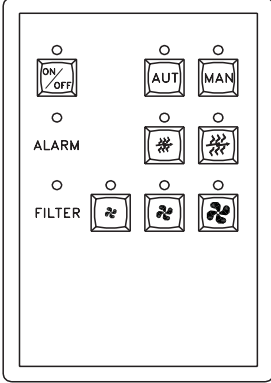
All chained air curtains operate always in the same way in both automatic and manual modes. In case the external switches are used, they must be always connected to the MASTER air curtain. The MASTER air curtain is understood that one connected to control panel. The same cable is used for interconnection of the air curtains and the connection to the controller. Telephone connectors are fixed to the ends of the cable so the connection is a matter of few moments and any misconnection is avoided.

In case any motor overheats and the overheat protection switches it off, the remaining motors remain in operation. In case any electric heat exchanger gets overheated, the safety thermostat switches it off. All remaining heat exchangers remain in operation and ALARM signal appears on the control panel. In case the filter is clogged on any air curtain, FILTER signal gets on.

For the dimensions of the controller see Fig. 6. The Controller is to be hanged on the wall.

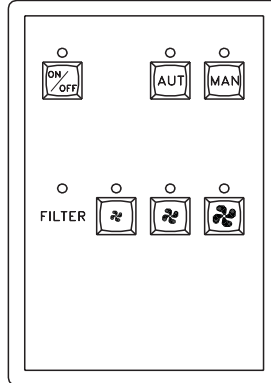
For wiring diagram see Figs. 19 and 20.

E-DA controller for air curtains with electric heat exchanger



Meaning of push button symbols	
	ON / OFF
	Automatic mode
	Manual mode
	Heat exchanger overheating
	Heat exchanger output 1 st step (min.)
	Heat exchanger output 2 nd step max.)
	Filter clogged
	Air output 1 st stage (min.)
	Air output 2 nd stage
	Air output 3 rd stage (max.)

V-DA controller for air curtains with water heat exchanger or without heat exchanger



Meaning of push button symbols	
	ON / OFF
	Automatic mode
	Manual mode
	Filter clogged
	Air output 1 st stage (min.)
	Air output 2 nd stage
	Air output 3 rd stage (max.)

Fig. 8 Interconnection on the control board

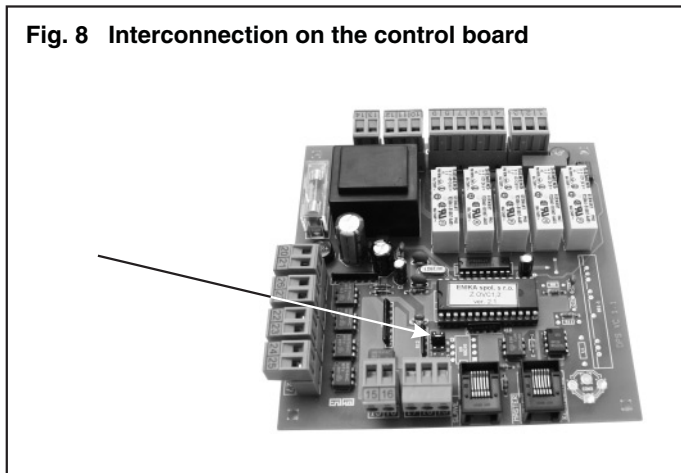


Fig. 9 E-DA controller



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INSTALLATION

The following rules important for the proper function of the air curtain must be kept at installation:

- air curtain must be placed as close as possible to the upper edge of door opening
- it is recommended the air curtain is wider than the door opening (best for 100 mm on each side)
- distance between air curtain and ceiling must be at least 100 mm for connection of heating water and power supply. Air inlet must be at least 150 mm from solid wall to ensure unobstructed air inlet - see Fig. 10.

In case the protected space is behind an air-lock, the air curtain must be placed in the protected space: Heat savings would be much smaller in case the air curtain is in the air-lock and the heating power of the air curtain could not be used for heating of protected space.

Open space installation

According to the concrete situation on the site is the air curtain hanged by aid of some from standard hanging elements - see Accessories.

Fig.10 Minimum distance from building structure

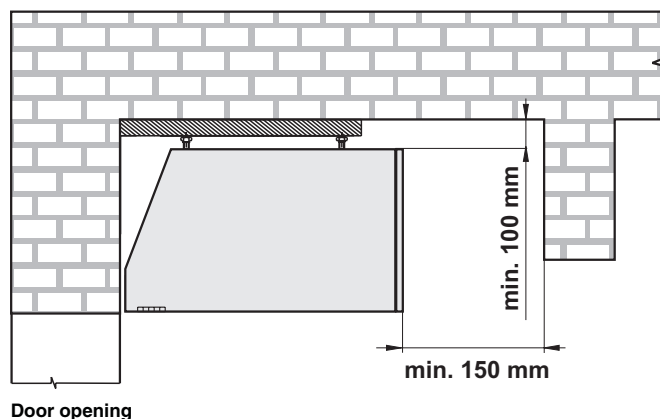


Fig. 11 Hanging of air curtain by aid of wall bracket VCS3-SKD

Installation in case of high ceiling and supporting wall

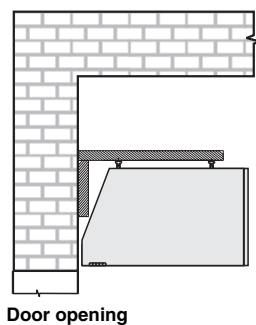


Fig. 12 Hanging of air curtain by aid of threaded bars and the ceiling holders type VCS3-SD

Installation in case of high ceiling and non-supporting partition wall

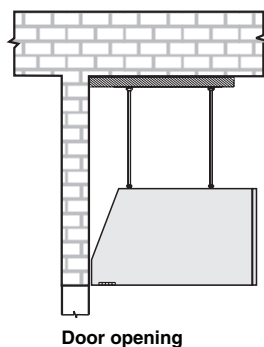
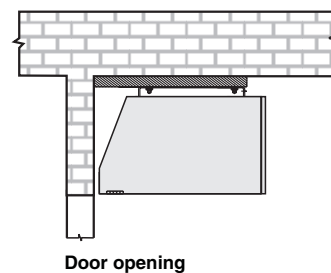


Fig. 13 Hanging of the air curtain by air do ceiling holders type VCS3-SD

Installation in case of low ceiling.



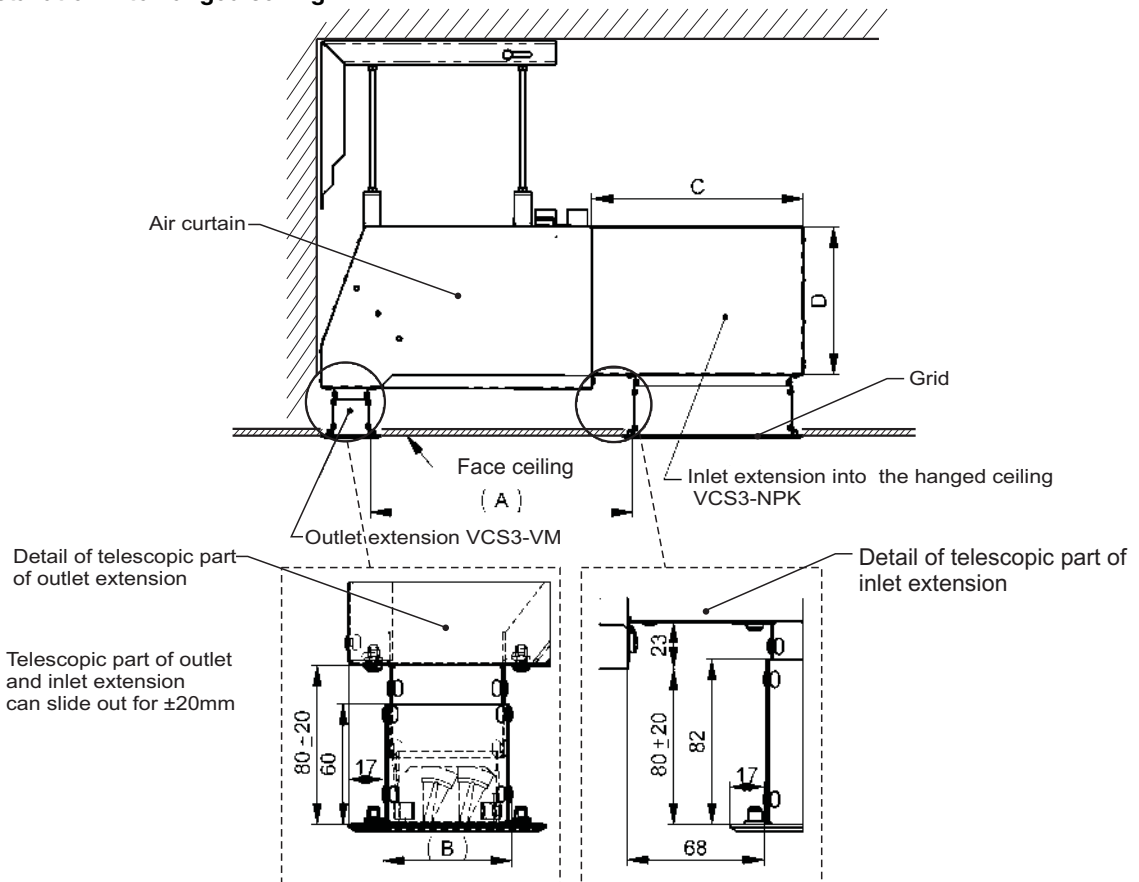
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Installation into hanged ceiling

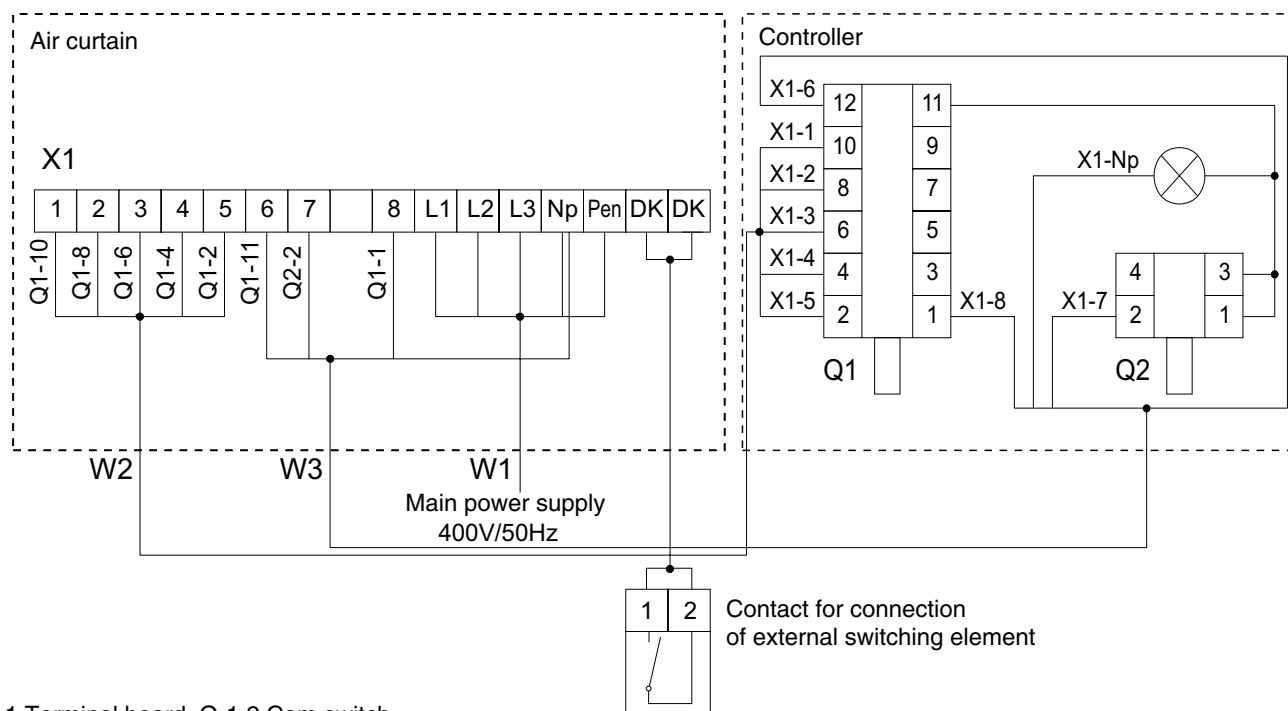
Air curtain is hanged by hanging elements before the installation of the ceiling so that the lowered edge of the curtain is min 60 mm and maximum 100 mm above the face of the future ceiling. It is necessary to remove the outlet grid from the outlet of the air curtain (VCS3-VM-xxx). Outlet extension will be fixed by screws on the place of the outlet grid. Inlet extension into the hanged ceiling (VCS3-NKP-xxx-xx) will replace the inlet grid. When the hanged ceiling is ready, it is necessary to insert into the air curtain the telescopic part of the outlet extension and to connect it by self-drilling screws to the hanged ceiling. An AI-grid with filters is to be set on the telescopic part of the inlet extension in the same way (Fig. 25). In case the hanged ceilings are not air-tight, when an enough amount of air is ensured to get in the space above the hanged ceiling, it is not necessary to install the inlet extension with the grid. However it is always necessary to ensure an access to the air curtain by removal part of the hanged ceiling under the entire air curtain.

Fig. 14 Installation into hanged ceiling

Tab.9 Dimensions of outlet and inlet dimensions into hanged ceiling

Air curtain	Outlet extension	Inlet extension	A [mm]	B [mm]	C [mm]	D [mm]
VCS3A,B	-10 VCS3-VMP-10A	VCS3-NKP-10A	457	44	352	247
	-15 VCS3-VMP-15A	VCS3-NKP-15A				
	-20 VCS3-VMP-20A	VCS3-NKP-20A				
VCS3C	-10 VCS3-VMP-10C	VCS3-NKP-10A	437	64	352	247
	-15 VCS3-VMP-15C	VCS3-NKP-15A				
	-20 VCS3-VMP-20C	VCS3-NKP-20A				
VCS3D,E	-10 VCS3-VMP-10D	VCS3-NKP-10D	651	108	452	347
	-15 VCS3-VMP-15D	VCS3-NKP-15D				
	-20 VCS3-VMP-20D	VCS3-NKP-20D				

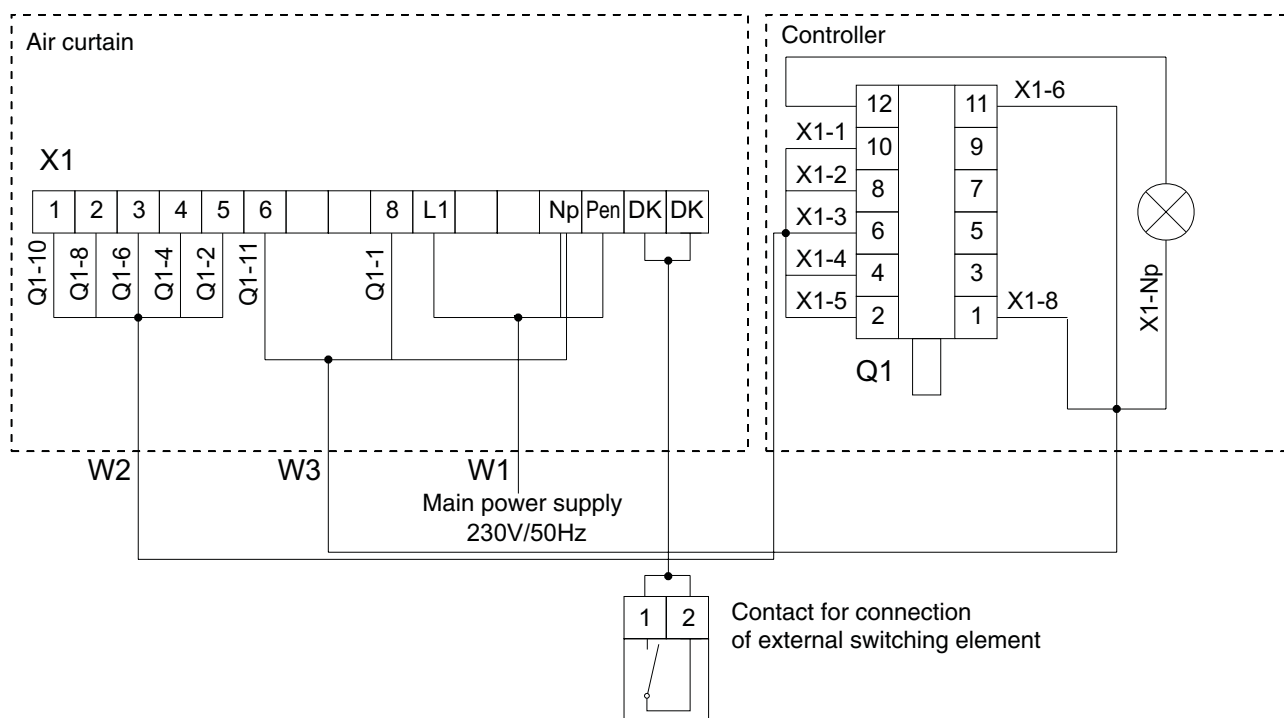
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Fig. 15 Wiring diagram of connection of air curtains with electric heat exchanger (SM control) for VCS3x-xxE-1-xx


X-1 Terminal board, Q-1,2 Cam switch

W-1 Mains cable CYKY-5Cx..., W-2 Control cable CYKY-7Cx1,5, W-3 Control cable CYKY-7Cx1,5

Fig. 16 Wiring diagram of connection of air curtains with water or none heat exchanger (SM control) for VCS3x-xxV-1-xx


X-1 Terminal board, Q-1,2 Cam switch

W-1 Mains cable CYKY-5Cx..., W-2 Control cable CYKY-7Cx1,5, W-3 Control cable CYKY-7Cx1,5

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Fig. 17. Wiring diagram of connection of air curtains with electric heat exchanger (DM control)

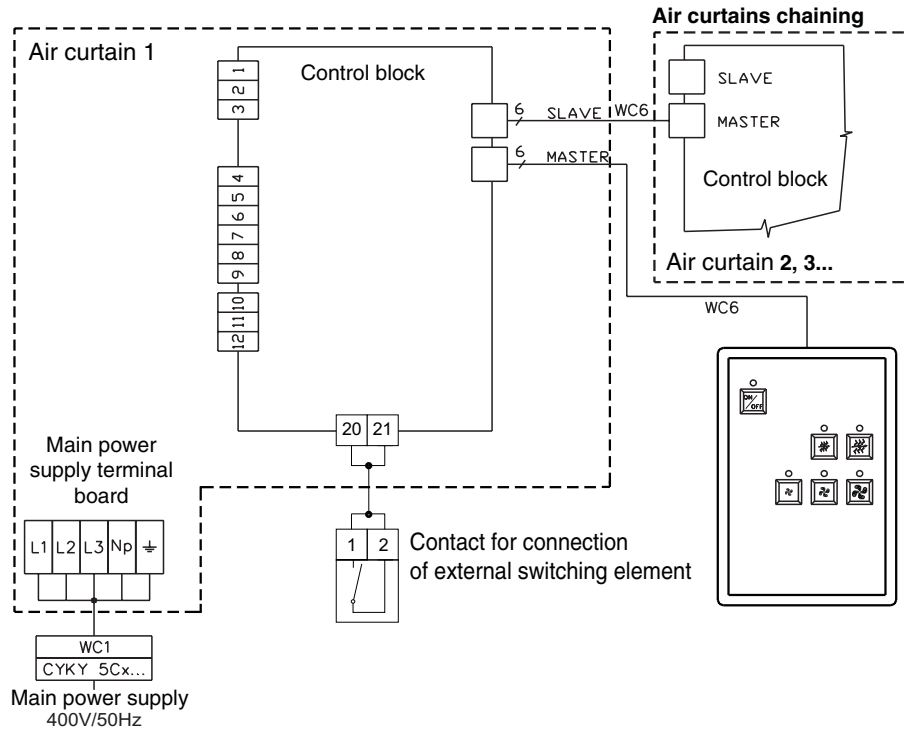
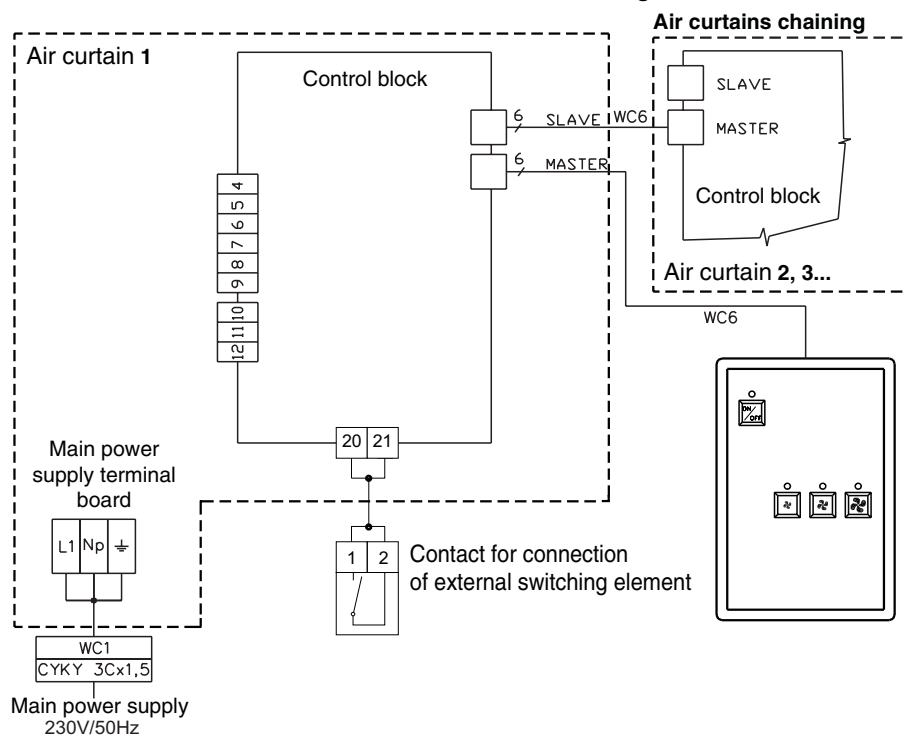


Fig. 18. Wiring diagram of connection of air curtains with water heat exchanger or without heat exchanger (DM control)



LIST OF USED CABLES

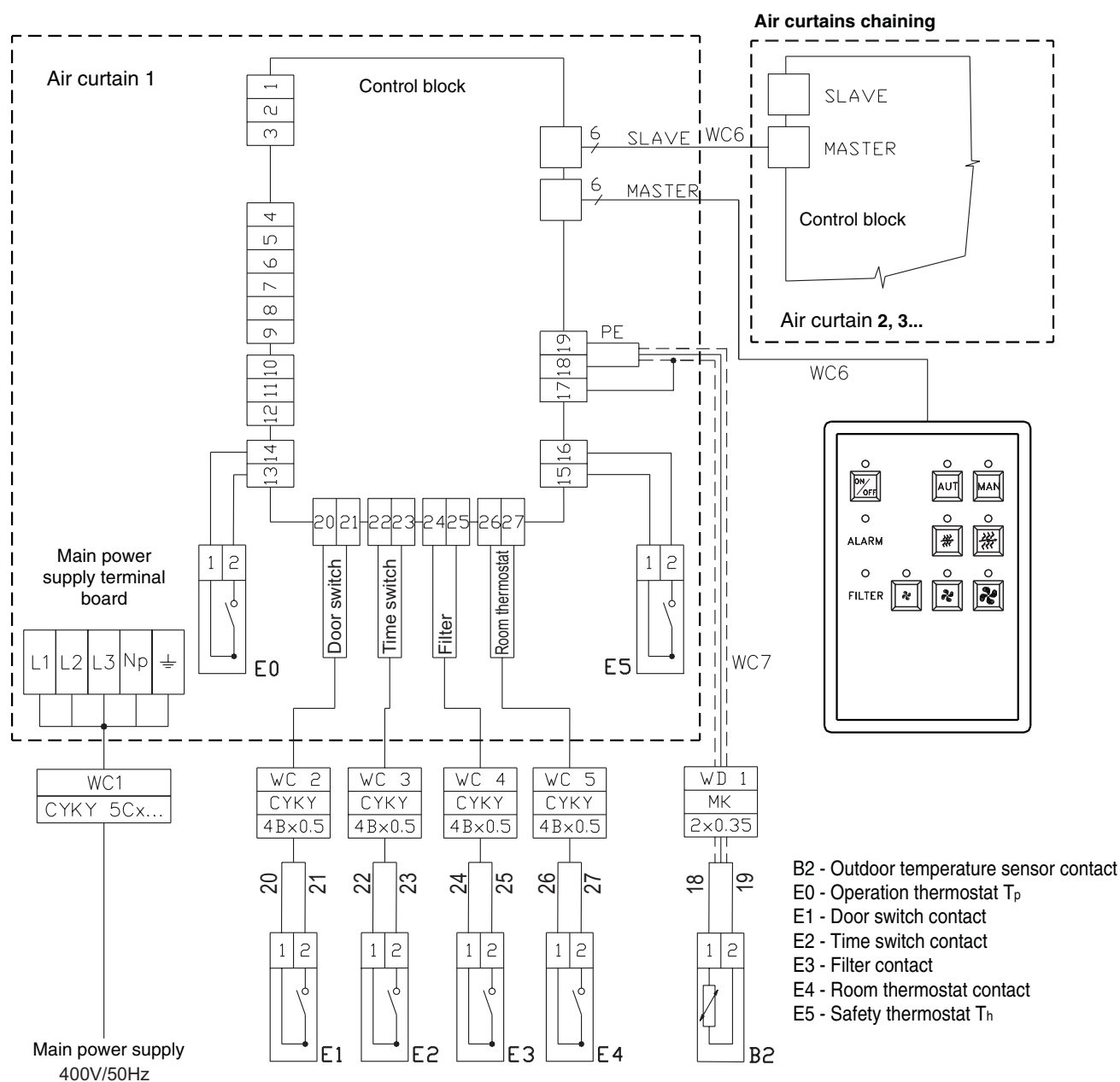
Connection point	Cable marking	Cable type	Control voltage
Main connection (with electric heat exchanger)	WC1	CYKY 5Cx...	400V/50Hz
Main connection (with water heat exchanger or no heat exchanger)	WC1	CYKY 3Cx1,5	230V/50Hz
Master, Slave control blocks	WC6	6-lines low voltage cable	12V

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Fig. 19. Wiring diagram of connection of air curtains with electric heat exchanger (DA control)

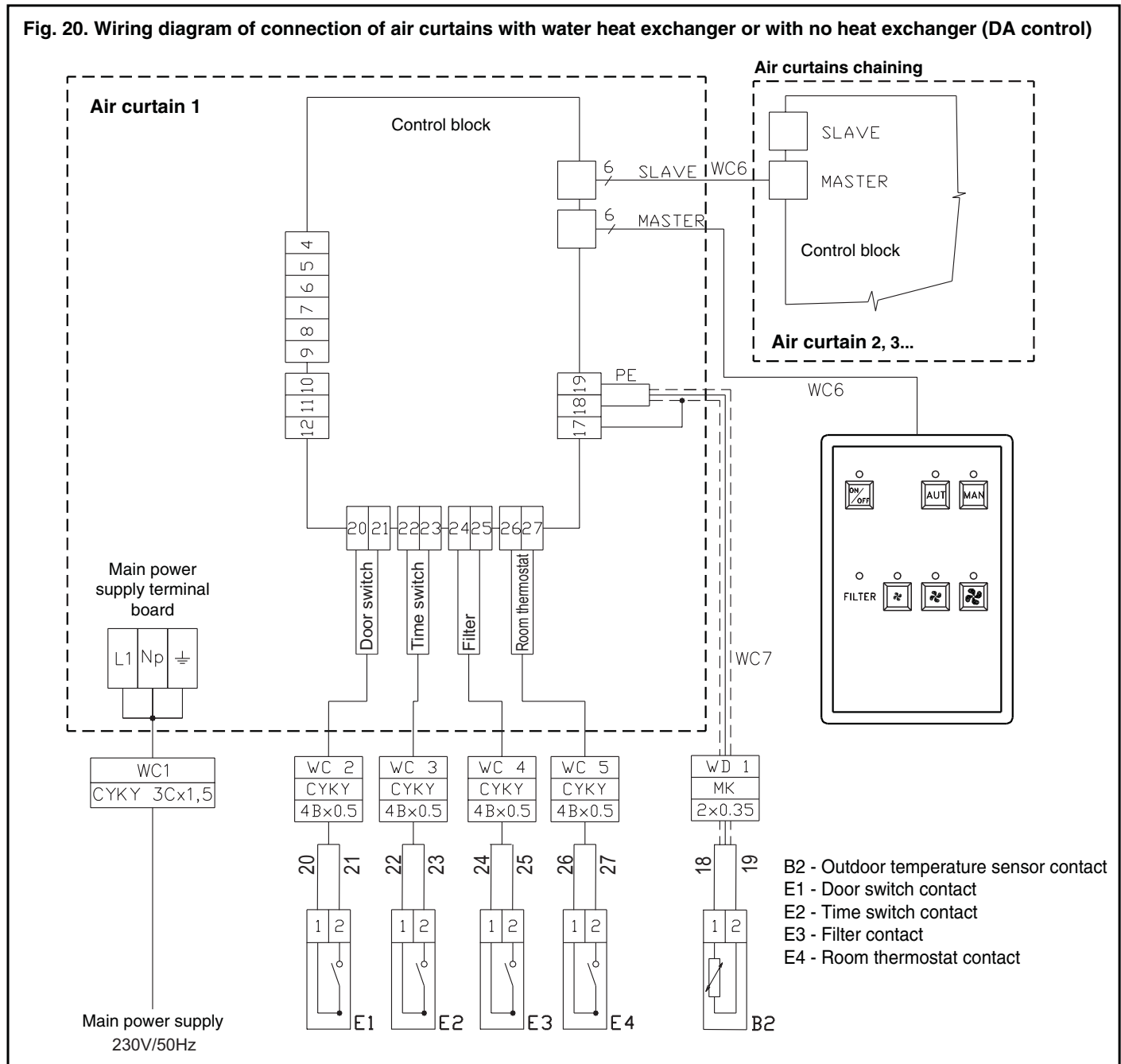


LIST OF USED CABLES

Connection point	Cable marking	Cable type	Control voltage
Main connection	WC1	CYKY 5Cx...	400V/50Hz
Control block 20, 21	WC2	CYKY 4Bx0,5	12V
Control block 22, 23	WC3	CYKY 4Bx0,5	12V
Control block 24, 25	WC4	CYKY 4Bx0,5	12V
Control block 26, 27	WC5	CYKY 4Bx0,5	12V
Master, Slave control blocks	WC6	6-lines low voltage cable	12V
Control block 17, 18, 19	WC7	MK 2x0,35	12V

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Fig. 20. Wiring diagram of connection of air curtains with water heat exchanger or with no heat exchanger (DA control)

LIST OF USED CABLES

Connection point	Cable marking	Cable type	Control voltage
Main connection	WC1	CYKY 3Cx1,5	230V/50Hz
Control block 20, 21	WC2	CYKY 4Bx0,5	12V
Control block 22, 23	WC3	CYKY 4Bx0,5	12V
Control block 24, 25	WC4	CYKY 4Bx0,5	12V
Control block 26, 27	WC5	CYKY 4Bx0,5	12V
Master, Slave control blocks	WC6	6-lines low voltage cable	12V
Control block 17, 18, 19	WC7	MK 2x0,35	12V

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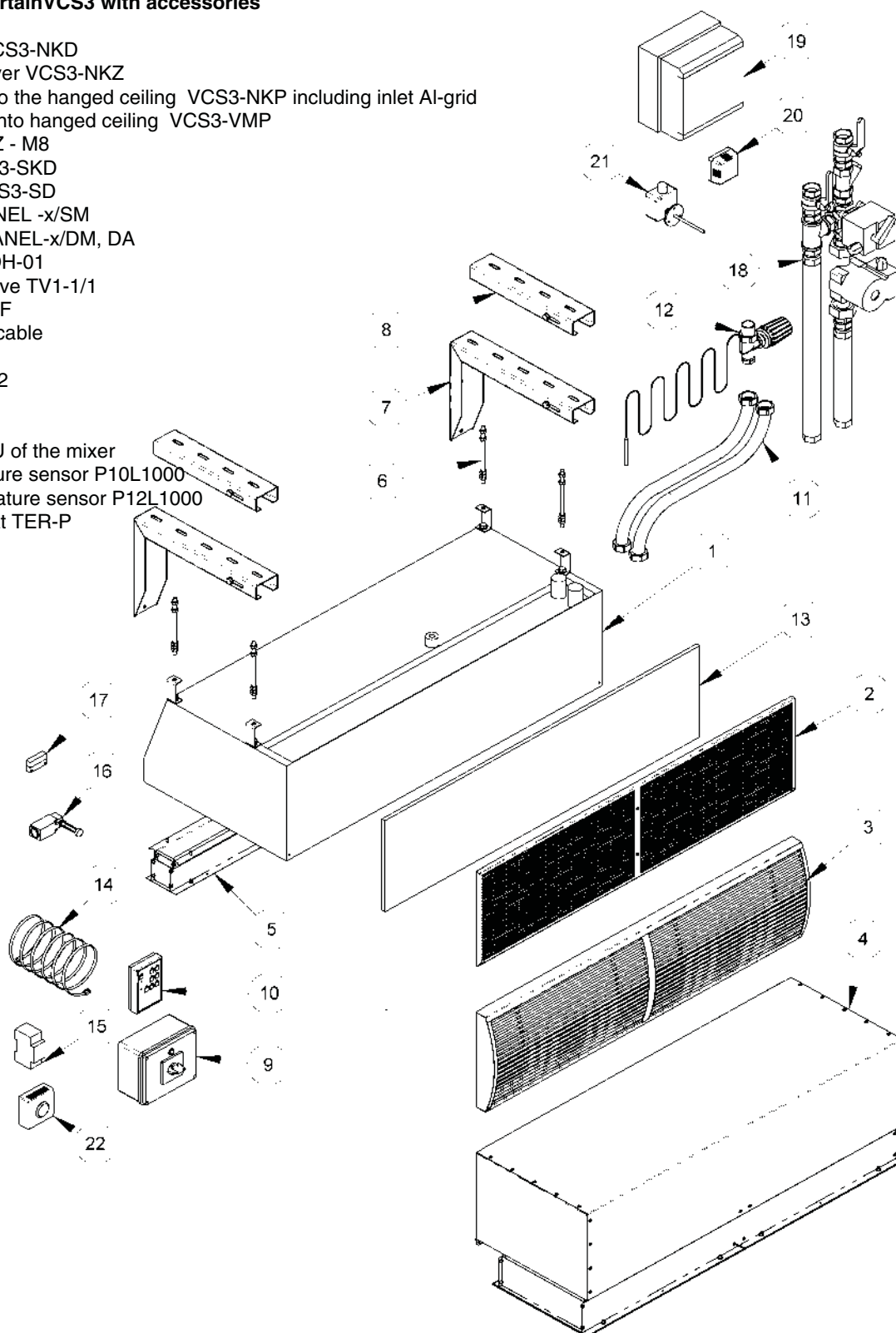
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ACCESSORIES

Fig. 21 Set of Air curtain VCS3 with accessories

- 1 - Air curtain VCS3
- 2 - Flat inlet cover VCS3-NKD
- 3 - Rounded inlet cover VCS3-NKZ
- 4 - Inlet extension into the hanged ceiling VCS3-NKP including inlet AI-grid
- 5 - Outlet extension into hanged ceiling VCS3-VMP
- 6 - Threaded bar ZTZ - M8
- 7 - Wall bracket VCS3-SKD
- 8 - Ceiling holder VCS3-SD
- 9 - Control panel PANEL -x/SM
- 10 - Control panel PANEL-x/DM, DA
- 11 - Flexible hoses OH-01
- 12 - Thermostatic valve TV1-1/1
- 13 - Air filter VCS3-NF
- 14 - Interconnection cable
- 15 - Time switch SH
- 16 - Door switch DS-2
- 17 - Door switch DK1
- 18 - Mixer SMU
- 19 - Controller OSMU of the mixer
- 20 - Space temperature sensor P10L1000
- 21 - Channel temperature sensor P12L1000
- 22 - Room thermostat TER-P



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Since the *STANDESSE* air curtains have been designed as a prefabricated system, it is necessary to order at ordering the air curtain also the standard accessories necessary for the proper function of the air curtain, as well as other optional accessories according to the requirements of the Client.

BASIC ACCESSORIES (to be ordered separately)

- **PANEL-x/xx-x - Control panel** is used for control of the air curtains output and it is necessary for all air curtains! The possibilities of single panes, their description, dimensions and parameters are stated in the CONTROL article above. The Panel is fixed to the wall and it is interconnected with the air curtain by a cable (not included) according to the appropriate wiring diagram.

PANEL-V/SM-A

Output (stated just for SM panel for manual control of air curtains)
 A - for air curtains A, B, C of lower output (max current load of controller 8A)
 D - for air curtains D, E of higher output (max current load of controller 18A)
Control
 SM - power manual control
 DM - semi-automatic control
 DA - automatic control
Heat exchanger
 V - water heat exchanger or no heat exchanger
 E - electric heat exchanger



- **KABEL-xx - Interconnection cable** (used just for DM and DA controlled air curtains; Low-voltage cable fit with telephone connector on the both ends is necessary for interconnection of control panels DM and DA with the air curtain or in case of chaining for interconnection of more air curtains together.

KABEL-10

Length (in case of no length data the standard length is 5m)
 5, 10, 12, 15, 20, 25, 30, 35 are the possible length in m.
 Maximum length of the cable is 50m.
Interconnection cable



* SM type panels are interconnected with standard electric installation cable (see wiring diagram) and it is not delivered as an accessories.

- **VCS3-NKx-xxx-x - Inlet cover** for the air curtains to be put into open space are delivered in two types (D and Z). The inlet covers are not delivered for the air curtains to be mounted into hanged ceiling. The inlet extension must be order instead, the Al-grid is a part thereof .

VCS3-NKD-10 A-0 B

Filter
 B - without filter
 F - with G3-type air filter
Color (surface finish)
 0 - white RAL 9002 - just D and Z
 1 - optional color of RAL standard (color number to be stated as an auxiliary information to the code, just for D nad Z types)
 2 - galvanised (just in P- type)
Output range
 A - for air curtains A, B, C
 D - for air curtains D, E
Air curtain width
 10 - 1000 mm
 15 - 1500 mm
 20 - 2000 mm
Type
 D - flat perforated outlet cover (see Fig. 24)
 Z - rounded cover into open space with Al grid (see Fig. 23)
 P - extension piece into hanged ceiling (see Installation into hanged ceiling Fig.14 and 25)

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Fig. 23 Rounded inlet cover VCS3-NKZ

- *as a cover to air curtains A, B, C
- **as a cover to air curtains D, E

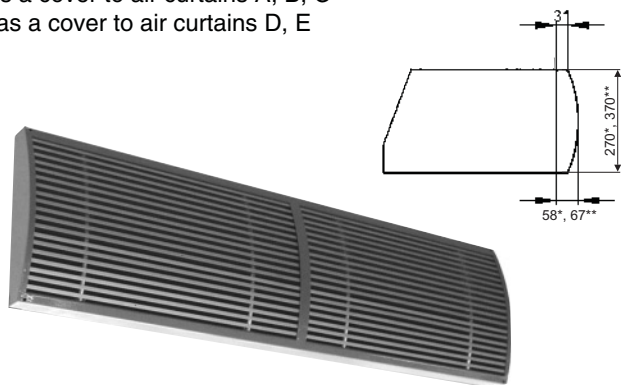


Fig. 24 Flat inlet cover VCS3-NKD

- *as a cover to air curtains A, B, C
- **as a cover to air curtains D, E

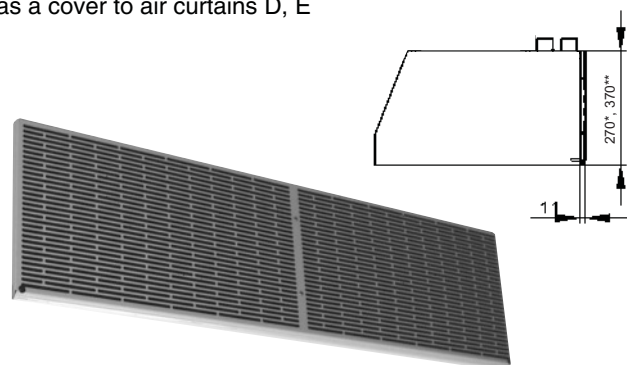
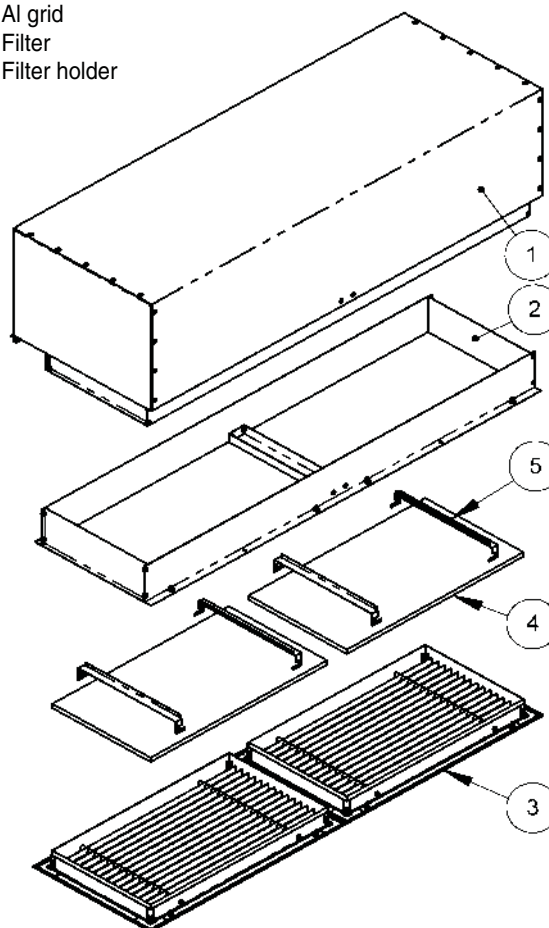


Fig. 25 Extension into hanged ceiling VCS3 - NKP

- 1 - Fixed part - (to be fixed to the air curtain inlet).
- 2 - Movable part- (to be fixed to the hanged ceiling)
- 3 - Al grid
- 4 - Filter
- 5 - Filter holder



FOR AIR CURTAINS TO BE SET INTO THE HANGED CEILING

- **VCS3-VMP-xxx** - Outlet extension into hanged ceiling ensures an uniform air supply form an air curtain located in the hanged ceiling. For easy installation this part has been designed as telescope. (For the dimensions see the Installation into hanged ceiling Fig.14)

VCS3-VMP-10 A

Output range

A - A, B

C - C

D - D, E

Air curtain width

10 - 1000 mm

15 - 1500 mm

20 - 2000 mm

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OPTIONAL ACCESSORIES

• VCS3-NF-x-xxx - Air filter

Special filtration material of G3 filtration class. The filter can be partially renewed by dusting out, vacuuming or washing in soap water.

VCS3-NF-Z-10 A

Output range

A - for air curtains A, B, C

D - for air curtains D, E

Air curtain width

10 - 1000 mm

15 - 1500 mm

20 - 2000 mm

Type

D - to be installed into perforated outlet cover into space VCS3-NKD

Z - to be installed into rounded inlet cover with AI grid VCS3-NKZ

P - to be installed into inlet grid of the extension into hanged ceiling VCS3-NKP

• HANGING ELEMENTS

The following hanging elements are delivered for easy installation of the air curtains in various conditions: Threaded bars, ceiling holders and wall brackets. The number of the single items necessary for hanging of one or more air curtains side by side is clear from the following table.

Tab.10 Number of hanging elements necessary for hanging of the air curtain.

Number of hanging elements according to the number of air curtain modules in the chain	Number of air curtain modules (in the chain)				
	1	2	3	4	n
Number of brackets VCS3-SKD-x	2	3	4	5	n+1
Number of ceiling hangers VCS3-SD-x	2	3	4	5	n+1
Number of threaded bars segments ZTZ-M8	4	8	12	16	4xn

- **ZTZ-M8/1,0 - Threaded bar** 1m long, thread M8
Air curtain is hanged in four points.

• VCS3-SKx-x - Wall bracket

VCS3-SK D-A

Output range

A - for air curtains A, B, C

D - for air curtains D, E

Fig.26 Wall bracket VCS3-SKD

- 1 - Bracket
- 2 - Hanger slat
- 3 - Safety bolt

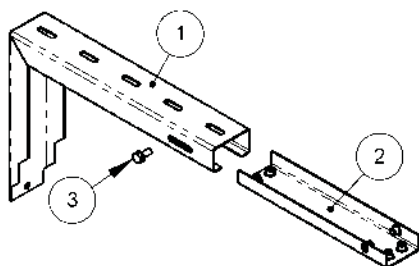
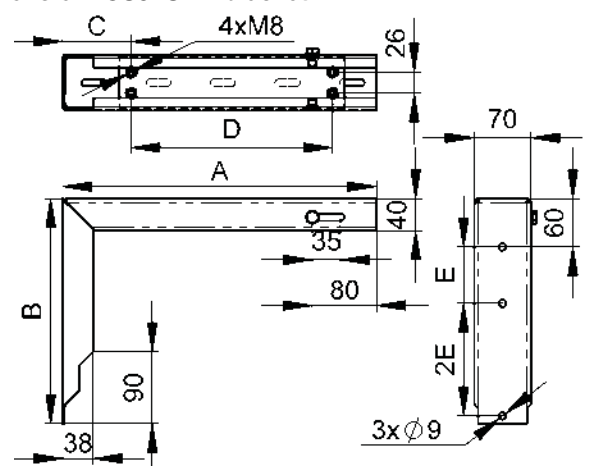


Fig 27. Dimensions of VCS3- SKD bracket



Typ	A	B	C	D	E
VCS3-SKD-A	390	280	85	250	70
VCS3-SKD-D	560	350	110	395	90

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• VCS3-SD-x - Ceiling holder

VCS3-SD-A

Output range

A - for air curtains A, B, C

D - for air curtains D, E

Fig. 29 Ceiling holder VCS3-SD

- 1 - Ceiling holder
- 2 - Hanging slat
- 3 - Safety screw

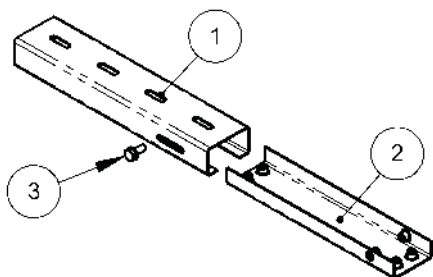
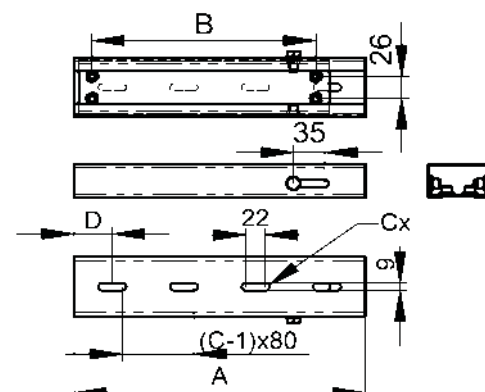


Fig. 28 Dimensions of the ceiling holder VCS3-SD



Typ	A	B	C	D
VCS3-SD-A	325	250	4	42,5
VCS3-SD-D	470	395	6	35,0

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ACCESSORIES FOR AIR CURTAINS WITH WATER HEAT EXCHANGER

- **TV1-1/1 - Thermostatic valve**

Direct thermostatic valve 1" (DN 25) with a capillary tube is used for simple control of heat output by means of throttling. It is set on the entry of heating media, capillary tube sensor is placed into a pit in the upper part of the air curtain casing. Valve is CEN certified and tested pursuant to DIN EN 215.



- **SMU-01-xx -Mixer**

The type of mixer must be chosen by the designer according to the pressure drop of the water exchanger. Mixer is used for control of heating output by mixing of inlet and return heating water. It consists of three-speed pump, three-way mixing valve with servo control, water filter, 2 pcs of closing cocks and 2 pcs of connection flexible hoses. All components are of unified connection size 1" (DN 25). Mixer SMU is described in detail on its own data sheet.

In case you will need to cover the pressure loss up to 40kPa, will you order mixer SM-01-40

SMU-01-40

————— maximum pressure of the mixer pump in kPa

————— type

In case you need to cover loss bigger than 80 kPa, will you order mixer SMU-01-80.

SMU-01-80

————— maximum pressure of the mixer pump in kPa

————— type

Fig. 32 Mixer

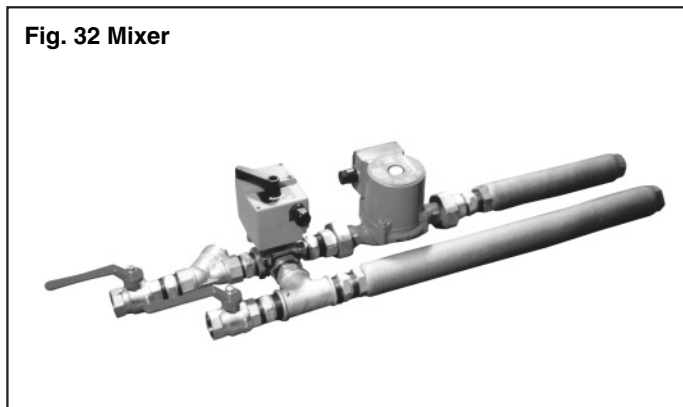
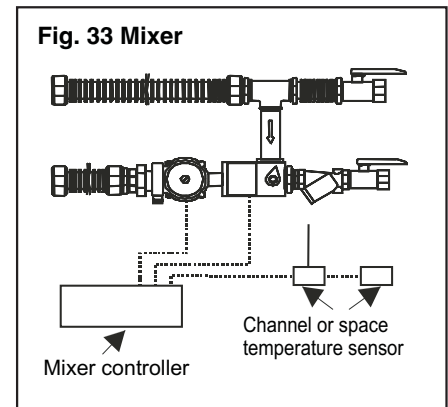


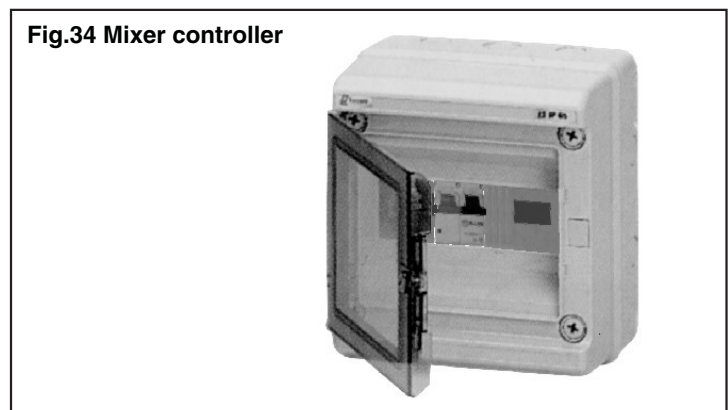
Fig. 33 Mixer



- **OSMU-01-6A - Mixer controller**

Device designed for SMU mixer control. It is possible to connect more mixers to the controller, however they will then work always in the same way, according to one required temperature. Channel- (P12L1000) or space (P10L1000) temperature sensor to follow the air temperature is necessary for the right function of the controller (the sensor must be ordered separately). Mixer controller OSMU is described in detail on its own data sheet.

Fig.34 Mixer controller



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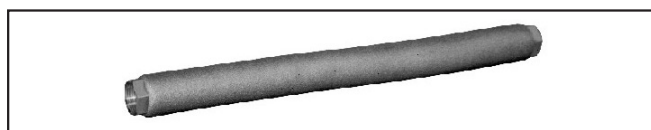
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- **OH-01-1/1-xxx - Flexible connection hoses type 01**

Use of these hoses enables to install the hot water piping independently on the air curtains installation, also a necessity to place the branch pipes exactly (efforts to connect the air curtain firmly to piping cause often big problems ending even in damage of heat exchangers). Hoses are made from stainless steel (DIN 17440, TÜV certified) with PE foam heat insulation 15 mm thick. Work temperatures range -20 to +110°C, maximum work overpressure 1 MPa. Inner diameter of the hoses is 3/4" (DN 20), the both ends of the hose are fitted with 1" (DN 15) cap nuts. Hoses are supplied in lengths 300 and 500 mm. For detailed description of the hoses see its own data sheet.

OH-01-1/1-300

300 (500) length of the hose in mm
inner diameter of connection joint in inches

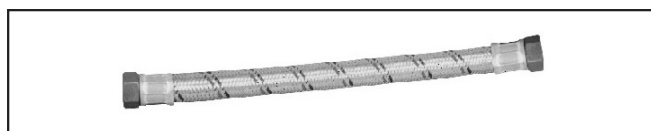


- **OH-02-1/1-xxx - Flexible connection hoses type 02**

Use of the hoses - see above. Hoses are made from non-toxic rubber (DIN 7715) with steel galvanised braiding. Maximum work temperature is 100°C, maximum work overpressure 0,6 MPa. Inner diameter of the hoses is 3/4" (DN 20), the both ends of the hose are fitted with 1" (DN 15) cap nuts. Hoses are supplied in lengths 300 and 500 mm. For detailed description of the hoses see its own data sheet.

OH-01-1/1-300

300 (500) length of the hose in mm
inner diameter of connection joint in inches



- **DK1 - Door switch**

Used for switching the air curtain ON /OFF in dependence of opening/closing of doors together with semi-automatic DM or automatic DA control system. Max contacts load 12V/30mA.

- **DS - Door switch**

Used for switching the air curtain ON/OFF in dependence on opening / closing of doors with manual control SM. End switch with revolving arm of variable length with a pulley at the end (max. diameter 80 mm).

Dimensions: 31 x 31 x 81mm, specific heat current 10A, max. voltage 600V/AC15, protection degree IP 66, temperature range -25 to +85°C

- **SH - Time switch with a day or a week program**

Used for switching of air curtain on / off in pre-set time intervals. Maximum contacts load 250 V/6A, 2.5A inductive load., 20 memory points

- **TER-P - Room thermostat**

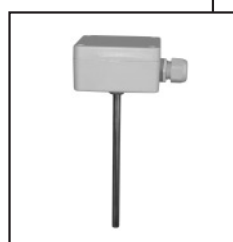
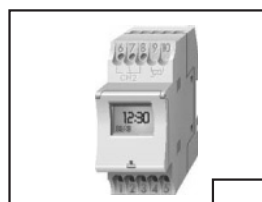
It is used in connection with SM or DM controls to switch the air curtain on and off according to the preset temperature value. If connected to the DA control it controls the air output of the air curtain and the heat output according to the Tab. in part Automatic control DA. Thermostat can be used also for the air curtains with the water heat exchanger; it does not control their output, but ensures switching the air curtain off in case the pre-set temperature has been reached. Adjustable range 5 to 30°C. Maximum contacts load 250 V/10A, 2A inductive load. For detailed description see its own data sheet.

- **P12L1000 - Channel temperature sensor**

Sensor is used to read the temperature and is used together with the mixer. Sensor is placed on the casing of air curtain in the pit which is a part of the air curtain. It is necessary to remove the pit and after drilling of necessary holes to mount instead of it a plastic holder of the sensor, which is a part of its delivery together with the drill template. Sensor is described in detail on its own data sheet.

- **P10L1000 - Space temperature sensor**

Sensor is used to read the temperature and is used together with the mixer. This sensor is to be placed on a wall in the protected space. Sensor is described in detail on its own data sheet.



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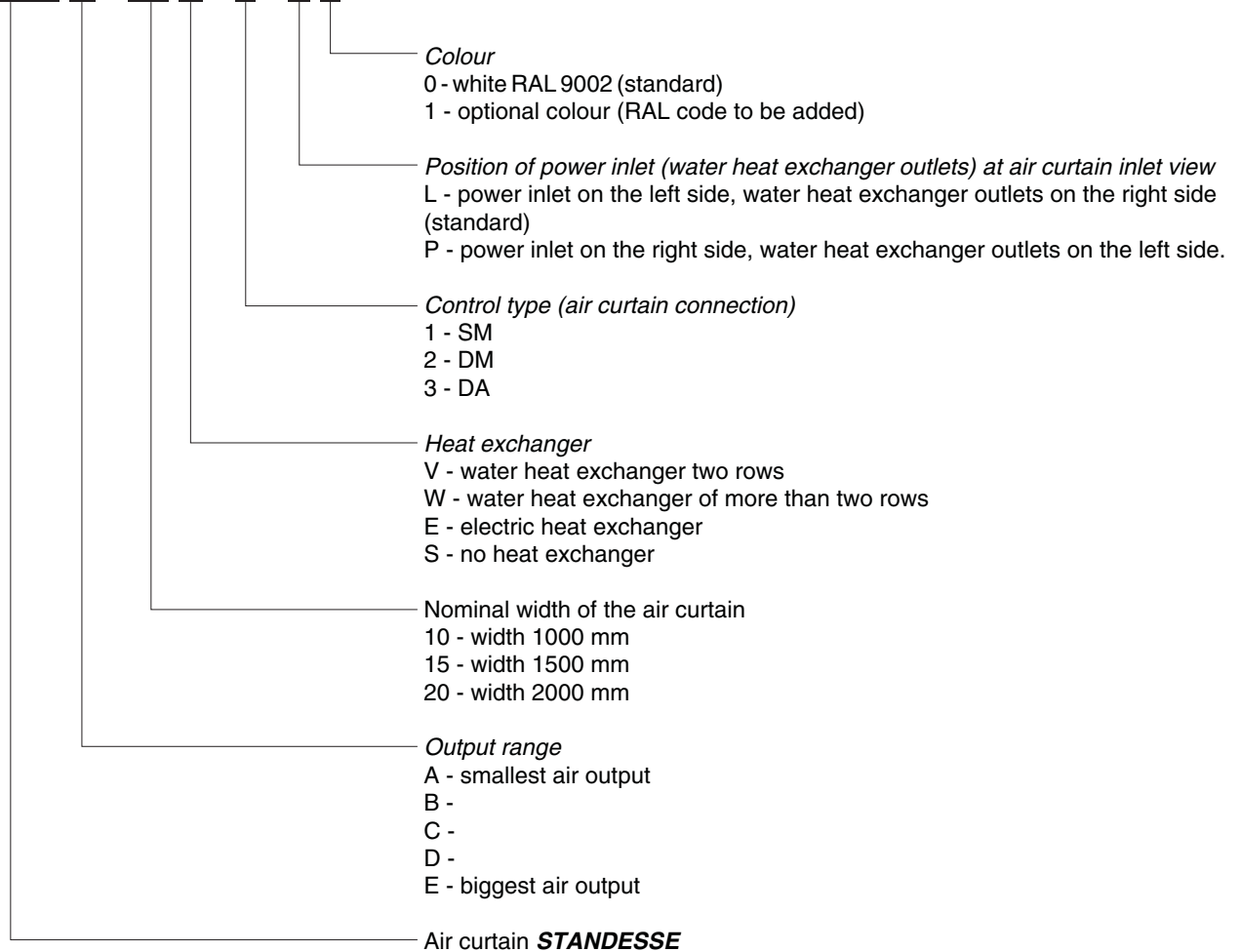
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KEY CODE

VCS3 A - 10 V - 1 - L 0



ORDER SAMPLE

Air curtain must be ordered as single parts of a kit, i.e. casing + accessories. The sample below is based on the accessories codes (see Accessories).

Door air curtain Standesse of air flow volume C, 2000 mm wide, with water heat exchanger, power manual control. Perforated inlet cover. Water inlet and outlet connected by flexible hoses 500 mm long. Heat output of the air curtain will be adjusted by mixer and its controller based on room temperature sensor data. Air curtain will be hanged on threaded bars 0,5 m long.

VCS3C-20V-1-L0	1 pc
VCS3-NKD-20C-0B	1 pc
PANEL-V/SM-A	1 pc
DS	1 pc
ZTZ-M8/1,0	2 pcs (4 x 0.5 m)
OH-01-1/1-500	2 pcs
SMU-01-40	1 pc
OSMU-01-6A	1 pc
P12L1000	1 pc