

KOOLAIR

series

VAK

Active chilled beams



www.koolair.com



KOOLAIR, S.L.

Calle Urano, 26

Poligono industrial nº 2 – La Fuensanta

28936 Móstoles - Madrid - (España)

Tel: +34 91 645 00 33

Fax: +34 91 645 69 62

e-mail: info@koolair.com

www.koolair.com

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VAK Active Chilled Beam



VAK Active chilled beam



VAK Active chilled beam



VAK ceiling installation

Description

The VAK active chilled beam is one of the ceiling-mounted induction terminal units. They are used in air-water systems to diffuse air in two directions. They provide a high degree of comfort in indoor environments with high internal cooling loads. They include, specifically, the following elements:

- Primary air plenum, with one or two circular connections for primary air supply and a distribution of small nozzles with different special designs.
- Cold or hot water coil (two-pipe installation) or hot and cold water coil (four-pipe installation).
- Linear diffusers, for supply and diffusion of the combined primary and induced air to the room.
- Perforated front grille, used for access when cleaning the coil. Available in different perforation designs.
- Nozzle control mechanism (depending on model), to configure different air discharge patterns in the nozzles.
- Integrated air deflectors in the linear diffusers, for the purpose of combining alternative air flow patterns.

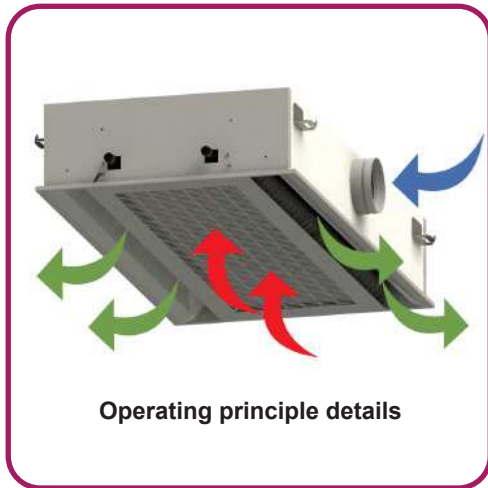
Application

The terminal air diffusion units with induction (VAK Model), are suitable for air conditioning different types of premises, such as: Office buildings, hospitals, hotels, bank branches.

Materials and Finishes

The exterior and interior housings, nozzle plate and induction grille are made of galvanised steel sheet, painted with RAL 9010 powder paint as a standard finish. Other RAL colours are available upon request. The coil is manufactured of copper pipes and aluminium fins.

VAK Active Chilled Beam



Operation

The primary air, as it exits through the nozzles, induces a volume of air in the room, which we will call secondary, that passes through the coil, and cools down or/and heats up. Depending on the case, it combines with the primary inside the beam, before being propelled into the room by means of the diffusers.

As in all air-water air conditioning systems, the choice of active chilled beams has the advantage of using water as a vehicle to transport the cooling or heating power to the different rooms, consequently saving energy and space, when compared to all-air systems. Likewise, the temperature of each independent room or area can be controlled by incorporating a 2 or 3-way valve in the coil of the terminal unit, controlled by the corresponding room regulator.

Advantages

VAK ceiling inductors are terminal units for centralised air conditioning installations that provide solutions to meet the needs of:

- Ventilation, which is achieved with the primary air.
- Cooling, through the primary air itself and the coil for water circulation.
- Heating, through the coil for water circulation.
- Control: Possibility of individual control or groups of units in rooms or areas, using regulation and control valves in the coil to adjust the volume of water and ambient thermostats.
- Air diffusion through linear diffusers that guarantee correct air diffusion.

VAK units have, in addition to the operational advantages described, the following main advantages over conventional air conditioning systems (fan-coils, VRV, all-air,...):

- High energy efficiency: Low life-cycle or operating costs. This advantage lies mainly in the absence of a fan in the terminal unit.
- Minimum maintenance costs: It does not include a filter or condensate tray to replace or clean. The surface of the battery is the only thing that requires cleaning (recommended every 2 years).
- Low unit noise level.
- Absence of air currents in the occupied area.
- Very hygienic systems, due to the absence of filters and condensate tray.
- Saves space: Reduction in the size of air ducts and equipment.
- Easy to assemble.
- Adaptable to all types of false ceilings and profiles.



Dimensions

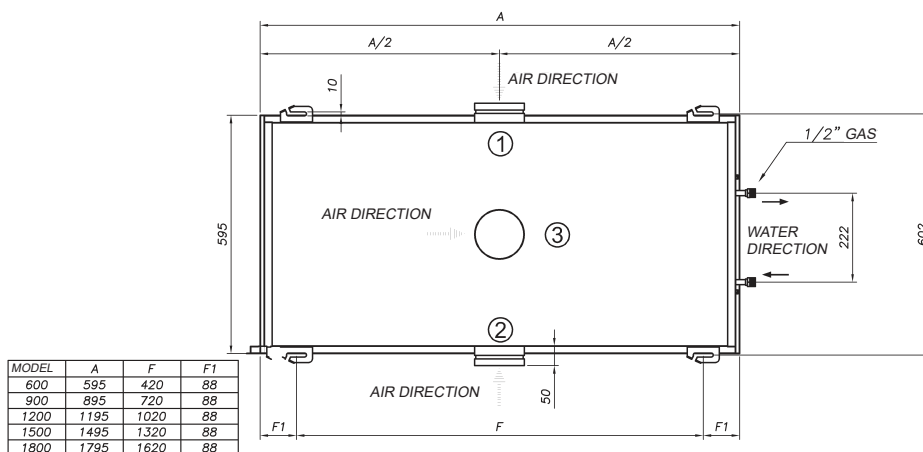
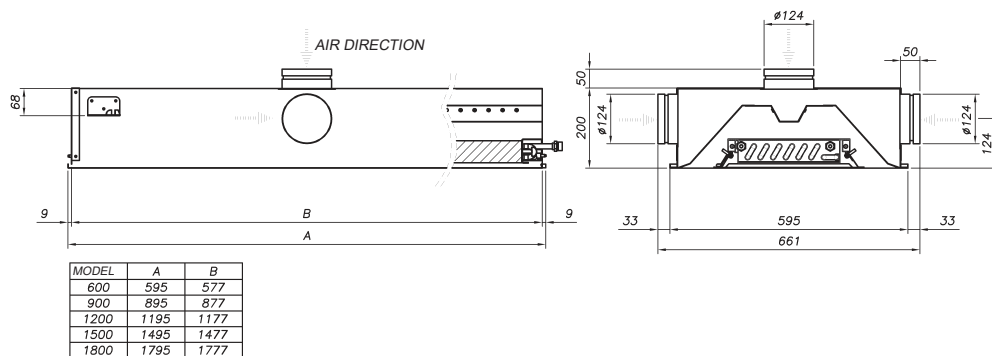
VAK model

Sizes 600 to 1800 2-pipe system (4-pipe system connections, see page 6)

3 types of configurations are available, depending on the position of the primary air connection with respect to the water connections (with the water connection viewed from the front), these are:

- Left side primary air connection, (-LI) type
- Right side primary air connection, (-LD) type
- Primary air connection at the top, (-S) type

The 600 to 1800 sizes are manufactured with one primary air connection inlet.



Dimensions

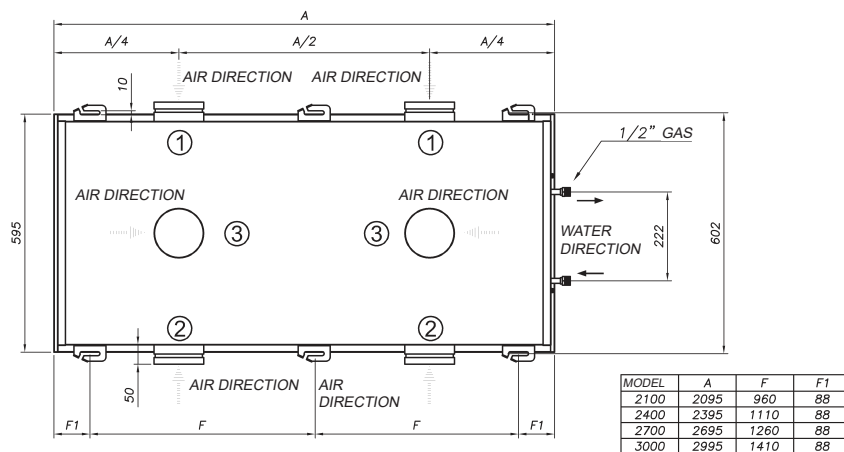
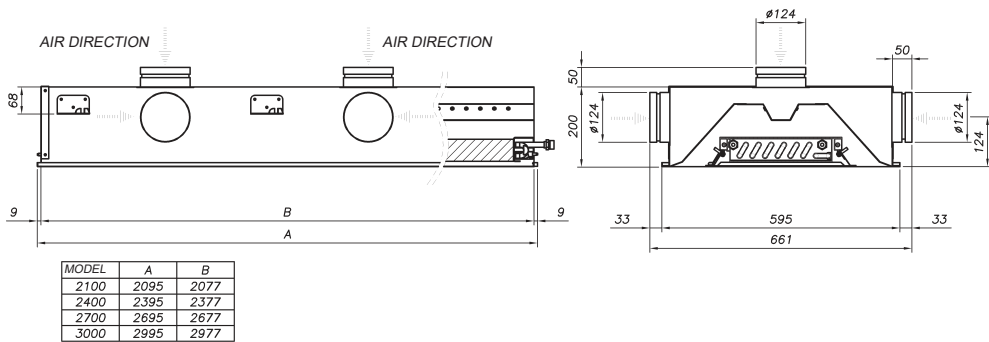
VAK model

Sizes 2100 to 3000 2-pipe system (4-pipe system connections, see page 6)

3 types of configurations are available, depending on the position of the primary air connection with respect to the water connections (with the water connection viewed from the front), these are:

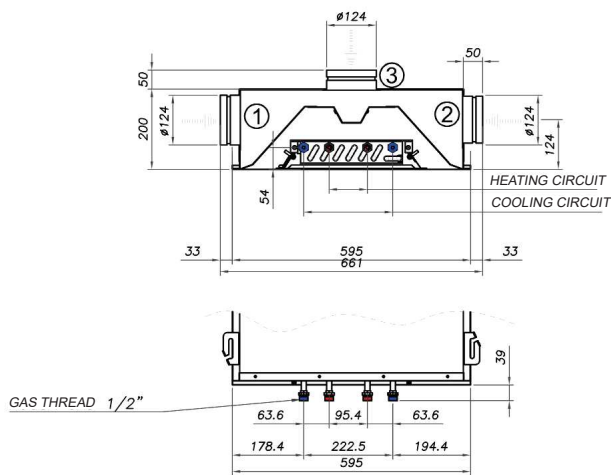
- 1. Left side primary air connection, (-LI) type
- 2. Right side primary air connection, (-LD) type
- 3. Primary air connection at the top, (-S) type

The 2100 to 3000 sizes are manufactured with two primary air connection inlets LI or LD or S.



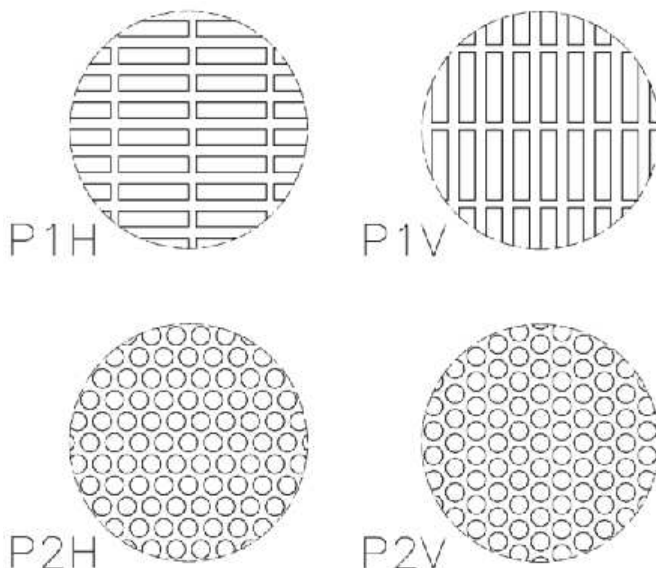
Dimensions

4-Pipe system: VAK model



Same criteria for identifying primary air connections as in the 2-pipe system, with the only difference being that in this one there is no front-rear configuration (-FT) on the same side as the water connections.

PERFORATED INDUCTION GRILLE DESIGN.



When placing the order, and as standard implementations, you can select between the following induction front grille designs:

- P1H Rectangular perforations along the length of the beam.
- P1V Rectangular perforations along the width of the beam.
- P2H Round perforations distributed continuously along the width of the beam.
- P2V Round perforations distributed continuously along the length of the beam.

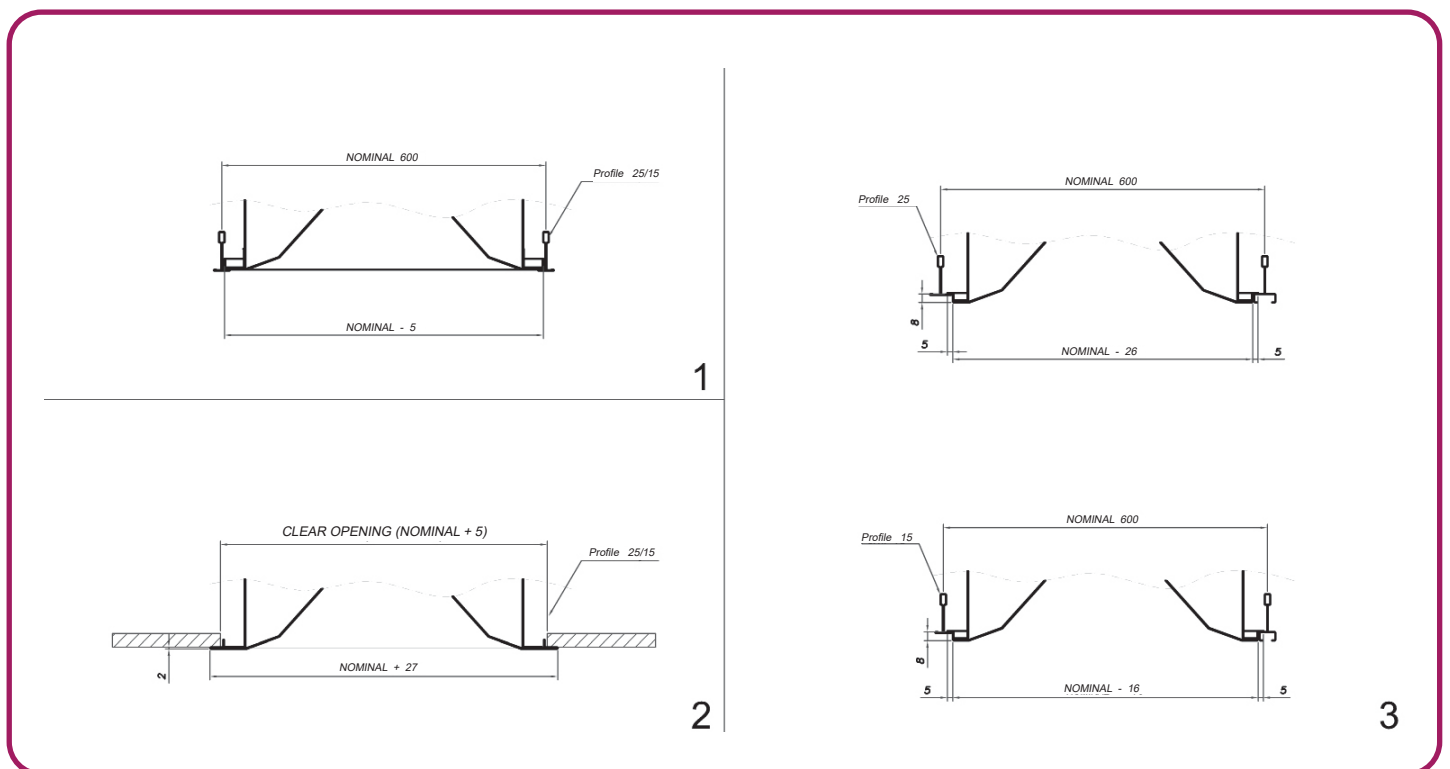
Other perforation designs can be manufactured upon request.

Installation

Chilled beam designs for different types of ceilings

All VAK series beam sizes are manufactured to be installed in different types of false ceilings. The most common types are listed below:

- Lay-in grid with T-support section with a width of 25 and 15 mm **(1)**
- Continuous or plasterboard ceiling **(2)**
- Tegular ceiling with drop face tile **(3)**



Installation

Anchoring

The VAK units include a series of hanging brackets on the two upper longitudinal sides of the beam, as shown in the following photographs. There are two brackets per side for sizes 600 to 1800 and three for sizes 2100 to 3000.

These brackets have a slot hole to hold a $\varnothing 6$ mm threaded rod, which is first attached to the ceiling slab to hang the unit.



Access



2 hinged latches

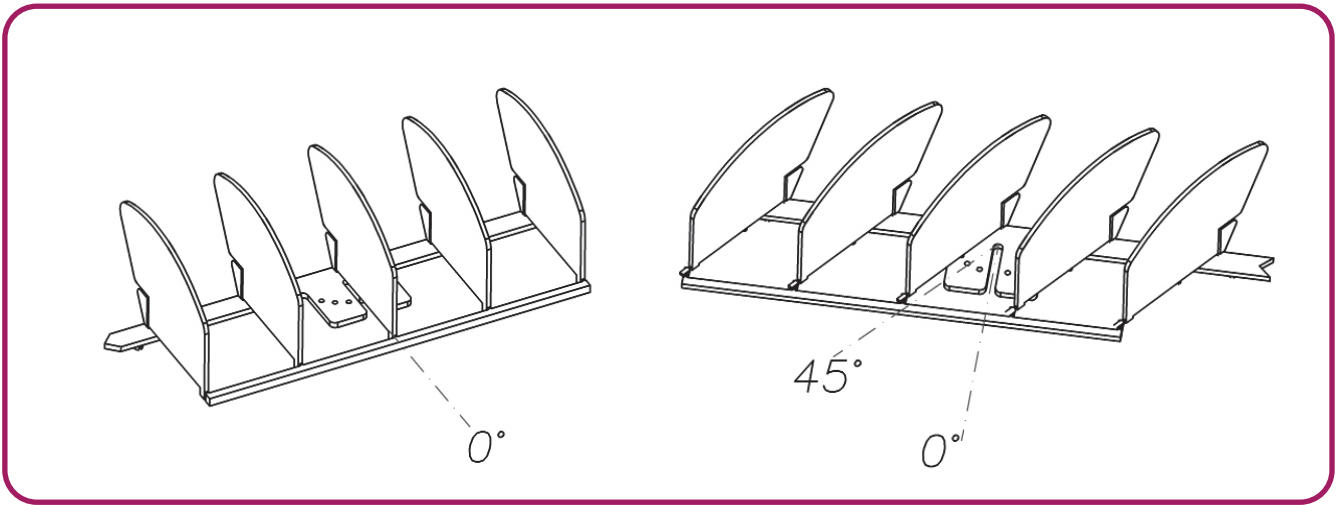


4 hinged latches

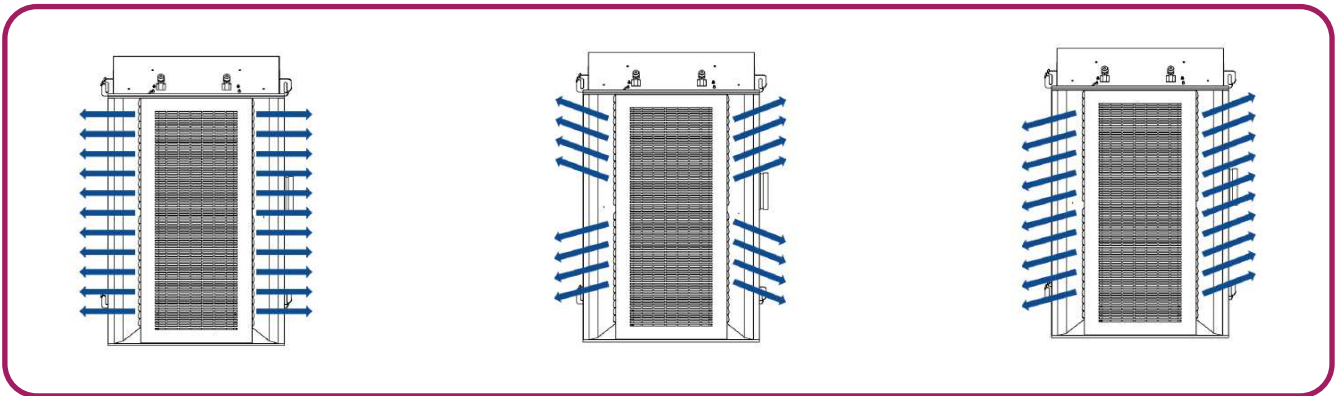
The induction grille or front perforated grille can swing 90° by operating small latches on the side of the grille or by using the locks to remove it completely. This provides access to the interior of the chilled beam to clean the inner surfaces of the coil and to adjust the nozzles.

Air Deflectors

As an optional accessory, the VAK active chilled beams can be fitted with air deflector blades (-DF), manufactured from M1 plastic, longitudinally built into the diffusers. By modifying their position, the air flow can be adjusted in different directions, making it a highly flexible unit to adapt to different situations within the installation. This makes it possible to handle obstacles, to broaden the width of the air flow, and to slow the velocity of the flow over a specific area, in short, it ensures an environment free of air currents. Several applications are shown below in the following diagrams:



Air deflector design. This allows the air flow to be oriented in 4 deflection angles (0-15-30-45°)



Examples of diffusion in different directions



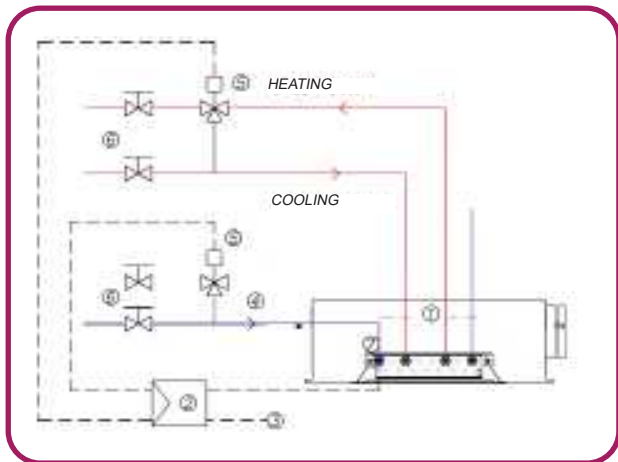
Examples of diffusion in different directions

Regulation and Control Components

Water

According to the system used, type of control, electrical installation, etc., the usual control and regulation components for chilled beam or groups of units of the water system are as follows:

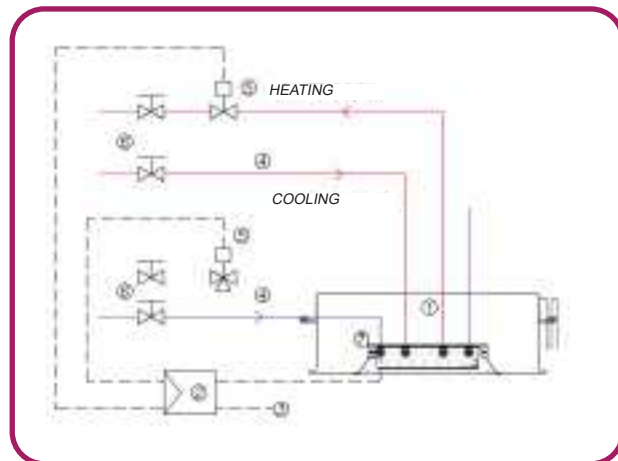
Constant Water Flow Rate System



Basic diagram of 4-pipe installation for constant water flow rate.

- Active chilled beam.
- Compact ambient controller or regulator (on-site installation). They can be individual or can be integrated into a centralised control system.
- Ambient temperature sensor (usually integrated into the controller).
- 3-way valve.
- Electric servomotor for the 3-way valve. (on-off, 3 points, proportional 0 -10 VDC, electrothermal operation). 24 V or 230 V power supply depending on the type of actuator.
- Shut-off valve. Depending on the hydraulic network, balancing or other type of valve will be necessary.
- Dew point detector (anti-condensation sensor).

Variable Water Flow Rate System



Basic diagram of 4-pipe installation for variable water flow rate.

- Active chilled beam
- Compact ambient controller or regulator (on-site installation). They can be individual or can be integrated into a centralised control system.
- Ambient temperature sensor (usually integrated into the controller).
- 2-way valve (possibility of thermostatic valves; does not include actuator or electric power supply).
- Electric servomotor for the 2-way valve (on-off, 3 points, 0-10 VDC proportional, electrothermal operation). 24 V or 230 V power supply depending on the type of actuator.
- Shut-off valve. Depending on the hydraulic network, balancing or other type of valve will be necessary
- Dew point detector (anti-condensation sensor).

Regulation and Control Components

Air

Usually, the constant flow system is used most often to distribute primary air to the induction terminal units. To ensure that the installation is correctly balanced, an extremely important aspect for proper operation of the active chilled beam, Koolair KRCK or RCCK mechanical self-regulators are used, guaranteeing the self-balancing of the installation. CRC-M manual control dampers can be selected, but these require the installation to be balanced manually.

Ductwork pressure dampers (RVV) can be used to ensure the specific inlet pressure in each beam.

If, for example, a variable air-flow system is designed based on occupancy, then the minimum design flow rate per unit should correspond to a minimum inlet pressure to the beam of approximately 40 Pa.



Circular constant air volume regulator, RCCK model



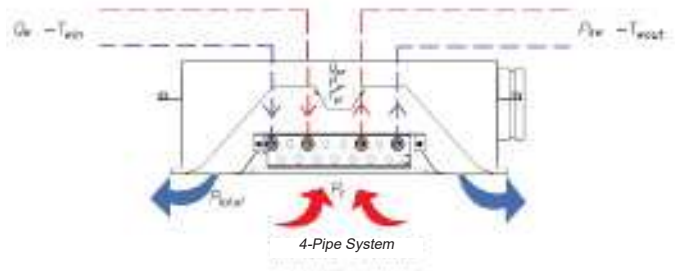
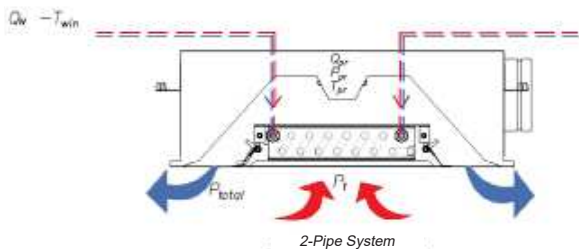
Mechanical constant air flow self-regulator, KCRK model

Technical Specifications

Symbols

The symbols used in the selection tables corresponding to the VAK chilled beam are as follows:

Q_{pr}	Primary air flow
L_w - dB(A)	Sound power level, in dB(A)
ΔP_{pr}	Primary air pressure drop, in Pa
T_{pr}	Primary air temperature, in °C
T_R	Room air temperature °C
ΔT_{pr}	Temperature difference between room air and primary air ($T_R - T_{pr}$)
Q_w	Water flow rate, in l/h
ΔP_w	Water pressure drop in the coil, in kPa
T_{WIN}	Water inlet temperature in the coil, in °C
ΔT_w	Water temperature difference in the coil
ΔT_{SWIN}	Temperature difference between room and coil water inlet
P_{pr}	Capacity supplied by primary air, in W
P_{sw}	Capacity supplied by the coil, in W
P_T	Total capacity $P_{pr} + P_{sw}$ in W
X	Air flow reach, in m, for a maximum velocity of 0.25 m/s in the occupied area, installation height of 3 m and $\Delta T = 0$ °C (supply - ambient)



Technical Specifications. Selection Tables

COOLING - 2-PIPE SYSTEM - P-TYPE NOZZLE

Reference water flow (QW) of 250 L/h

For other water flow rates, correct the unit capacity (PSW) in the table by the factors listed in the attached table.

VAK 2-PIPE SYSTEM COOLING									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Qw (l/h)	COIL CAPACITY CORRECTION FACTOR								
80	0,69	0,70	0,69	0,68	0,66	0,62	0,61	0,60	0,59
100	0,79	0,78	0,77	0,77	0,75	0,71	0,70	0,69	0,68
120	0,86	0,85	0,84	0,83	0,82	0,78	0,77	0,77	0,76
150	0,92	0,91	0,90	0,90	0,89	0,86	0,85	0,86	0,85
180	0,96	0,95	0,94	0,94	0,94	0,92	0,91	0,92	0,92
210	0,98	0,97	0,97	0,97	0,97	0,96	0,96	0,97	0,98
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,01	1,01	1,02	1,02	1,02	1,03	1,03	1,06	1,08
340	1,03	1,03	1,04	1,04	1,05	1,06	1,07	1,10	1,11

VAK OPEN TYPE P NOZZLES - 2-PIPE COIL - COOLING																	
VAK Size	Q _{Pr}		L _w - dB(A)	ΔP _{pr} (Pa)	X (m)	ΔT _{pr} (K)					ΔT _{SWIN} (K)						ΔP _w (kPa)
	l/s	m ³ /h				P _{pr} (W)					P _{sw} (W)						
						6	7	8	9	10	6	7	8	9	10	12	
600	3,6	13	<20	45	1,4	26	30	35	39	43	143	164	188	211	249	285	2,95
	4,2	15	21	60	1,6	30	35	40	45	50	157	180	205	233	272	310	
	5,0	18	25	87	1,9	36	42	48	54	60	178	203	230	262	305	346	
	6,4	23	30	141	2,5	46	54	61	69	77	210	239	270	306	356	403	
	7,8	28	35	209	3,0	56	65	75	84	93	239	272	309	348	405	460	
900	5,3	19	<20	43	1,7	38	44	51	57	63	137	168	208	242	227	370	4,31
	6,1	22	20	57	1,9	44	51	59	66	73	177	215	257	294	296	428	
	7,2	26	24	80	2,3	52	61	69	78	87	223	268	314	354	375	496	
	9,2	33	29	129	2,9	66	77	88	99	110	288	343	393	437	482	594	
	11,7	42	34	209	3,7	84	98	112	126	140	351	414	469	516	581	698	
1200	6,9	25	<20	42	1,9	50	58	67	75	83	254	301	328	374	396	459	5,79
	8,3	30	20	60	2,3	60	70	80	90	100	290	343	378	427	463	544	
	10,6	38	25	96	2,9	76	89	101	114	127	343	406	453	507	560	668	
	13,3	48	30	154	3,6	96	112	128	144	160	403	476	539	599	666	802	
	16,1	58	34	225	4,4	116	135	155	174	193	456	539	617	681	758	916	
1500	8,6	31	<20	41	2,1	62	72	83	93	103	298	353	400	466	534	658	7,19
	10,6	38	20	61	2,6	76	89	101	114	127	354	416	470	539	609	742	
	12,8	46	24	90	3,1	92	107	123	138	153	413	481	544	617	690	834	
	15,6	56	29	133	3,8	112	131	149	168	187	477	554	627	705	784	941	
	20,0	72	34	220	4,9	144	168	192	216	240	563	654	741	830	919	1098	
1800	10,6	38	<20	43	2,4	76	89	101	114	127	344	405	472	532	611	762	8,6
	12,8	46	20	62	2,8	92	107	123	138	153	412	483	554	624	707	865	
	15,3	55	24	89	3,4	110	128	147	165	183	480	561	637	718	805	972	
	19,2	69	29	140	4,3	138	161	184	207	230	569	663	751	846	937	1124	
	24,4	88	34	228	5,4	176	205	235	264	293	665	773	878	989	1085	1302	
2100	19,4	70	<20	107	4,0	140	163	187	210	233	595	696	796	892	988	1183	10,11
	23,9	86	20	162	4,9	172	201	229	258	287	677	791	900	1010	1122	1346	
	28,6	103	25	232	5,9	206	240	275	309	343	751	875	994	1117	1242	1495	
	33,9	122	30	326	7,0	244	285	325	366	407	819	954	1084	1219	1356	1639	
	40,3	145	35	460	8,3	290	338	387	435	483	889	1033	1175	1325	1472	1792	
2400	22,8	82	<20	113	4,4	164	191	219	246	273	684	797	901	1019	1114	1333	11,27
	27,2	98	20	161	5,3	196	229	261	294	327	755	882	1003	1130	1239	1483	
	30,8	111	24	207	5,9	222	259	296	333	370	808	944	1076	1210	1330	1591	
	36,9	133	29	297	7,1	266	310	355	399	443	886	1037	1182	1328	1469	1747	
	44,4	160	34	429	8,6	320	373	427	480	533	965	1133	1289	1445	1615	1899	
2700	25,0	90	<20	124	4,5	180	210	240	270	300	736	858	979	1099	1216	1459	12,65
	30,6	110	20	186	5,6	220	257	293	330	367	825	962	1100	1233	1365	1638	
	34,7	125	24	240	6,3	250	292	333	375	417	884	1032	1181	1323	1463	1756	
	41,7	150	29	345	7,6	300	350	400	450	500	969	1133	1296	1458	1607	1926	
	51,4	185	35	526	9,3	370	432	493	555	617	1061	1252	1424	1619	1772	2122	
3000	30,0	108	<20	145	5,2	216	252	288	324	360	838	974	1107	1262	1390	1668	14,17
	33,9	122	20	185	5,8	244	285	325	366	407	898	1041	1186	1348	1484	1780	
	38,9	140	24	244	6,7	280	327	373	420	467	967	1118	1279	1448	1594	1912	
	47,2	170	30	359	8,1	340	397	453	510	567	1064	1232	1412	1588	1750	2102	
	55,6	200	34	497	9,6	400	467	533	600	667	1143	1330	1525	1699	1877	2261	

Technical Specifications. Selection Tables

COOLING - 2-PIPE SYSTEM - M-TYPE NOZZLE

Reference water flow (QW) of 250 L/h

For other water flow rates, correct the unit capacity (PSW) in the table by the factors listed in the attached table.

VAK 2-PIPE SYSTEM COOLING									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Qw (l/h)	COIL CAPACITY CORRECTION FACTOR								
80	0,69	0,70	0,69	0,68	0,66	0,62	0,61	0,60	0,59
100	0,79	0,78	0,77	0,77	0,75	0,71	0,70	0,69	0,68
120	0,86	0,85	0,84	0,83	0,82	0,78	0,77	0,77	0,76
150	0,92	0,91	0,90	0,90	0,89	0,86	0,85	0,86	0,85
180	0,96	0,95	0,94	0,94	0,94	0,92	0,91	0,92	0,92
210	0,98	0,97	0,97	0,97	0,97	0,97	0,96	0,97	0,98
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,01	1,01	1,02	1,02	1,02	1,03	1,03	1,06	1,08
340	1,03	1,03	1,04	1,04	1,05	1,06	1,07	1,10	1,11

VAK OPEN TYPE M NOZZLES - 2-PIPE COIL - COOLING																	
VAK Size	Q _{pr}		L _w - dB(A)	ΔP _{pr} (Pa)	X (m)	ΔT _{pr} (K)					ΔT _{swin} (K)						ΔP _w (kPa)
	l/s	m ³ /h				P _{pr} (W)					P _{sw} (W)						
						6	7	8	9	10	6	7	8	9	10	12	
600	7,8	28	<20	47	2,4	56	65	75	84	93	175	200	226	258	300	341	2,95
	9,2	33	21	65	2,8	66	77	88	99	110	195	223	252	286	333	377	
	11,1	40	26	96	3,4	80	93	107	120	133	222	253	286	323	377	427	
	12,8	46	30	126	3,9	92	107	123	138	153	244	278	316	355	414	470	
900	15,8	57	35	194	4,9	114	133	152	171	190	287	326	374	427	486	558	4,31
	11,1	40	<20	39	2,8	80	93	107	120	133	215	259	304	343	362	483	
	13,1	47	20	54	3,3	94	110	125	141	157	259	309	357	399	435	548	
	15,6	56	25	76	3,9	112	131	149	168	187	305	362	414	458	510	621	
1200	19,4	70	30	119	4,9	140	163	187	210	233	363	427	483	530	599	718	5,79
	23,9	86	35	180	6,0	172	201	229	258	287	423	492	555	604	693	834	
	15,3	55	<20	41	3,3	110	128	147	165	183	321	379	422	474	520	618	
	17,8	64	21	56	3,9	128	149	171	192	213	357	422	473	528	585	700	
1500	21,4	77	25	81	4,7	154	180	205	231	257	405	478	542	602	670	806	7,19
	25,6	92	30	116	5,6	184	215	245	276	307	455	537	615	679	756	913	
	32,8	118	36	191	7,2	236	275	315	354	393	529	624	726	795	882	1063	
	19,4	70	<20	43	3,8	140	163	187	210	233	399	465	526	597	669	810	
1800	21,7	78	20	53	4,2	156	182	208	234	260	433	504	570	644	718	865	8,6
	27,5	99	26	86	5,4	198	231	264	297	330	512	595	673	755	837	1002	
	33,3	120	31	126	6,5	240	280	320	360	400	578	672	762	853	944	1127	
	41,4	149	36	195	8,1	298	348	397	447	497	653	764	867	970	1075	1280	
2100	22,8	82	<20	41	4,1	164	191	219	246	273	455	532	606	683	768	931	10,11
	25,6	92	20	52	4,6	184	215	245	276	307	500	583	662	745	832	1003	
	31,9	115	26	81	5,7	230	268	307	345	383	587	684	774	872	964	1155	
	38,3	138	30	116	6,8	276	322	368	414	460	657	765	869	978	1074	1288	
2400	46,1	166	34	168	8,2	332	387	443	498	553	727	844	965	1087	1185	1430	12,65
	36,1	130	<20	82	6,0	260	303	347	390	433	655	765	871	978	1086	1303	
	38,9	140	21	96	6,4	280	327	373	420	467	685	800	909	1021	1135	1362	
	44,4	160	25	125	7,3	320	373	427	480	533	739	862	979	1100	1223	1471	
2700	52,8	190	30	176	8,7	380	443	507	570	633	808	941	1069	1202	1337	1616	14,17
	63,9	230	35	258	10,5	460	537	613	690	767	885	1027	1168	1318	1464	1784	
	33,3	120	<20	54	5,1	240	280	320	360	400	650	758	854	967	1056	1262	
	44,4	160	21	96	6,9	320	373	427	480	533	764	893	1015	1144	1255	1502	
3000	50,0	180	25	121	7,7	360	420	480	540	600	814	951	1084	1219	1341	1603	12,65
	59,7	215	30	173	9,2	430	502	573	645	717	890	1041	1187	1333	1477	1754	
	72,2	260	35	252	11,1	520	607	693	780	867	970	1140	1296	1452	1627	1907	
	38,9	140	<20	58	5,7	280	327	373	420	467	725	845	963	1083	1197	1436	
3000	48,6	175	21	90	7,1	350	408	467	525	583	823	960	1097	1230	1361	1634	12,65
	58,1	209	26	129	8,4	418	488	557	627	697	905	1056	1208	1355	1498	1797	
	66,7	240	30	170	9,7	480	560	640	720	800	968	1132	1295	1457	1606	1925	
	76,9	277	34	226	11,2	554	646	739	831	923	1031	1213	1383	1566	1718	2057	
3000	47,5	171	<20	70	6,6	342	399	456	513	570	833	969	1101	1255	1383	1659	14,17
	53,3	192	21	88	7,4	384	448	512	576	640	890	1032	1176	1337	1471	1765	
	62,5	225	26	121	8,6	450	525	600	675	750	969	1121	1282	1451	1596	1915	
	72,2	260	30	162	10,0	520	607	693	780	867	1040	1204	1381	1554	1712	2056	
86,1	310	35	230	11,9	620	723	827	930	1033	1126	1309	1502	1674	1849	2226		

Technical Specifications. Selection Tables

COOLING - 2-PIPE SYSTEM - G-TYPE NOZZLE

Reference water flow (QW) of 250 L/h

For other water flow rates, correct the unit capacity (PSW) in the table by the factors listed in the attached table.

VAK 2-PIPE SYSTEM COOLING									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Qw (l/h)	COIL CAPACITY CORRECTION FACTOR								
80	0,69	0,70	0,69	0,68	0,66	0,62	0,61	0,60	0,59
100	0,79	0,78	0,77	0,77	0,75	0,71	0,70	0,69	0,68
120	0,86	0,85	0,84	0,83	0,82	0,78	0,77	0,77	0,76
150	0,92	0,91	0,90	0,90	0,89	0,86	0,85	0,86	0,85
180	0,96	0,95	0,94	0,94	0,94	0,92	0,91	0,92	0,92
210	0,98	0,97	0,97	0,97	0,97	0,96	0,96	0,97	0,98
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,01	1,01	1,02	1,02	1,02	1,03	1,03	1,06	1,08
340	1,03	1,03	1,04	1,04	1,05	1,06	1,07	1,10	1,11

VAK OPEN TYPE G NOZZLES - 2-PIPE COIL - COOLING																	
VAK Size	Q _{Pr}		L _w - dB(A)	ΔP _{pr} (Pa)	X (m)	ΔT _{pr} (K)					ΔT _{swin} (K)						ΔP _w (kPa)
	l/s	m ³ /h				P _{pr} (W)					P _{sw} (W)						
						6	7	8	9	10	6	7	8	9	10	12	
600	10,6	38	<20	39	2,1	76	89	101	114	127	188	214	242	275	320	362	2,95
	12,2	44	21	52	2,5	88	103	117	132	147	207	236	266	302	351	397	
	14,4	52	25	73	2,9	104	121	139	156	173	231	263	299	336	392	444	
	17,2	62	30	103	3,5	124	145	165	186	207	262	298	340	384	444	507	
	20,6	74	35	147	4,1	148	173	197	222	247	302	342	395	457	512	592	
900	16,7	60	<20	43	2,7	120	140	160	180	200	271	324	372	414	455	566	4,31
	20,8	75	25	67	3,4	150	175	200	225	250	329	389	442	487	547	658	
	25,0	90	30	97	4,1	180	210	240	270	300	377	441	499	546	619	742	
	29,2	105	34	132	4,8	210	245	280	315	350	423	492	555	604	693	834	
	34,7	125	38	187	5,7	250	292	333	375	417	498	575	648	702	827	994	
1200	20,8	75	<20	38	3,0	150	175	200	225	250	346	409	458	512	566	677	5,79
	22,5	81	20	44	3,2	162	189	216	243	270	365	432	486	541	600	720	
	26,4	95	24	61	3,7	190	222	253	285	317	407	481	546	605	674	812	
	34,2	123	31	102	4,9	246	287	328	369	410	480	567	653	719	799	965	
	41,7	150	36	151	5,9	300	350	400	450	500	540	636	743	813	901	1084	
1500	26,4	95	<20	39	3,4	190	222	253	285	317	432	502	568	642	716	862	7,19
	27,8	100	20	43	3,5	200	233	267	300	333	448	521	589	665	740	889	
	34,4	124	26	66	4,4	248	289	331	372	413	520	604	683	766	849	1015	
	40,6	146	30	91	5,2	292	341	389	438	487	576	669	758	849	939	1121	
	50,0	180	35	138	6,4	360	420	480	540	600	647	758	859	962	1065	1269	
1800	30,0	108	<20	35	3,5	216	252	288	324	360	484	565	642	723	809	976	8,6
	33,3	120	21	43	3,9	240	280	320	360	400	525	612	693	781	869	1044	
	41,7	150	26	67	4,8	300	350	400	450	500	611	712	807	908	1001	1199	
	50,6	182	31	98	5,9	364	425	485	546	607	684	796	907	1021	1117	1343	
	58,9	212	35	133	6,8	424	495	565	636	707	741	860	985	1110	1207	1460	
2100	36,1	130	<20	37	3,9	260	303	347	390	433	576	674	771	864	957	1145	10,11
	41,1	148	21	48	4,4	296	345	395	444	493	626	732	834	936	1038	1244	
	49,2	177	26	69	5,3	354	413	472	531	590	697	813	925	1038	1154	1387	
	56,9	205	30	92	6,1	410	478	547	615	683	756	881	1001	1124	1251	1507	
	66,7	240	35	126	7,2	480	560	640	720	800	818	952	1083	1218	1354	1639	
2400	40,0	144	<20	35	4,0	288	336	384	432	480	642	748	842	955	1043	1246	11,27
	46,1	166	21	46	4,6	332	387	443	498	553	696	812	920	1039	1137	1361	
	52,8	190	25	61	5,3	380	443	507	570	633	750	876	996	1123	1231	1474	
	63,9	230	31	89	6,4	460	537	613	690	767	830	970	1107	1244	1371	1636	
	75,0	270	35	122	7,5	540	630	720	810	900	898	1052	1199	1346	1493	1770	
2700	45,0	162	<20	35	4,3	324	378	432	486	540	701	817	930	1046	1157	1387	12,65
	49,2	177	21	42	4,7	354	413	472	531	590	738	860	981	1102	1219	1462	
	55,6	200	25	53	5,3	400	467	533	600	667	791	922	1054	1181	1308	1570	
	66,7	240	30	76	6,3	480	560	640	720	800	873	1019	1166	1307	1445	1734	
	80,6	290	35	111	7,6	580	677	773	870	967	960	1122	1283	1444	1591	1908	
3000	50,0	180	<20	35	4,5	360	420	480	540	600	761	890	1006	1151	1271	1526	14,17
	52,8	190	21	39	4,7	380	443	507	570	633	786	917	1039	1187	1309	1572	
	61,1	220	25	52	5,5	440	513	587	660	733	856	994	1131	1287	1418	1701	
	72,2	260	30	73	6,5	520	607	693	780	867	938	1085	1241	1406	1547	1856	
	88,9	320	36	110	8,0	640	747	853	960	1067	1040	1204	1381	1553	1711	2055	

Technical Specifications. Selection Tables

COOLING - 4-PIPE SYSTEM - P-TYPE NOZZLE

Reference water flow (QW) of 250 L/h

For other water flow rates, correct the unit capacity (PSW) in the table by the factors listed in the attached table.

VAK 4-PIPE SYSTEM COOLING									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Qw (l/h)	COIL CAPACITY CORRECTION FACTOR								
80	0,69	0,70	0,69	0,68	0,66	0,62	0,61	0,60	0,59
100	0,79	0,78	0,77	0,77	0,75	0,71	0,70	0,69	0,68
120	0,86	0,85	0,84	0,83	0,82	0,78	0,77	0,77	0,76
150	0,92	0,91	0,90	0,90	0,89	0,86	0,85	0,86	0,85
180	0,96	0,95	0,94	0,94	0,94	0,92	0,91	0,92	0,92
210	0,98	0,97	0,97	0,97	0,97	0,96	0,96	0,97	0,98
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,01	1,01	1,02	1,02	1,02	1,03	1,03	1,06	1,08
340	1,03	1,03	1,04	1,04	1,05	1,06	1,07	1,10	1,11

VAK OPEN TYPE P NOZZLES - 4-PIPE COIL - COOLING																	
VAK Size	Q _{Pr}		L _w - dB(A)	ΔP _{Pr} (Pa)	X (m)	ΔT _{Pr} (K)					ΔT _{SWIN} (K)						ΔP _W (kPa)
	l/s	m ³ /h				P _{Pr} (W)					P _{SW} (W)						
						6	7	8	9	10	6	7	8	9	10	12	
600	3,6	13	<20	45	1,4	26	30	35	39	43	141	163	186	209	234	283	2,2
	4,2	15	21	60	1,6	30	35	40	45	50	156	179	204	232	255	308	
	5,0	18	25	87	1,9	36	42	48	54	60	176	202	229	262	285	345	
	6,4	23	30	141	2,5	46	54	61	69	77	208	239	269	307	331	403	
	7,8	28	35	209	3,0	56	65	75	84	93	237	274	310	352	373	463	
900	5,3	19	<20	43	1,7	38	44	51	57	63	130	159	195	230	244	349	3,5
	6,1	22	20	57	1,9	44	51	59	66	73	168	202	242	279	299	403	
	7,2	26	24	80	2,3	52	61	69	78	87	211	253	295	336	362	467	
	9,2	33	29	129	2,9	66	77	88	99	110	273	323	369	416	452	558	
	11,7	42	34	209	3,7	84	98	112	126	140	335	389	440	495	541	652	
1200	6,9	25	<20	42	1,9	50	58	67	75	83	241	284	310	353	376	430	4,6
	8,3	30	20	60	2,3	60	70	80	90	100	274	323	357	404	439	510	
	10,6	38	25	96	2,9	76	89	101	114	127	324	382	427	481	530	626	
	13,3	48	30	154	3,6	96	112	128	144	160	380	448	506	568	629	751	
	16,1	58	34	225	4,4	116	135	155	174	193	431	507	577	647	714	858	
1500	8,6	31	<20	41	2,1	62	72	83	93	103	282	334	379	439	503	621	5,8
	10,6	38	20	61	2,6	76	89	101	114	127	335	394	446	508	575	701	
	12,8	46	24	90	3,1	92	107	123	138	153	390	455	516	581	651	787	
	15,6	56	29	133	3,8	112	131	149	168	187	451	524	595	664	739	888	
	20,0	72	34	220	4,9	144	168	192	216	240	533	615	703	781	864	1035	
1800	10,6	38	<20	43	2,4	76	89	101	114	127	323	383	445	501	576	719	6,9
	12,8	46	20	62	2,8	92	107	123	138	153	387	458	522	587	667	816	
	15,3	55	24	89	3,4	110	128	147	165	183	451	532	601	676	759	917	
	19,2	69	29	140	4,3	138	161	184	207	230	534	629	708	795	887	1060	
	24,4	88	34	228	5,4	176	205	235	264	293	622	732	830	930	1032	1229	
2100	19,4	70	<20	107	4,0	140	163	187	210	233	562	655	752	849	930	1119	8,1
	23,9	86	20	162	4,9	172	201	229	258	287	640	747	850	960	1055	1273	
	28,6	103	25	232	5,9	206	240	275	309	343	712	831	939	1061	1167	1411	
	33,9	122	30	326	7,0	244	285	325	366	407	780	913	1026	1156	1272	1543	
	40,3	145	35	460	8,3	290	338	387	435	483	854	1001	1115	1254	1379	1678	
2400	22,8	82	<20	113	4,4	164	191	219	246	273	643	754	850	955	1057	1261	9,0
	27,2	98	20	161	5,3	196	229	261	294	327	712	835	945	1059	1175	1406	
	30,8	111	24	207	5,9	222	259	296	333	370	763	895	1012	1134	1260	1511	
	36,9	133	29	297	7,1	266	310	355	399	443	840	983	1107	1246	1385	1664	
	44,4	160	34	429	8,6	320	373	427	480	533	924	1074	1197	1361	1509	1819	
2700	25,0	90	<20	124	4,5	180	210	240	270	300	693	804	920	1041	1152	1380	10,4
	30,6	110	20	186	5,6	220	257	293	330	367	778	901	1033	1166	1293	1548	
	34,7	125	24	240	6,3	250	292	333	375	417	835	966	1107	1249	1386	1658	
	41,7	150	29	345	7,6	300	350	400	450	500	920	1062	1215	1370	1520	1814	
	51,4	185	35	526	9,3	370	432	493	555	617	1018	1180	1335	1505	1671	1986	
3000	30,0	108	<20	145	5,2	216	252	288	324	360	782	935	1054	1187	1308	1567	11,3
	33,9	122	20	185	5,8	244	285	325	366	407	838	1001	1131	1270	1398	1672	
	38,9	140	24	244	6,7	280	327	373	420	467	902	1079	1220	1367	1504	1797	
	47,2	170	30	359	8,1	340	397	453	510	567	994	1192	1345	1508	1660	1980	
	55,6	200	34	497	9,6	400	467	533	600	667	1073	1290	1448	1628	1795	2139	

Technical Specifications. Selection Tables

COOLING - 4-PIPE SYSTEM - M-TYPE NOZZLE

Reference water flow (QW) of 250 L/h

For other water flow rates, correct the unit capacity (PSW) in the table by the factors listed in the attached table.

VAK 4-PIPE SYSTEM COOLING									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Qw (l/h)	COIL CAPACITY CORRECTION FACTOR								
80	0,69	0,70	0,69	0,68	0,66	0,62	0,61	0,60	0,59
100	0,79	0,78	0,77	0,77	0,75	0,71	0,70	0,69	0,68
120	0,86	0,85	0,84	0,83	0,82	0,78	0,77	0,77	0,76
150	0,92	0,91	0,90	0,90	0,89	0,86	0,85	0,86	0,85
180	0,96	0,95	0,94	0,94	0,94	0,92	0,91	0,92	0,92
210	0,98	0,97	0,97	0,97	0,97	0,96	0,96	0,97	0,98
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,01	1,01	1,02	1,02	1,02	1,03	1,03	1,06	1,08
340	1,03	1,03	1,04	1,04	1,05	1,06	1,07	1,10	1,11

VAK OPEN TYPE M NOZZLES - 4-PIPE COIL - COOLING																	
VAK Size	Q _{pr}		L _w - dB(A)	ΔP _{pr} (Pa)	X (m)	ΔT _{pr} (K)					ΔT _{SWIN} (K)						ΔP _w (kPa)
	l/s	m ³ /h				6	7	8	9	10	6	7	8	9	10	12	
600	7,8	28	<20	47	2,4	56	65	75	84	93	178	205	232	265	289	349	2,2
	9,2	33	21	65	2,8	66	77	88	99	110	199	229	258	295	319	387	
	11,1	40	26	96	3,4	80	93	107	120	133	226	261	295	335	358	441	
	12,8	46	30	126	3,9	92	107	123	138	153	249	288	327	371	391	488	
	15,8	57	35	194	4,9	114	133	152	171	190	292	340	389	452	453	586	
900	11,1	40	<20	39	2,8	80	93	107	120	133	210	251	293	335	361	467	3,5
	13,1	47	20	54	3,3	94	110	125	141	157	253	300	345	391	423	530	
	15,6	56	25	76	3,9	112	131	149	168	187	299	351	399	450	489	599	
	19,4	70	30	119	4,9	140	163	187	210	233	356	413	466	524	574	689	
	23,9	86	35	180	6,0	172	201	229	258	287	417	476	535	604	665	793	
1200	15,3	55	<20	41	3,3	110	128	147	165	183	312	367	409	462	507	596	4,6
	17,8	64	21	56	3,9	128	149	171	192	213	346	408	458	515	570	675	
	21,4	77	25	81	4,7	154	180	205	231	257	393	463	524	587	651	777	
	25,6	92	30	116	5,6	184	215	245	276	307	442	520	592	663	732	880	
	32,8	118	36	191	7,2	236	275	315	354	393	516	607	696	778	850	1028	
1500	19,4	70	<20	43	3,8	140	163	187	210	233	388	453	513	579	649	786	5,8
	21,7	78	20	53	4,2	156	182	208	234	260	421	490	556	624	696	840	
	27,5	99	26	86	5,4	198	231	264	297	330	499	577	657	731	811	973	
	33,3	120	31	126	6,5	240	280	320	360	400	563	649	743	825	913	1092	
	41,4	149	36	195	8,1	298	348	397	447	497	635	729	843	937	1036	1239	
1800	22,8	82	<20	41	4,1	164	191	219	246	273	440	519	586	661	745	903	6,9
	25,6	92	20	52	4,6	184	215	245	276	307	482	569	638	721	809	973	
	31,9	115	26	81	5,7	230	268	307	345	383	566	667	744	843	939	1121	
	38,3	138	30	116	6,8	276	322	368	414	460	634	745	832	947	1050	1251	
	46,1	166	34	168	8,2	332	387	443	498	553	700	821	919	1053	1168	1389	
2100	36,1	130	<20	82	6,0	260	303	347	390	433	637	743	847	957	1051	1267	8,1
	38,9	140	21	96	6,4	280	327	373	420	467	667	778	883	999	1098	1325	
	44,4	160	25	125	7,3	320	373	427	480	533	721	842	951	1075	1182	1429	
	52,8	190	30	176	8,7	380	443	507	570	633	791	926	1040	1173	1291	1565	
	63,9	230	35	258	10,5	460	537	613	690	767	874	1025	1141	1283	1411	1718	
2400	33,3	120	<20	54	5,1	240	280	320	360	400	629	737	829	933	1031	1229	9,0
	44,4	160	21	96	6,9	320	373	427	480	533	741	870	984	1103	1223	1465	
	50,0	180	25	121	7,7	360	420	480	540	600	791	927	1048	1175	1306	1567	
	59,7	215	30	173	9,2	430	502	573	645	717	869	1016	1142	1287	1431	1720	
	72,2	260	35	252	11,1	520	607	693	780	867	958	1111	1235	1408	1560	1882	
2700	38,9	140	<20	58	5,7	280	327	373	420	467	702	815	932	1054	1166	1398	10,4
	48,6	175	21	90	7,1	350	408	467	525	583	798	924	1060	1196	1326	1589	
	58,1	209	26	129	8,4	418	488	557	627	697	880	1017	1166	1315	1459	1744	
	66,7	240	30	170	9,7	480	560	640	720	800	946	1092	1249	1408	1562	1864	
	76,9	277	34	226	11,2	554	646	739	831	923	1015	1174	1333	1503	1668	1984	
3000	47,5	171	<20	70	6,6	342	399	456	513	570	801	957	1079	1215	1339	1603	11,3
	53,3	192	21	88	7,4	384	448	512	576	640	855	1021	1153	1295	1426	1705	
	62,5	225	26	121	8,6	450	525	600	675	750	930	1113	1258	1409	1551	1852	
	72,2	260	30	162	10,0	520	607	693	780	867	1000	1199	1353	1516	1669	1991	
	86,1	310	35	230	11,9	620	723	827	930	1033	1087	1306	1467	1648	1818	2166	

Technical Specifications. Selection Tables

COOLING - 4-PIPE SYSTEM - G-TYPE NOZZLE

Reference water flow (QW) of 250 L/h

For other water flow rates, correct the unit capacity (PSW) in the table by the factors listed in the attached table.

VAK 4-PIPE SYSTEM COOLING									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Qw (l/h)	COIL CAPACITY CORRECTION FACTOR								
80	0,69	0,70	0,69	0,68	0,66	0,62	0,61	0,60	0,59
100	0,79	0,78	0,77	0,77	0,75	0,71	0,70	0,69	0,68
120	0,86	0,85	0,84	0,83	0,82	0,78	0,77	0,77	0,76
150	0,92	0,91	0,90	0,90	0,89	0,86	0,85	0,86	0,85
180	0,96	0,95	0,94	0,94	0,94	0,92	0,91	0,92	0,92
210	0,98	0,97	0,97	0,97	0,97	0,96	0,96	0,97	0,98
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,01	1,01	1,02	1,02	1,02	1,03	1,03	1,06	1,08
340	1,03	1,03	1,04	1,04	1,05	1,06	1,07	1,10	1,11

VAK OPEN TYPE G NOZZLES - 4-PIPE COIL - COOLING																	
VAK Size	Q _{Pr}		L _w - dB(A)	ΔP _{pr} (Pa)	X (m)	ΔT _{pr} (K)					ΔT _{swin} (K)						ΔP _w (kPa)
	l/s	m ³ /h				P _{pr} (W)					P _{sw} (W)						
						6	7	8	9	10	6	7	8	9	10	12	
600	10,6	38	<20	39	3,3	76	89	101	114	127	189	216	244	279	303	367	2,2
	12,2	44	21	52	3,8	88	103	117	132	147	208	239	270	307	331	404	
	14,4	52	25	73	4,5	104	121	139	156	173	232	268	304	345	367	454	
	17,2	62	30	103	5,3	124	145	165	186	207	263	306	348	398	411	521	
	20,6	74	35	147	6,3	148	173	197	222	247	303	354	407	480	467	615	
900	16,7	60	<20	43	4,2	120	140	160	180	200	261	309	354	400	434	539	3,5
	20,8	75	25	67	5,2	150	175	200	225	250	318	371	420	473	516	625	
	25,0	90	30	97	6,3	180	210	240	270	300	365	421	474	534	585	701	
	29,2	105	34	132	7,3	210	245	280	315	350	411	469	527	595	655	781	
	34,7	125	38	187	8,7	250	292	333	375	417	487	548	615	699	771	922	
1200	20,8	75	<20	38	4,5	150	175	200	225	250	331	391	438	493	544	644	4,6
	22,5	81	20	44	4,9	162	189	216	243	270	349	412	463	521	576	684	
	26,4	95	24	61	5,8	190	222	253	285	317	389	459	519	583	645	771	
	34,2	123	31	102	7,5	246	287	328	369	410	460	542	619	693	762	919	
	41,7	150	36	151	9,1	300	350	400	450	500	520	611	701	785	855	1035	
1500	26,4	95	<20	39	5,2	190	222	253	285	317	414	482	547	613	684	825	5,8
	27,8	100	20	43	5,4	200	233	267	300	333	430	500	567	635	707	852	
	34,4	124	26	66	6,7	248	289	331	372	413	499	577	658	731	810	972	
	40,6	146	30	91	7,9	292	341	389	438	487	552	637	729	810	896	1072	
	50,0	180	35	138	9,8	360	420	480	540	600	621	713	824	915	1013	1210	
1800	30,0	108	<20	35	5,3	216	252	288	324	360	461	544	611	690	775	934	6,9
	33,3	120	21	43	5,9	240	280	320	360	400	499	589	659	745	833	999	
	41,7	150	26	67	7,4	300	350	400	450	500	581	684	764	867	963	1148	
	50,6	182	31	98	9,0	364	425	485	546	607	650	764	854	974	1080	1286	
	58,9	212	35	133	10,5	424	495	565	636	707	704	824	923	1061	1176	1399	
2100	36,1	130	<20	37	6,0	260	303	347	390	433	551	643	739	834	913	1099	8,1
	41,1	148	21	48	6,8	296	345	395	444	493	600	700	799	903	991	1194	
	49,2	177	26	69	8,1	354	413	472	531	590	669	781	886	1001	1101	1329	
	56,9	205	30	92	9,4	410	478	547	615	683	728	850	959	1083	1192	1442	
	66,7	240	35	126	11,0	480	560	640	720	800	792	927	1039	1171	1289	1564	
2400	40,0	144	<20	35	6,2	288	336	384	432	480	613	717	807	908	1004	1196	9,0
	46,1	166	21	46	7,1	332	387	443	498	553	665	780	880	988	1094	1307	
	52,8	190	25	61	8,1	380	443	507	570	633	717	842	952	1067	1184	1418	
	63,9	230	31	89	9,9	460	537	613	690	767	796	933	1054	1183	1315	1578	
	75,0	270	35	122	11,6	540	630	720	810	900	867	1011	1135	1282	1424	1713	
2700	45,0	162	<20	35	6,5	324	378	432	486	540	669	776	887	1005	1111	1332	10,4
	49,2	177	21	42	7,2	354	413	472	531	590	704	817	935	1058	1171	1403	
	55,6	200	25	53	8,1	400	467	533	600	667	756	876	1004	1134	1256	1505	
	66,7	240	30	76	9,7	480	560	640	720	800	837	967	1109	1251	1388	1661	
	80,6	290	35	111	11,7	580	677	773	870	967	924	1068	1220	1376	1527	1821	
3000	50,0	180	<20	35	6,9	360	420	480	540	600	721	865	972	1098	1212	1454	11,3
	52,8	190	21	39	7,3	380	443	507	570	633	745	892	1004	1132	1249	1497	
	61,1	220	25	52	8,4	440	513	587	660	733	811	969	1094	1229	1354	1620	
	72,2	260	30	73	10,0	520	607	693	780	867	888	1062	1200	1345	1480	1769	
	88,9	320	36	110	12,3	640	747	853	960	1067	986	1182	1334	1495	1646	1964	

Technical Specifications. Selection Tables

HEATING - 2-PIPE SYSTEM - P-TYPE NOZZLE

Reference water flow (QW) of 250 L/h

For other water flow rates, correct the unit capacity (PSW) in the table by the factors listed in the attached table.

VAK 2-PIPE SYSTEM HEATING									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Qw (l/h)	COIL CAPACITY CORRECTION FACTOR								
80	0,69	0,70	0,69	0,68	0,66	0,62	0,61	0,60	0,59
100	0,79	0,78	0,77	0,77	0,75	0,71	0,70	0,69	0,68
120	0,86	0,85	0,84	0,83	0,82	0,78	0,77	0,77	0,76
150	0,92	0,91	0,90	0,90	0,89	0,86	0,85	0,86	0,85
180	0,96	0,95	0,94	0,94	0,94	0,92	0,91	0,92	0,92
210	0,98	0,97	0,97	0,97	0,97	0,96	0,96	0,97	0,98
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,01	1,01	1,02	1,02	1,02	1,03	1,03	1,06	1,08
340	1,03	1,03	1,04	1,04	1,05	1,06	1,07	1,10	1,11

VAK OPEN TYPE P NOZZLES - 2-PIPE COIL - HEATING																	
VAK Size	Q _{pr}		L _w - dB(A)	ΔP _{pr} (Pa)	X (m)	ΔT _{pr} (K)					ΔT _{swin} (K)					ΔP _w (kPa)	
	l/s	m ³ /h				P _{pr} (W)					P _{sw} (W)						
						6	7	8	9	10	10	15	20	25	30		35
600	3,6	13	<20	45	1,0	26	30	35	39	43	202	297	384	479	580	704	2,95
	4,2	15	21	60	1,1	30	35	40	45	50	215	320	419	521	624	753	
	5,0	18	25	87	1,4	36	42	48	54	60	235	353	470	583	693	827	
	6,4	23	30	141	1,7	46	54	61	69	77	268	404	551	685	813	953	
	7,8	28	35	209	2,1	56	65	75	84	93	300	450	625	785	939	1083	
900	5,3	19	<20	43	1,2	38	44	51	57	63	197	296	395	493	593	688	4,31
	6,1	22	20	57	1,3	44	51	59	66	73	203	305	407	509	611	709	
	7,2	26	24	80	1,6	52	61	69	78	87	215	323	431	539	647	751	
	9,2	33	29	129	2,0	66	77	88	99	110	243	366	489	612	735	853	
	11,7	42	34	209	2,6	84	98	112	126	140	287	434	581	726	874	1017	
1200	6,9	25	<20	42	1,3	50	58	67	75	83	216	324	434	537	634	739	5,79
	8,3	30	20	60	1,6	60	70	80	90	100	244	365	489	605	718	838	
	10,6	38	25	96	2,0	76	89	101	114	127	291	435	582	723	861	1003	
	13,3	48	30	154	2,5	96	112	128	144	160	351	525	704	881	1049	1216	
	16,1	58	34	225	3,1	116	135	155	174	193	411	616	831	1050	1244	1427	
1500	8,6	31	<20	41	1,5	62	72	83	93	103	246	403	539	673	808	934	7,19
	10,6	38	20	61	1,8	76	89	101	114	127	269	455	607	759	911	1057	
	12,8	46	24	90	2,2	92	107	123	138	153	295	516	689	861	1034	1204	
	15,6	56	29	133	2,7	112	131	149	168	187	323	594	793	991	1190	1389	
	20,0	72	34	220	3,4	144	168	192	216	240	357	715	955	1192	1432	1676	
1800	10,6	38	<20	43	1,6	76	89	101	114	127	329	495	659	824	988	1153	8,6
	12,8	46	20	62	2,0	92	107	123	138	153	366	550	733	916	1098	1282	
	15,3	55	24	89	2,4	110	128	147	165	183	410	615	820	1025	1228	1433	
	19,2	69	29	140	3,0	138	161	184	207	230	480	718	960	1201	1436	1676	
	24,4	88	34	228	3,8	176	205	235	264	293	572	854	1147	1437	1711	1996	
2100	19,4	70	<20	107	2,8	140	163	187	210	233	497	745	993	1239	1486	1735	10,11
	23,9	86	20	162	3,4	172	201	229	258	287	578	864	1153	1439	1725	2014	
	28,6	103	25	232	4,1	206	240	275	309	343	658	985	1314	1640	1967	2296	
	33,9	122	30	326	4,9	244	285	325	366	407	737	1103	1472	1839	2204	2574	
	40,3	145	35	460	5,8	290	338	387	435	483	809	1211	1617	2023	2421	2825	
2400	22,8	82	<20	113	3,1	164	191	219	246	273	568	853	1143	1428	1709	1992	11,27
	27,2	98	20	161	3,7	196	229	261	294	327	646	970	1302	1625	1944	2263	
	30,8	111	24	207	4,2	222	259	296	333	370	707	1062	1425	1779	2126	2474	
	36,9	133	29	297	5,0	266	310	355	399	443	801	1204	1616	2016	2405	2793	
	44,4	160	34	429	6,0	320	373	427	480	533	890	1341	1800	2243	2669	3090	
2700	25,0	90	<20	124	3,2	180	210	240	270	300	620	935	1243	1553	1868	2172	12,65
	30,6	110	20	186	3,9	220	257	293	330	367	716	1080	1435	1794	2160	2507	
	34,7	125	24	240	4,4	250	292	333	375	417	786	1185	1573	1967	2371	2749	
	41,7	150	29	345	5,3	300	350	400	450	500	891	1341	1779	2229	2692	3114	
	51,4	185	35	526	6,5	370	432	493	555	617	1002	1502	1993	2506	3039	3498	
3000	30,0	108	<20	145	3,6	216	252	288	324	360	703	1058	1408	1765	2111	2473	14,17
	33,9	122	20	185	4,1	244	285	325	366	407	767	1154	1536	1925	2304	2699	
	38,9	140	24	244	4,7	280	327	373	420	467	846	1272	1694	2123	2541	2979	
	47,2	170	30	359	5,7	340	397	453	510	567	963	1448	1931	2418	2898	3402	
	55,6	200	34	497	6,7	400	467	533	600	667	1056	1585	2119	2650	3184	3742	

Technical Specifications. Selection Tables

HEATING - 2-PIPE SYSTEM - M-TYPE NOZZLE

Reference water flow (QW) of 250 L/h

For other water flow rates, correct the unit capacity (PSW) in the table by the factors listed in the attached table.

VAK 2-PIPE SYSTEM HEATING									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Qw (l/h)	COIL CAPACITY CORRECTION FACTOR								
80	0,69	0,70	0,69	0,68	0,66	0,62	0,61	0,60	0,59
100	0,79	0,78	0,77	0,77	0,75	0,71	0,70	0,69	0,68
120	0,86	0,85	0,84	0,83	0,82	0,78	0,77	0,77	0,76
150	0,92	0,91	0,90	0,90	0,89	0,86	0,85	0,86	0,85
180	0,96	0,95	0,94	0,94	0,94	0,92	0,91	0,92	0,92
210	0,98	0,97	0,97	0,97	0,97	0,96	0,96	0,97	0,98
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,01	1,01	1,02	1,02	1,02	1,03	1,03	1,06	1,08
340	1,03	1,03	1,04	1,04	1,05	1,06	1,07	1,10	1,11

VAK OPEN TYPE M NOZZLES - 2-PIPE COIL - HEATING																	
VAK Size	Q _{pr}		L _w - dB(A)	ΔP _{pr} (Pa)	X (m)	ΔT _{pr} (K)					ΔT _{swin} (K)					ΔP _w (kPa)	
	l/s	m ³ /h				P _{pr} (W)					P _{sw} (W)						
						6	7	8	9	10	10	15	20	25	30		35
600	7,8	28	<20	47	1,7	56	65	75	84	93	186	270	366	479	562	660	2,95
	9,2	33	21	65	2,0	66	77	88	99	110	214	317	428	544	634	743	
	11,1	40	26	96	2,4	80	93	107	120	133	252	379	509	635	741	864	
	12,8	46	30	126	2,8	92	107	123	138	153	284	430	575	712	838	973	
	15,8	57	35	194	3,4	114	133	152	171	190	340	515	685	853	1029	1182	
900	11,1	40	<20	39	2,0	80	93	107	120	133	217	326	435	544	654	758	4,31
	13,1	47	20	54	2,3	94	110	125	141	157	234	352	470	588	706	820	
	15,6	56	25	76	2,7	112	131	149	168	187	260	392	524	656	789	916	
	19,4	70	30	119	3,4	140	163	187	210	233	306	462	619	775	932	1086	
	23,9	86	35	180	4,2	172	201	229	258	287	353	534	718	899	1083	1268	
1200	15,3	55	<20	41	2,3	110	128	147	165	183	286	451	629	785	933	1118	5,79
	17,8	64	21	56	2,7	128	149	171	192	213	307	472	650	812	968	1153	
	21,4	77	25	81	3,3	154	180	205	231	257	341	506	684	855	1026	1211	
	25,6	92	30	116	3,9	184	215	245	276	307	382	547	726	909	1099	1284	
	32,8	118	36	191	5,0	236	275	315	354	393	454	619	797	979	1241	1426	
1500	19,4	70	<20	43	2,7	140	163	187	210	233	341	514	687	859	1031	1199	7,19
	21,7	78	20	53	3,0	156	182	208	234	260	368	555	741	926	1111	1295	
	27,5	99	26	86	3,8	198	231	264	297	330	438	660	882	1102	1323	1546	
	33,3	120	31	126	4,6	240	280	320	360	400	505	761	1015	1267	1523	1782	
	41,4	149	36	195	5,7	298	348	397	447	497	582	876	1166	1455	1750	2054	
1800	22,8	82	<20	41	2,8	164	191	219	246	273	404	605	807	1010	1209	1412	8,6
	25,6	92	20	52	3,2	184	215	245	276	307	436	653	871	1090	1305	1523	
	31,9	115	26	81	4,0	230	268	307	345	383	510	763	1021	1278	1527	1782	
	38,3	138	30	116	4,8	276	322	368	414	460	582	869	1167	1463	1741	2032	
	46,1	166	34	168	5,8	332	387	443	498	553	659	982	1326	1666	1973	2301	
2100	36,1	130	<20	82	4,2	260	303	347	390	433	572	856	1143	1426	1709	1995	10,11
	38,9	140	21	96	4,5	280	327	373	420	467	604	904	1206	1505	1805	2107	
	44,4	160	25	125	5,1	320	373	427	480	533	665	995	1328	1658	1988	2321	
	52,8	190	30	176	6,1	380	443	507	570	633	747	1118	1492	1863	2234	2609	
	63,9	230	35	258	7,4	460	537	613	690	767	828	1240	1654	2071	2478	2891	
2400	33,3	120	<20	54	3,6	240	280	320	360	400	550	826	1107	1383	1656	1931	11,27
	44,4	160	21	96	4,8	320	373	427	480	533	677	1017	1364	1703	2037	2371	
	50,0	180	25	121	5,4	360	420	480	540	600	737	1107	1486	1855	2216	2577	
	59,7	215	30	173	6,5	430	502	573	645	717	831	1249	1678	2093	2496	2897	
	72,2	260	35	252	7,8	520	607	693	780	867	921	1388	1864	2321	2761	3194	
2700	38,9	140	<20	58	4,0	280	327	373	420	467	628	946	1258	1571	1890	2198	12,65
	48,6	175	21	90	5,0	350	408	467	525	583	737	1111	1476	1845	2221	2579	
	58,1	209	26	129	5,9	418	488	557	627	697	837	1261	1674	2095	2526	2927	
	66,7	240	30	170	6,8	480	560	640	720	800	918	1382	1834	2298	2776	3211	
	76,9	277	34	226	7,8	554	646	739	831	923	998	1498	1988	2496	3024	3486	
3000	47,5	171	<20	70	4,6	342	399	456	513	570	720	1084	1443	1809	2164	2534	14,17
	53,3	192	21	88	5,2	384	448	512	576	640	782	1177	1568	1964	2350	2754	
	62,5	225	26	121	6,0	450	525	600	675	750	875	1317	1754	2198	2631	3085	
	72,2	260	30	162	7,0	520	607	693	780	867	965	1451	1935	2422	2903	3407	
	86,1	310	35	230	8,3	620	723	827	930	1033	1069	1604	2145	2683	3223	3787	

Technical Specifications. Selection Tables

HEATING - 2-PIPE SYSTEM - G-TYPE NOZZLE

Reference water flow (QW) of 250 L/h

For other water flow rates, correct the unit capacity (PSW) in the table by the factors listed in the attached table.

VAK 2-PIPE SYSTEM HEATING										
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000	
Qw (l/h)	COIL CAPACITY CORRECTION FACTOR									
80	0,69	0,70	0,69	0,68	0,66	0,62	0,61	0,60	0,59	
100	0,79	0,78	0,77	0,77	0,75	0,71	0,70	0,69	0,68	
120	0,86	0,85	0,84	0,83	0,82	0,78	0,77	0,77	0,76	
150	0,92	0,91	0,90	0,90	0,89	0,86	0,85	0,86	0,85	
180	0,96	0,95	0,94	0,94	0,94	0,92	0,91	0,92	0,92	
210	0,98	0,97	0,97	0,97	0,97	0,96	0,96	0,97	0,98	
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	
290	1,01	1,01	1,02	1,02	1,02	1,03	1,03	1,06	1,08	
340	1,03	1,03	1,04	1,04	1,05	1,06	1,07	1,10	1,11	

VAK OPEN TYPE G NOZZLES - 2-PIPE COIL - HEATING																	
VAK Size	Q _{pr}		L _w - dB(A)	ΔP _{pr} (Pa)	X (m)	ΔT _{pr} (K)					ΔT _{SWIN} (K)					ΔP _w (kPa)	
	l/s	m ³ /h				P _{pr} (W)					P _{sw} (W)						
						6	7	8	9	10	10	15	20	25	30		35
600	10,6	38	<20	39	1,7	76	89	101	114	127	237	322	430	601	634	704	2,95
	12,2	44	21	52	2,0	88	103	117	132	147	251	354	475	637	696	780	
	14,4	52	25	73	2,3	104	121	139	156	173	270	396	532	685	779	882	
	17,2	62	30	103	2,8	124	145	165	186	207	294	443	598	745	877	1010	
	20,6	74	35	147	3,3	148	173	197	222	247	324	495	668	818	985	1156	
900	16,7	60	<20	43	2,2	120	140	160	180	200	241	363	486	607	730	847	4,31
	20,8	75	25	67	2,7	150	175	200	225	250	280	423	565	707	851	990	
	25,0	90	30	97	3,3	180	210	240	270	300	321	485	649	813	978	1142	
	29,2	105	34	132	3,8	210	245	280	315	350	355	538	723	905	1091	1278	
	34,7	125	38	187	4,6	250	292	333	375	417	380	578	779	978	1179	1391	
1200	20,8	75	<20	38	2,4	150	175	200	225	250	421	650	875	1084	1230	1357	5,79
	22,5	81	20	44	2,6	162	189	216	243	270	431	665	890	1103	1264	1407	
	26,4	95	24	61	3,0	190	222	253	285	317	457	699	928	1149	1344	1523	
	34,2	123	31	102	3,9	246	287	328	369	410	508	766	1003	1247	1503	1747	
	41,7	150	36	151	4,7	300	350	400	450	500	553	818	1068	1343	1641	1929	
1500	26,4	95	<20	39	2,7	190	222	253	285	317	371	558	746	932	1119	1304	7,19
	27,8	100	20	43	2,8	200	233	267	300	333	384	579	774	967	1161	1354	
	34,4	124	26	66	3,5	248	289	331	372	413	450	679	907	1132	1360	1590	
	40,6	146	30	91	4,1	292	341	389	438	487	508	765	1021	1274	1531	1793	
	50,0	180	35	138	5,1	360	420	480	540	600	583	877	1166	1456	1751	2055	
1800	30,0	108	<20	35	2,8	216	252	288	324	360	428	641	855	1070	1281	1602	8,6
	33,3	120	21	43	3,1	240	280	320	360	400	460	689	920	1151	1376	1589	
	41,7	150	26	67	3,9	300	350	400	450	500	540	807	1081	1354	1615	1840	
	50,6	182	31	98	4,7	364	425	485	546	607	619	924	1243	1560	1852	2114	
	58,9	212	35	133	5,5	424	495	565	636	707	682	1015	1374	1727	2041	2335	
2100	36,1	130	<20	37	3,1	260	303	347	390	433	500	748	997	1244	1492	1742	10,11
	41,1	148	21	48	3,5	296	345	395	444	493	548	821	1095	1366	1638	1912	
	49,2	177	26	69	4,2	354	413	472	531	590	625	935	1248	1557	1867	2179	
	56,9	205	30	92	4,9	410	478	547	615	683	694	1038	1385	1729	2073	2421	
	66,7	240	35	126	5,7	480	560	640	720	800	768	1149	1534	1917	2297	2683	
2400	40,0	144	<20	35	3,2	288	336	384	432	480	548	823	1103	1378	1650	1923	11,27
	46,1	166	21	46	3,7	332	387	443	498	553	606	911	1221	1525	1825	2127	
	52,8	190	25	61	4,2	380	443	507	570	633	669	1005	1348	1683	2013	2344	
	63,9	230	31	89	5,1	460	537	613	690	767	767	1152	1547	1931	2306	2680	
	75,0	270	35	122	6,0	540	630	720	810	900	851	1281	1720	2145	2557	2966	
2700	45,0	162	<20	35	3,4	324	378	432	486	540	609	919	1221	1526	1835	2135	12,65
	49,2	177	21	42	3,7	354	413	472	531	590	649	978	1300	1624	1953	2271	
	55,6	200	25	53	4,2	400	467	533	600	667	708	1068	1419	1773	2134	2479	
	66,7	240	30	76	5,0	480	560	640	720	800	808	1218	1617	2022	2438	2826	
	80,6	290	35	111	6,1	580	677	773	870	967	919	1383	1836	2300	2779	3213	
3000	50,0	180	<20	35	3,6	360	420	480	540	600	654	985	1311	1643	1966	2301	14,17
	52,8	190	21	39	3,8	380	443	507	570	633	680	1022	1361	1706	2041	2390	
	61,1	220	25	52	4,4	440	513	587	660	733	754	1134	1510	1893	2265	2653	
	72,2	260	30	73	5,2	520	607	693	780	867	849	1277	1702	2132	2552	2992	
	88,9	320	36	110	6,4	640	747	853	960	1067	977	1469	1959	2453	2940	3451	

Technical Specifications. Selection Tables

HEATING - 4-PIPE SYSTEM - P-TYPE NOZZLE

Reference water flow (QW) of 50 l/h for sizes from 600 to 1800.

Reference water flow (QW) of 110 l/h for sizes from 2100 to 3000.

For other water flow rates, correct the unit capacity (PSW) in the table by the factors listed in the attached table.

VAK 4-PIPE SYSTEM HEATING									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Qw (l/h)	COIL CAPACITY CORRECTION FACTOR								
30	0,68	0,65	0,65	0,67	0,68	0,47	0,48	0,45	0,43
50	1,00	1,00	1,00	1,00	1,00	0,70	0,72	0,69	0,67
70	1,10	1,14	1,13	1,16	1,18	0,86	0,86	0,84	0,83
90	1,17	1,22	1,25	1,26	1,30	0,94	0,95	0,95	0,93
110	1,21	1,27	1,32	1,34	1,38	1,00	1,00	1,00	1,00
130	1,26	1,31	1,37	1,39	1,45	1,06	1,07	1,06	1,06
150	1,29	1,35	1,41	1,44	1,52	1,11	1,11	1,12	1,12
180	1,32	1,39	1,45	1,48	1,57	1,15	1,16	1,17	1,17
210	1,35	1,43	1,49	1,52	1,61	1,18	1,19	1,22	1,22
250	1,37	1,47	1,52	1,55	1,65	1,22	1,22	1,26	1,26

VAK OPEN TYPE P NOZZLES - 4-PIPE COIL - HEATING																	
VAK Size	Q _{pr}		L _w - dB(A)	ΔP _{pr} (Pa)	X (m)	ΔT _{pr} (K)					ΔT _{swin} (K)					ΔP _w (kPa)	
	l/s	m ³ /h				6	7	8	9	10	10	15	20	25	30		35
600	3,6	13	<20	45	1,0	26	30	35	39	43	208	313	417	521	406	195	0,19
	4,2	15	21	60	1,1	30	35	40	45	50	217	326	435	543	426	215	
	5,0	18	25	87	1,4	36	42	48	54	60	230	346	461	576	457	244	
	6,4	23	30	141	1,7	46	54	61	69	77	253	379	505	631	506	288	
	7,8	28	35	209	2,1	56	65	75	84	93	275	413	551	686	555	330	
900	5,3	19	<20	43	1,2	38	44	51	57	63	197	296	395	493	593	688	0,26
	6,1	22	20	57	1,3	44	51	59	66	73	203	305	407	509	611	709	
	7,2	26	24	80	1,6	52	61	69	78	87	215	323	431	539	647	751	
	9,2	33	29	129	2,0	66	77	88	99	110	243	366	489	612	735	853	
	11,7	42	34	209	2,6	84	98	112	126	140	287	434	581	726	874	1017	
1200	6,9	25	<20	42	1,3	50	58	67	75	83	211	322	436	544	653	762	0,35
	8,3	30	20	60	1,6	60	70	80	90	100	235	358	488	609	731	853	
	10,6	38	25	96	2,0	76	89	101	114	127	273	418	573	716	860	1004	
	13,3	48	30	154	2,5	96	112	128	144	160	320	494	680	850	1021	1192	
	16,1	58	34	225	3,1	116	135	155	174	193	364	565	784	979	1175	1374	
1500	8,6	31	<20	41	1,5	62	72	83	93	103	268	403	539	673	808	934	0,43
	10,6	38	20	61	1,8	76	89	101	114	127	302	455	607	759	911	1057	
	12,8	46	24	90	2,2	92	107	123	138	153	342	516	689	861	1034	1204	
	15,6	56	29	133	2,7	112	131	149	168	187	394	594	793	991	1190	1389	
	20,0	72	34	220	3,4	144	168	192	216	240	475	715	955	1192	1432	1676	
1800	10,6	38	<20	43	1,6	76	89	101	114	127	329	495	659	824	988	1153	0,52
	12,8	46	20	62	2,0	92	107	123	138	153	366	550	733	916	1098	1282	
	15,3	55	24	89	2,4	110	128	147	165	183	410	615	820	1025	1228	1433	
	19,2	69	29	140	3,0	138	161	184	207	230	480	718	960	1201	1436	1676	
	24,4	88	34	228	3,8	176	205	235	264	293	572	854	1147	1437	1711	1996	
2100	19,4	70	<20	107	2,8	140	163	187	210	233	497	745	993	1239	1486	1735	3,78
	23,9	86	20	162	3,4	172	201	229	258	287	578	864	1153	1439	1725	2014	
	28,6	103	25	232	4,1	206	240	275	309	343	658	985	1314	1640	1967	2296	
	33,9	122	30	326	4,9	244	285	325	366	407	737	1103	1472	1839	2204	2574	
	40,3	145	35	460	5,8	290	338	387	435	483	809	1211	1617	2023	2421	2825	
2400	22,8	82	<20	113	3,1	164	191	219	246	273	568	853	1143	1428	1709	1992	4,32
	27,2	98	20	161	3,7	196	229	261	294	327	646	970	1302	1625	1944	2263	
	30,8	111	24	207	4,2	222	259	296	333	370	707	1062	1425	1779	2126	2474	
	36,9	133	29	297	5,0	266	310	355	399	443	801	1204	1616	2016	2405	2793	
	44,4	160	34	429	6,0	320	373	427	480	533	890	1341	1800	2243	2669	3090	
2700	25,0	90	<20	124	3,2	180	210	240	270	300	620	935	1243	1553	1868	2172	4,85
	30,6	110	20	186	3,9	220	257	293	330	367	716	1080	1435	1794	2160	2507	
	34,7	125	24	240	4,4	250	292	333	375	417	786	1185	1573	1967	2371	2749	
	41,7	150	29	345	5,3	300	350	400	450	500	891	1341	1779	2229	2692	3114	
	51,4	185	35	526	6,5	370	432	493	555	617	1002	1502	1993	2506	3039	3498	
3000	30,0	108	<20	145	3,6	216	252	288	324	360	703	1058	1408	1765	2111	2473	5,39
	33,9	122	20	185	4,1	244	285	325	366	407	767	1154	1536	1925	2304	2699	
	38,9	140	24	244	4,7	280	327	373	420	467	846	1272	1694	2123	2541	2979	
	47,2	170	30	359	5,7	340	397	453	510	567	963	1448	1931	2418	2898	3402	
	55,6	200	34	497	6,7	400	467	533	600	667	1056	1585	2119	2650	3184	3742	

Technical Specifications. Selection Tables

HEATING - 4-PIPE SYSTEM - M-TYPE NOZZLE

Reference water flow (QW) of 50 l/h for sizes from 600 to 1800.

Reference water flow (QW) of 110 l/h for sizes from 2100 to 3000.

For other water flow rates, correct the unit capacity (PSW) in the table by the factors listed in the attached table.

VAK 4-PIPE SYSTEM HEATING									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Qw (l/h)	COIL CAPACITY CORRECTION FACTOR								
30	0,67	0,60	0,61	0,57	0,61	0,24	0,35	0,26	0,20
50	1,00	1,00	1,00	1,00	1,00	0,53	0,67	0,54	0,54
70	1,25	1,22	1,23	1,34	1,31	0,84	0,86	0,82	0,83
90	1,26	1,34	1,39	1,54	1,50	0,84	0,94	0,95	0,94
110	1,36	1,40	1,52	1,73	1,65	1,00	1,00	1,00	1,00
130	1,47	1,41	1,60	1,85	1,79	1,15	1,18	1,33	1,37
150	1,49	1,48	1,67	1,96	1,93	1,22	1,20	1,49	1,59
180	1,58	1,57	1,77	2,07	2,01	1,30	1,35	1,60	1,57
210	1,76	1,57	1,83	2,15	2,10	1,47	1,46	1,73	1,68
250	1,79	1,66	1,89	2,28	2,17	1,59	1,56	1,90	1,89

VAK OPEN TYPE M NOZZLES - 4-PIPE COIL - HEATING																	
VAK Size	Q _{Pr}		L _w - dB(A)	ΔP _{pr} (Pa)	X (m)	ΔT _{pr} (K)					ΔT _{swin} (K)					ΔP _w (kPa)	
	l/s	m ³ /h				P _{pr} (W)					P _{sw} (W)						
						6	7	8	9	10	10	15	20	25	30		35
600	7,8	28	<20	47	1,7	56	65	75	84	93	234	351	468	585	464	247	0,19
	9,2	33	21	65	2,0	66	77	88	99	110	248	373	497	620	496	276	
	11,1	40	26	96	2,4	80	93	107	120	133	269	403	538	671	540	315	
	12,8	46	30	126	2,8	92	107	123	138	153	286	430	573	714	579	347	
	15,8	57	35	194	3,4	114	133	152	171	190	318	479	639	794	650	403	
900	11,1	40	<20	39	2,0	80	93	107	120	133	217	326	435	544	654	758	0,26
	13,1	47	20	54	2,3	94	110	125	141	157	234	352	470	588	706	820	
	15,6	56	25	76	2,7	112	131	149	168	187	260	392	525	656	789	916	
	19,4	70	30	119	3,4	140	163	187	210	233	306	462	619	775	932	1086	
	23,9	86	35	180	4,2	172	201	229	258	287	353	534	718	899	1083	1268	
1200	15,3	55	<20	41	2,3	110	128	147	165	183	264	403	551	688	827	965	0,35
	17,8	64	21	56	2,7	128	149	171	192	213	292	447	614	767	921	1076	
	21,4	77	25	81	3,3	154	180	205	231	257	331	511	704	880	1056	1234	
	25,6	92	30	116	3,9	184	215	245	276	307	373	580	804	1004	1206	1410	
	32,8	118	36	191	5,0	236	275	315	354	393	429	683	958	1191	1429	1674	
1500	19,4	70	<20	43	2,7	140	163	187	210	233	341	514	687	859	1031	1199	0,43
	21,7	78	20	53	3,0	156	182	208	234	260	368	555	741	926	1111	1295	
	27,5	99	26	86	3,8	198	231	264	297	330	438	660	882	1102	1323	1546	
	33,3	120	31	126	4,6	240	280	320	360	400	505	761	1015	1267	1523	1782	
	41,4	149	36	195	5,7	298	348	397	447	497	582	876	1166	1455	1750	2054	
1800	22,8	82	<20	41	2,8	164	191	219	246	273	404	605	807	1010	1209	1412	0,52
	25,6	92	20	52	3,2	184	215	245	276	307	436	653	871	1090	1305	1523	
	31,9	115	26	81	4,0	230	268	307	345	383	510	763	1021	1278	1527	1782	
	38,3	138	30	116	4,8	276	322	368	414	460	582	869	1167	1463	1741	2032	
	46,1	166	34	168	5,8	332	387	443	498	553	659	982	1326	1666	1973	2301	
2100	36,1	130	<20	82	4,2	260	303	347	390	433	572	856	1143	1426	1709	1995	3,78
	38,9	140	21	96	4,5	280	327	373	420	467	604	904	1206	1505	1805	2107	
	44,4	160	25	125	5,1	320	373	427	480	533	665	995	1328	1658	1988	2321	
	52,8	190	30	176	6,1	380	443	507	570	633	747	1118	1492	1863	2234	2609	
	63,9	230	35	258	7,4	460	537	613	690	767	828	1240	1654	2071	2478	2891	
2400	33,3	120	<20	54	3,6	240	280	320	360	400	550	826	1107	1383	1656	1931	4,32
	44,4	160	21	96	4,8	320	373	427	480	533	677	1017	1364	1703	2037	2371	
	50,0	180	25	121	5,4	360	420	480	540	600	737	1107	1486	1855	2216	2577	
	59,7	215	30	173	6,5	430	502	573	645	717	831	1249	1678	2093	2496	2897	
	72,2	260	35	252	7,8	520	607	693	780	867	921	1388	1864	2321	2761	3194	
2700	38,9	140	<20	58	4,0	280	327	373	420	467	628	946	1258	1571	1890	2198	4,85
	48,6	175	21	90	5,0	350	408	467	525	583	737	1111	1476	1845	2221	2579	
	58,1	209	26	129	5,9	418	488	557	627	697	837	1261	1674	2095	2526	2927	
	66,7	240	30	170	6,8	480	560	640	720	800	918	1382	1834	2298	2776	3211	
	76,9	277	34	226	7,8	554	646	739	831	923	998	1498	1988	2496	3024	3486	
3000	47,5	171	<20	70	4,6	342	399	456	513	570	720	1084	1443	1809	2164	2534	5,39
	53,3	192	21	88	5,2	384	448	512	576	640	782	1177	1568	1964	2350	2754	
	62,5	225	26	121	6,0	450	525	600	675	750	875	1317	1754	2198	2631	3085	
	72,2	260	30	162	7,0	520	607	693	780	867	965	1451	1935	2422	2903	3407	
	86,1	310	35	230	8,3	620	723	827	930	1033	1069	1604	2145	2683	3223	3787	

Technical Specifications. Selection Tables

HEATING - 4-PIPE SYSTEM - G-TYPE NOZZLE

Reference water flow (QW) of 50 l/h for sizes from 600 to 1800.

Reference water flow (QW) of 110 l/h for sizes from 2100 to 3000

For other water flow rates, correct the unit capacity (PSW) in the table by the factors listed in the attached table.

VAK 4-PIPE SYSTEM HEATING									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Qw (l/h)	COIL CAPACITY CORRECTION FACTOR								
30	0,61	0,64	0,64	0,63	0,64	0,37	0,37	0,36	0,35
50	1,00	1,00	1,00	1,00	1,00	0,60	0,59	0,58	0,56
70	1,12	1,17	1,18	1,22	1,24	0,79	0,77	0,77	0,75
90	1,21	1,27	1,32	1,42	1,39	0,93	0,91	0,91	0,90
110	1,26	1,35	1,41	1,51	1,49	1,00	1,00	1,00	1,00
130	1,31	1,40	1,48	1,57	1,58	1,07	1,08	1,07	1,08
150	1,35	1,45	1,53	1,65	1,66	1,14	1,15	1,15	1,16
180	1,39	1,50	1,59	1,72	1,74	1,20	1,21	1,23	1,25
210	1,42	1,55	1,64	1,78	1,80	1,25	1,28	1,30	1,32
250	1,46	1,60	1,69	1,84	1,85	1,29	1,33	1,35	1,39

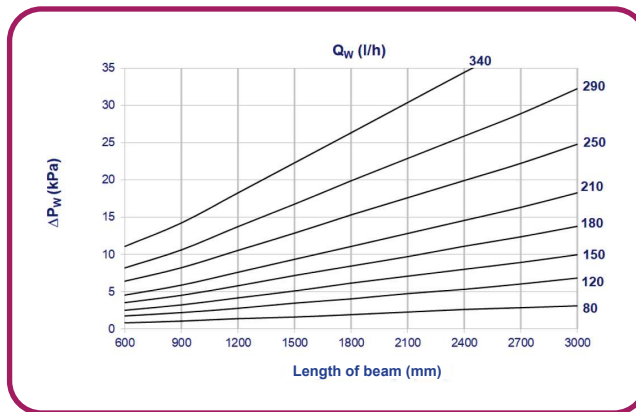
VAK OPEN TYPE G NOZZLES - 4-PIPE COIL - HEATING																	
VAK Size	Q _{Pr}		L _w - dB(A)	ΔP _{pr} (Pa)	X (m)	ΔT _{pr} (K)					ΔT _{swin} (K)					ΔP _w (kPa)	
	l/s	m ³ /h				6	7	8	9	10	10	15	20	25	30		35
600	10,6	38	<20	39	1,7	76	89	101	114	127	243	364	486	607	484	266	0,19
	12,2	44	21	52	2,0	88	103	117	132	147	257	386	515	642	515	294	
	14,4	52	25	73	2,3	104	121	139	156	173	276	415	553	690	557	330	
	17,2	62	30	103	2,8	124	145	165	186	207	300	452	602	750	610	372	
	20,6	74	35	147	3,3	148	173	197	222	247	329	496	661	822	675	423	
900	16,7	60	<20	43	2,2	120	140	160	180	200	240	362	483	604	726	843	0,26
	20,8	75	25	67	2,7	150	175	200	225	250	279	421	563	704	847	985	
	25,0	90	30	97	3,3	180	210	240	270	300	319	482	646	809	974	1136	
	29,2	105	34	132	3,8	210	245	280	315	350	353	536	720	901	1085	1272	
	34,7	125	38	187	4,6	250	292	333	375	417	378	575	775	974	1173	1384	
1200	20,8	75	<20	38	2,4	150	175	200	225	250	285	436	598	747	897	1048	0,35
	22,5	81	20	44	2,6	162	189	216	243	270	300	461	632	790	949	1109	
	26,4	95	24	61	3,0	190	222	253	285	317	335	516	712	890	1069	1249	
	34,2	123	31	102	3,9	246	287	328	369	410	395	620	863	1076	1291	1511	
	41,7	150	36	151	4,7	300	350	400	450	500	437	699	984	1222	1466	1719	
1500	26,4	95	<20	39	2,7	190	222	253	285	317	369	556	742	927	1113	1298	0,43
	27,8	100	20	43	2,8	200	233	267	300	333	383	576	770	962	1155	1347	
	34,4	124	26	66	3,5	248	289	331	372	413	448	676	902	1127	1354	1582	
	40,6	146	30	91	4,1	292	341	389	438	487	505	761	1016	1268	1524	1784	
	50,0	180	35	138	5,1	360	420	480	540	600	580	873	1161	1449	1743	2046	
1800	30,0	108	<20	35	2,8	216	252	288	324	360	426	638	851	1065	1275	1488	0,52
	33,3	120	21	43	3,1	240	280	320	360	400	458	685	915	1145	1370	1599	
	41,7	150	26	67	3,9	300	350	400	450	500	537	803	1076	1348	1607	1876	
	50,6	182	31	98	4,7	364	425	485	546	607	616	920	1237	1552	1844	2151	
	58,9	212	35	133	5,5	424	495	565	636	707	679	1010	1367	1719	2031	2369	
2100	36,1	130	<20	37	3,1	260	303	347	390	433	497	744	993	1238	1485	1734	3,78
	41,1	148	21	48	3,5	296	345	395	444	493	546	817	1090	1360	1630	1903	
	49,2	177	26	69	4,2	354	413	472	531	590	622	931	1242	1550	1858	2169	
	56,9	205	30	92	4,9	410	478	547	615	683	690	1033	1379	1721	2064	2410	
	66,7	240	35	126	5,7	480	560	640	720	800	765	1144	1527	1908	2287	2671	
2400	40,0	144	<20	35	3,2	288	336	384	432	480	545	819	1098	1371	1642	1914	4,32
	46,1	166	21	46	3,7	332	387	443	498	553	603	906	1216	1518	1817	2117	
	52,8	190	25	61	4,2	380	443	507	570	633	666	1000	1342	1675	2003	2332	
	63,9	230	31	89	5,1	460	537	613	690	767	763	1147	1540	1922	2295	2668	
	75,0	270	35	122	6,0	540	630	720	810	900	847	1275	1712	2135	2545	2952	
2700	45,0	162	<20	35	3,4	324	378	432	486	540	607	915	1216	1519	1826	2125	4,85
	49,2	177	21	42	3,7	354	413	472	531	590	646	973	1294	1616	1944	2261	
	55,6	200	25	53	4,2	400	467	533	600	667	705	1063	1412	1765	2124	2467	
	66,7	240	30	76	5,0	480	560	640	720	800	804	1212	1609	2013	2426	2813	
	80,6	290	35	111	6,1	580	677	773	870	967	915	1377	1827	2289	2765	3198	
3000	50,0	180	<20	35	3,6	360	420	480	540	600	651	980	1305	1635	1956	2290	5,39
	52,8	190	21	39	3,8	380	443	507	570	633	676	1018	1355	1698	2031	2378	
	61,1	220	25	52	4,4	440	513	587	660	733	750	1129	1503	1884	2254	2640	
	72,2	260	30	73	5,2	520	607	693	780	867	845	1271	1694	2122	2540	2977	
	88,9	320	36	110	6,4	640	747	853	960	1067	972	1462	1950	2441	2926	3435	

Technical Specifications. Selection Charts

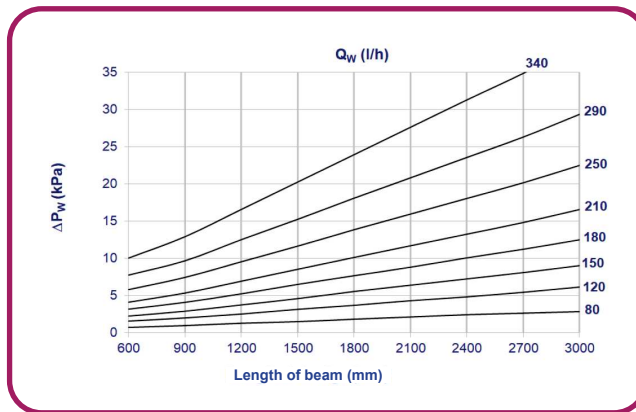
Pressure drop in water

The charts to obtain the pressure drop in the coil for different water flow rates in the various systems are shown below:

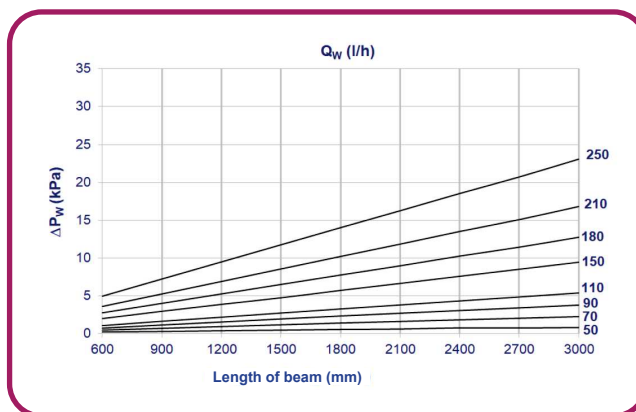
2-pipe system. Cooling - Heating



4-pipe system. Cooling



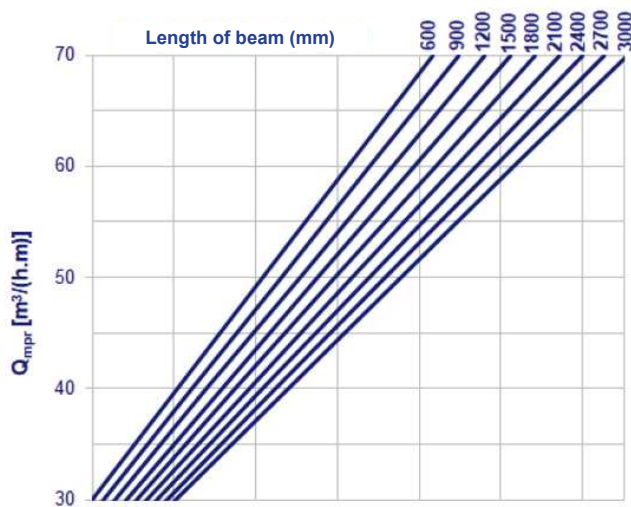
4-pipe system. Heating



Technical Specifications. Selection Charts

Velocity in occupied area. Opposing air flows

P-TYPE NOZZLE



Qmpr: primary air flow rate per linear metre of chilled beam, in $m^3/(h.m)$

B: distance in m between the centres of two chilled beams

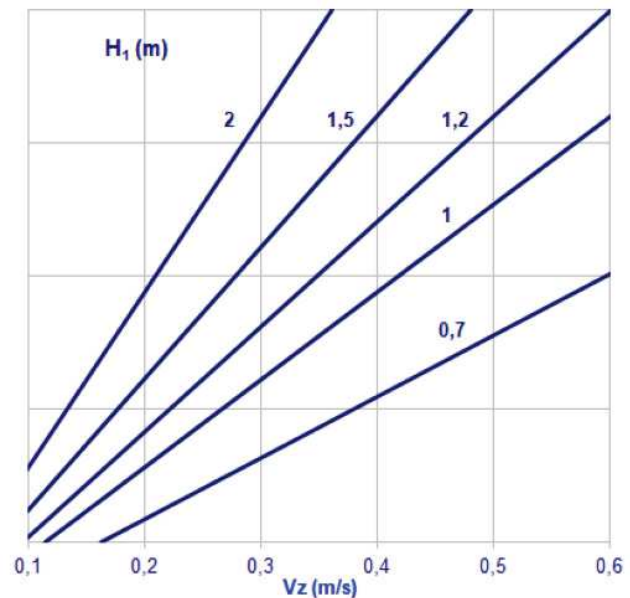
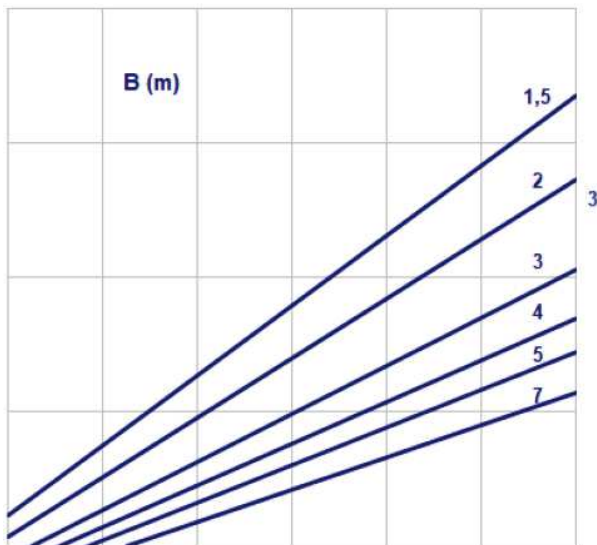
H1: distance in m between the ceiling and the point where it is necessary to know the velocity

VZ: maximum velocity in m/s in the occupied area, caused by the convergence of the air flow from two chilled beams

HZ0: Height in m of the occupied area

X: Horizontal distance in m from the centre of the chilled beam to wall $L = X + H1$

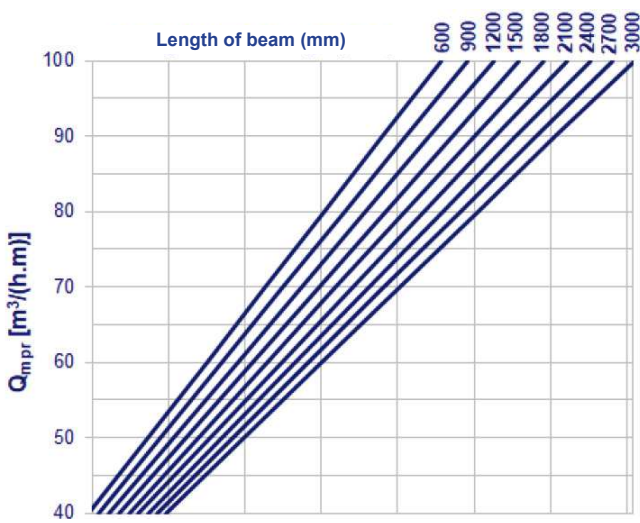
VP: Velocity in m/s at the wall at distance L from the centre of the chilled beam



Technical Specifications. Selection Charts

Velocity in occupied area. Opposing air flows

M-TYPE NOZZLE



Q_{m,pr}: primary air flow rate per linear metre of chilled beam, in $m^3/(h.m)$

B: distance in m between the centres of two chilled beams

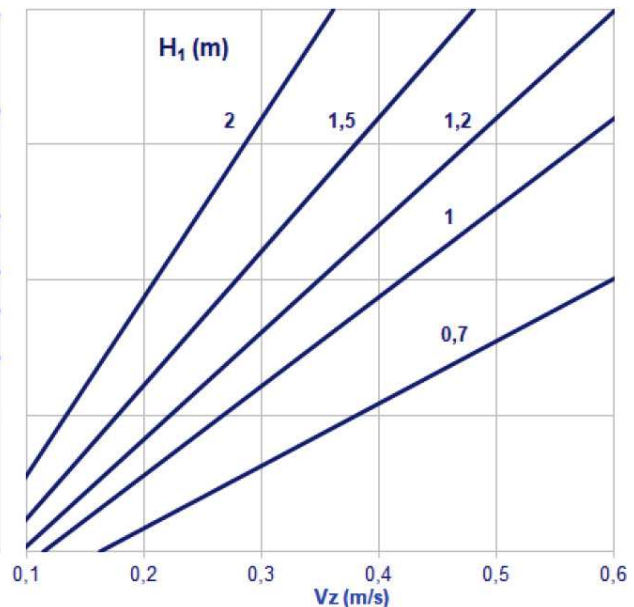
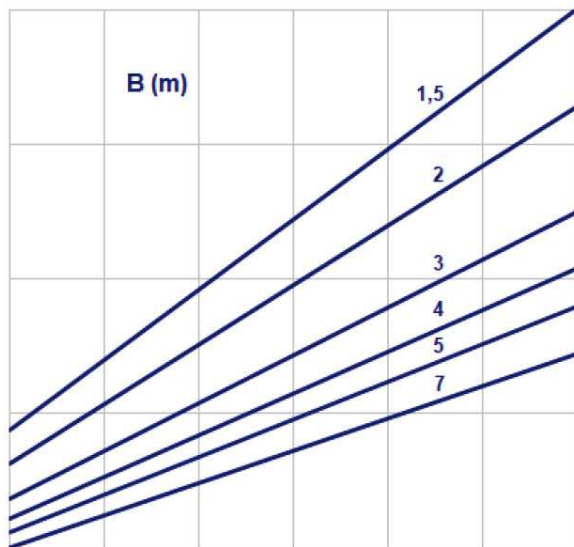
H₁: distance in m between the ceiling and the point where it is necessary to know the velocity

V_Z: maximum velocity in m/s in the occupied area, caused by the convergence of the air flow from two chilled beams

H_{Z0}: Height in m of the occupied area

X: Horizontal distance in m from the centre of the chilled beam to wall $L = X + H_1$

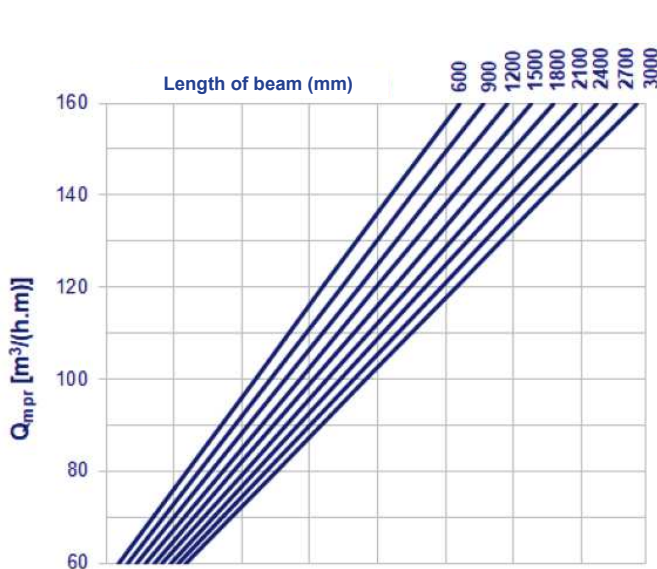
V_P: Velocity in m/s at the wall at distance L from the centre of the chilled beam



Technical Specifications. Selection Charts

Velocity in occupied area. Opposing air flows

G-TYPE NOZZLE



Qmpr: primary air flow rate per linear metre of chilled beam, in $m^3/(h.m)$

B: distance in m between the centres of two chilled beams

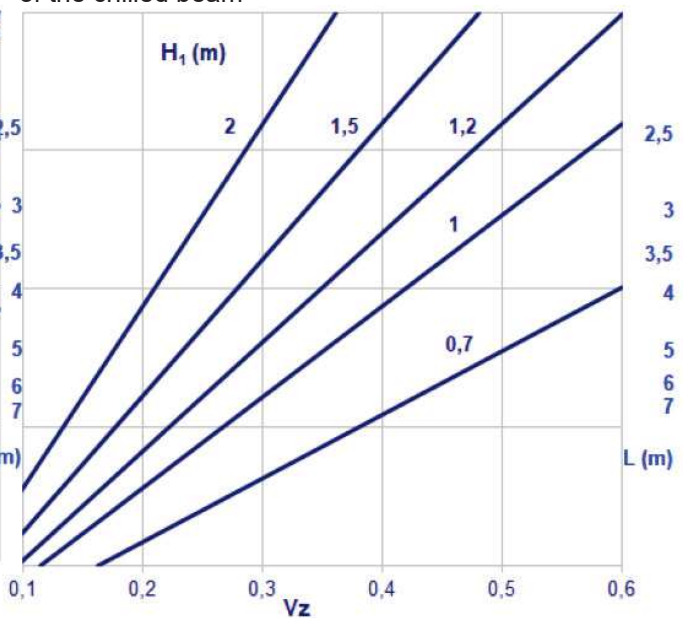
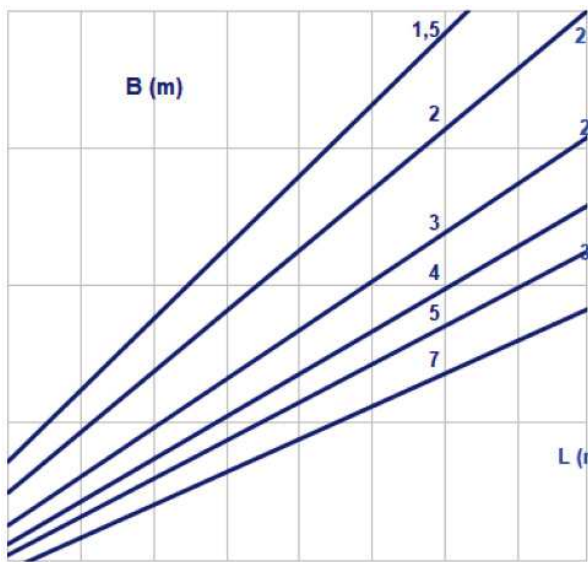
H1: distance in m between the ceiling and the point where it is necessary to know the velocity

VZ: maximum velocity in m/s in the occupied area, caused by the convergence of the air flow from two chilled beams

HZ0: Height in m of the occupied area

X: Horizontal distance in m from the centre of the chilled beam to wall $L = X + H1$

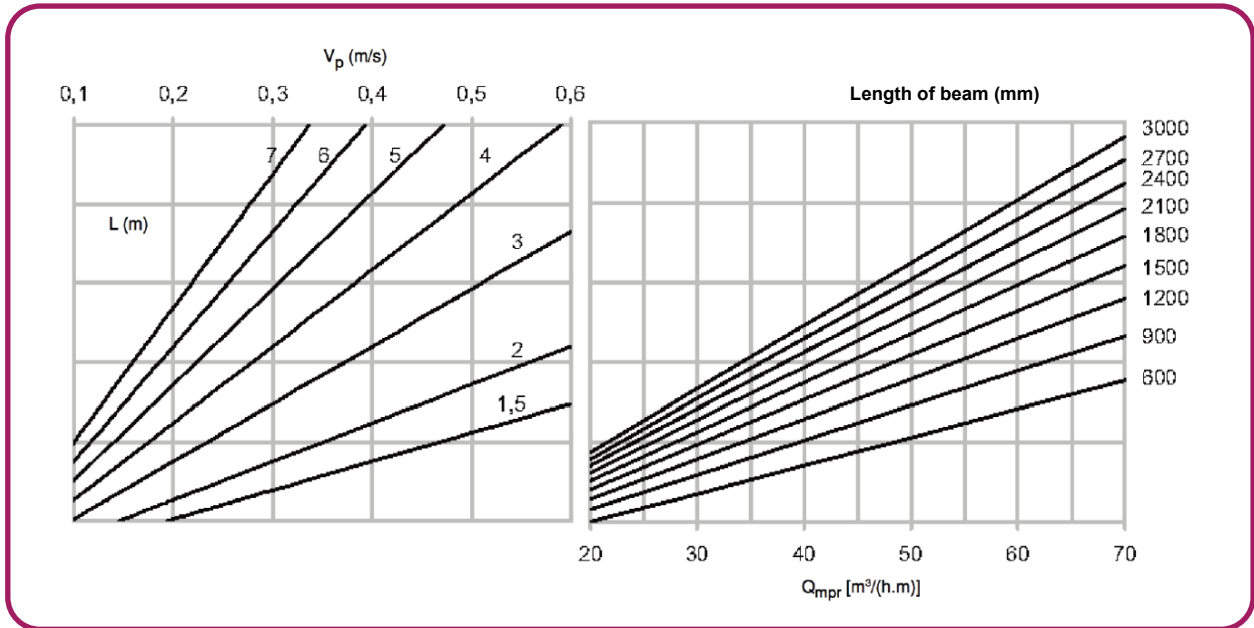
VP: Velocity in m/s at the wall at distance L from the centre of the chilled beam



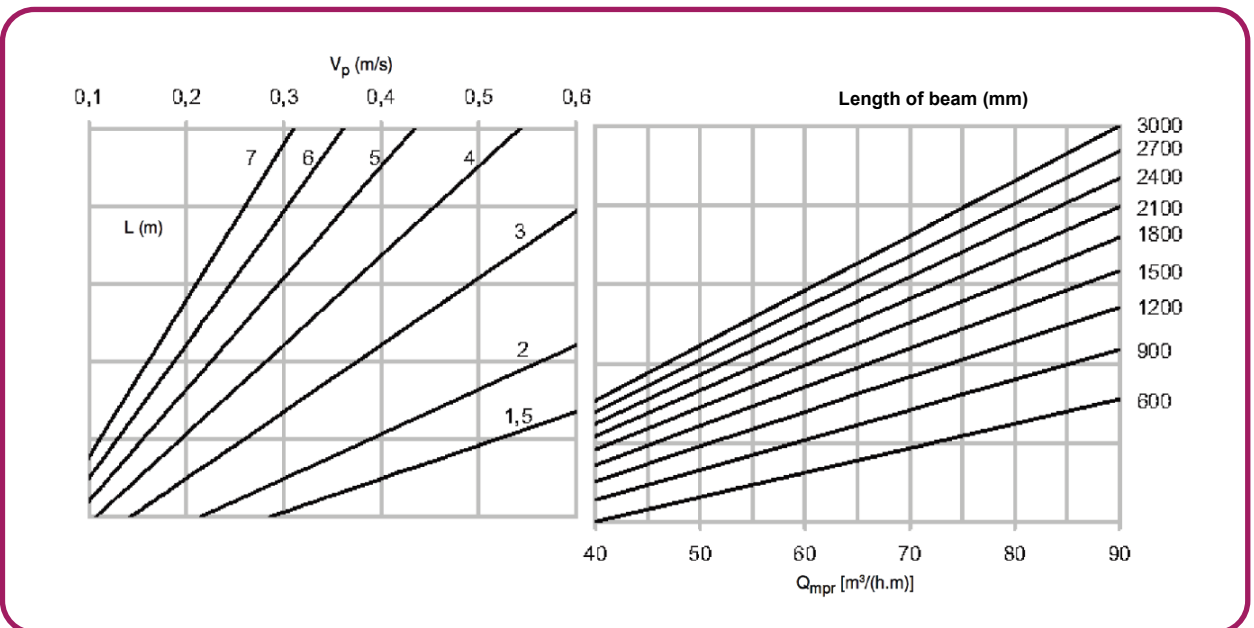
Technical Specifications. Selection Charts

Velocity in occupied area. Air flow facing wall

P-TYPE NOZZLE



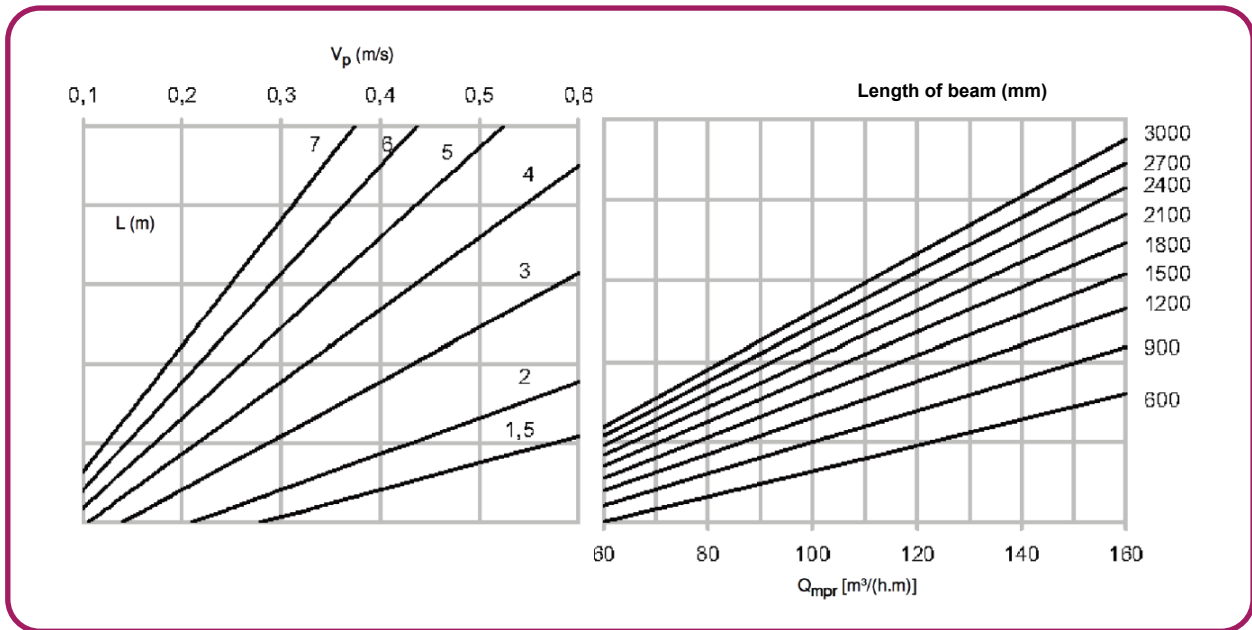
M-TYPE NOZZLE



Technical Specifications. Selection Charts

Velocity in occupied area. Opposing air flows

G-TYPE NOZZLE



Symbols

The symbols used in the selection charts in pages 27 through to 31 corresponding to the VAK chilled beam are as follows:

Qmpr: primary air flow rate per linear metre of chilled beam, in m³/(h.m)

B: distance in m between the centres of two chilled beams

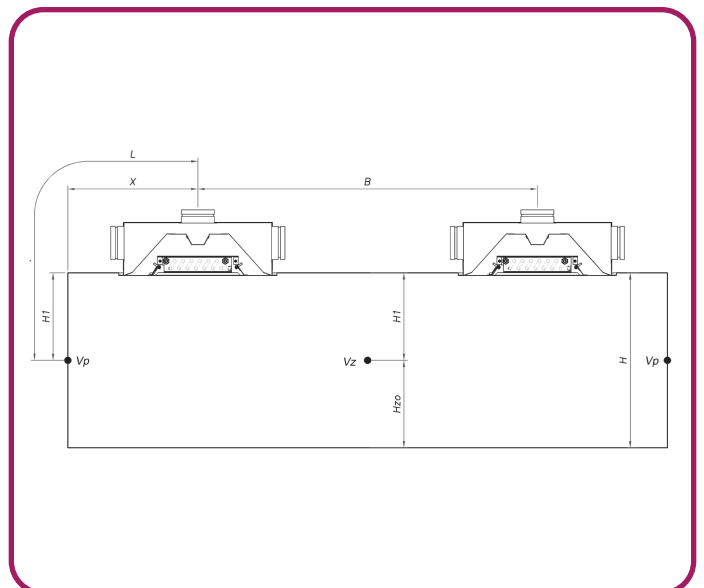
H1: distance in m between the ceiling and the point where it is necessary to know the velocity

VZ: maximum velocity in m/s in the occupied area, caused by the convergence of the air flow from two chilled beams

HZ0: Height in m of the occupied area

X: Horizontal distance in m from the centre of the chilled beam to wall $L = X + H1$

VP: Velocity in m/s at the wall at distance L from the centre of the chilled beam



Technical Specifications. Selection Example

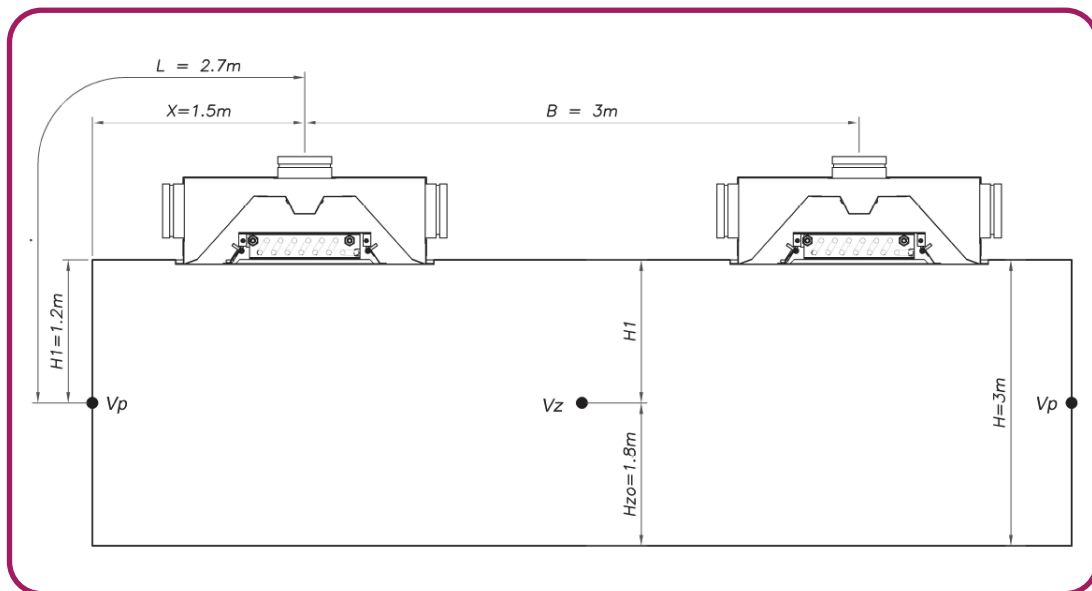
Air conditioning is to be provided using a 2-pipe air-water active chilled beam system, a façade office module with dimensions 6x6x3 m (LxWxH) which, after calculating the corresponding loads, a power requirement of 95 W/m² is obtained.

Design conditions (Cooling):

- Total sensible cooling load in the room to deal with, 3,060 W.
- Ventilation air flow supply, 45 m³/h per person, according to RITE Regulation, IDA 2.
- Maximum occupancy: 8 people.
- Primary air temperature 15 °C.
- Internal room temperature of 24 °C, with a relative humidity of 50%. Dew point 12.9 °C.
- Water inlet temperature for the beam 15 °C.
- Maximum water flow per beam 150 l/h.
- Architectural condition, ceiling grid 1200 x 600 mm.
- Maximum acceptable noise level 35 dB(A).
- Maximum pressure drop of 150 Pa in the chilled beam.

Solution:

By initially analyzing the selection table on page 13, that is, if previous calculations are made taking into account the different design conditions previously indicated, the selection can begin with 4 chilled beam units, VAK 600-1200-M-2T model, distributed (2x2) symmetrically in the room, as shown in the following diagram:



Technical Specifications. Selection Example

Calculation of the technical data referring to the coil and primary air

Based on these design premises, the following input data are obtained from the selection table on page 13:

- Previously selected chilled beam length 1,200 mm.
- Primary air flow per beam 90 m³/h.
- Temperature difference between room air and primary air, $\Delta T_{pr} = 9^{\circ} \text{C}$.
- Temperature difference between room and coil water inlet, $\Delta T_{SWIN} = 9^{\circ} \text{C}$.

Using these input values and interpolating between the two primary air flow values listed in the table, the following results are obtained:

- Capacity supplied by ventilation air, $P_{pr} = 270 \text{ W}$, obtained from the expression, $P_{pr} (\text{W}) = Q_{pr} (\text{l/s}) * 1.232 * \Delta T_{pr}$
- Capacity supplied per beam coil for a water flow rate of 250 l/h, $P_{sw} = 685 \text{ W}$ (data obtained directly from Table 1, after interpolation)
- Corrected coil power for a water flow rate of 150 l/h, $P_{sw} = 617 \text{ W}$. Referring to the table of correction factors for water flow rate on page 15, the value of 685 W listed above must be multiplied by a factor of 0.90
- Total capacity supplied per beam, $P_t = 887 \text{ W}$, obtained from the expression $P_t = P_{pr} + P_{sw}$.
- Pressure drop in water for a flow rate of 150 l/h, $\Delta P_w = 3.78 \text{ kPa}$. (data obtained from the chart on page 26).
- Water temperature difference in the coil, $\Delta T_w = 3.54^{\circ} \text{C}$, obtained from the expression $P_{sw} (\text{W}) * 0.86 = Q_w (\text{l/h}) * \Delta T_w$.
- Sound power level per beam, $L_w = 29 \text{ dB(A)}$ (data obtained directly from the table, after interpolation)
- Primary air pressure loss, $\Delta P_{pr} = 111 \text{ Pa}$ (data obtained directly from table, after interpolation).

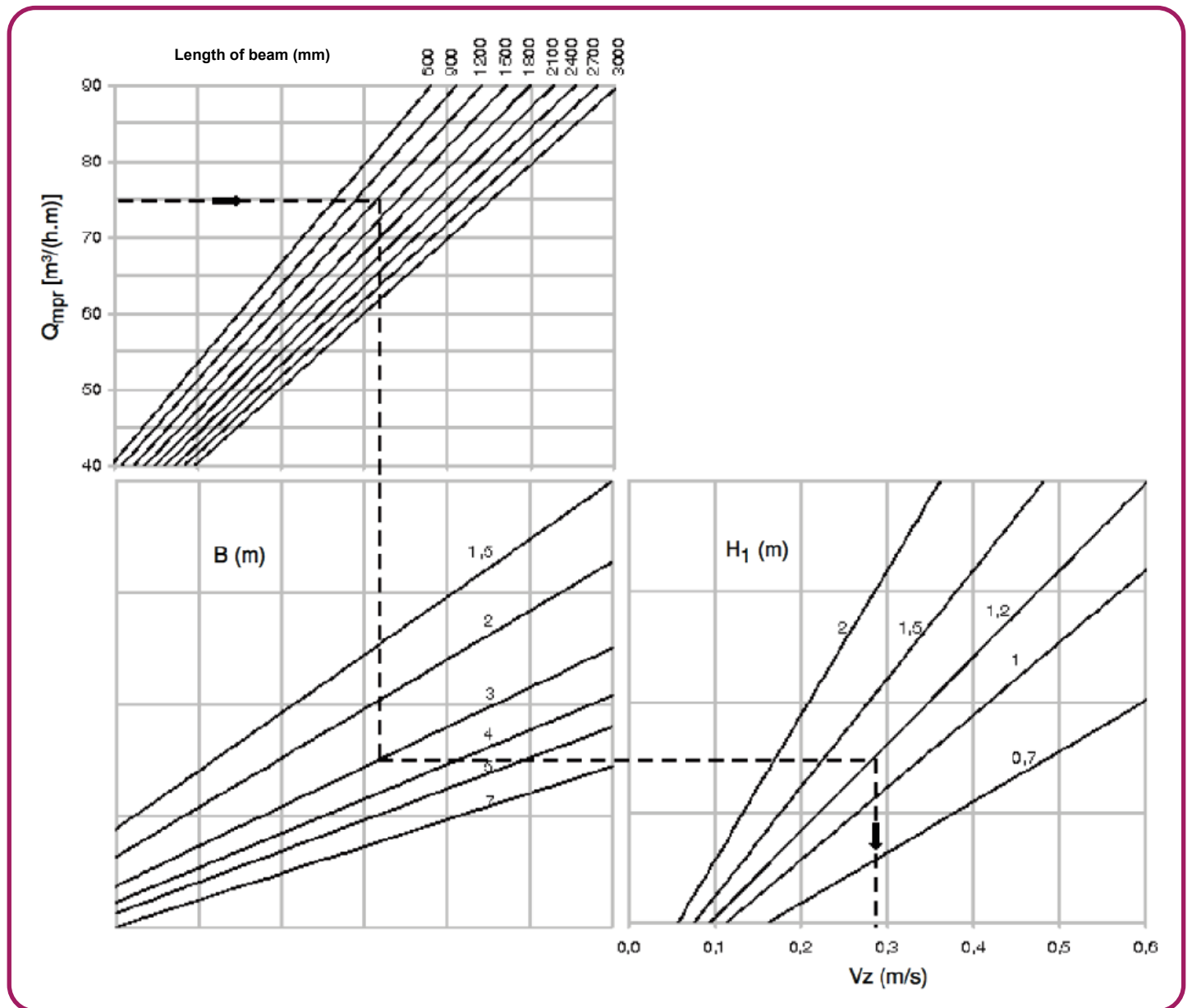
The total capacity supplied by the 4 active chilled beams installed in the room is $P_t = 3,548 \text{ W}$, which is higher than the maximum demand (3,060 W); in other words, the selection by unit power is considered to be correct.

Technical Specifications. Selection Example

Air flow calculations. Maximum velocity in occupied area (Vz) and air flow velocity at the perimeter (Vp)

To obtain the maximum velocity in the occupied area (Vz) for the aforementioned design conditions, refer to the chart on page 28 with the following parameters:

- Flow per linear metre, $Q_{mpr} = 90/1.2 = 75 \text{ m}^3/\text{h}\cdot\text{m}$
- Distance between beam centres, $B = 3 \text{ m}$
- Height from the ceiling to the occupied area, $H_1 = 3 - 1.8 = 1.2 \text{ m}$

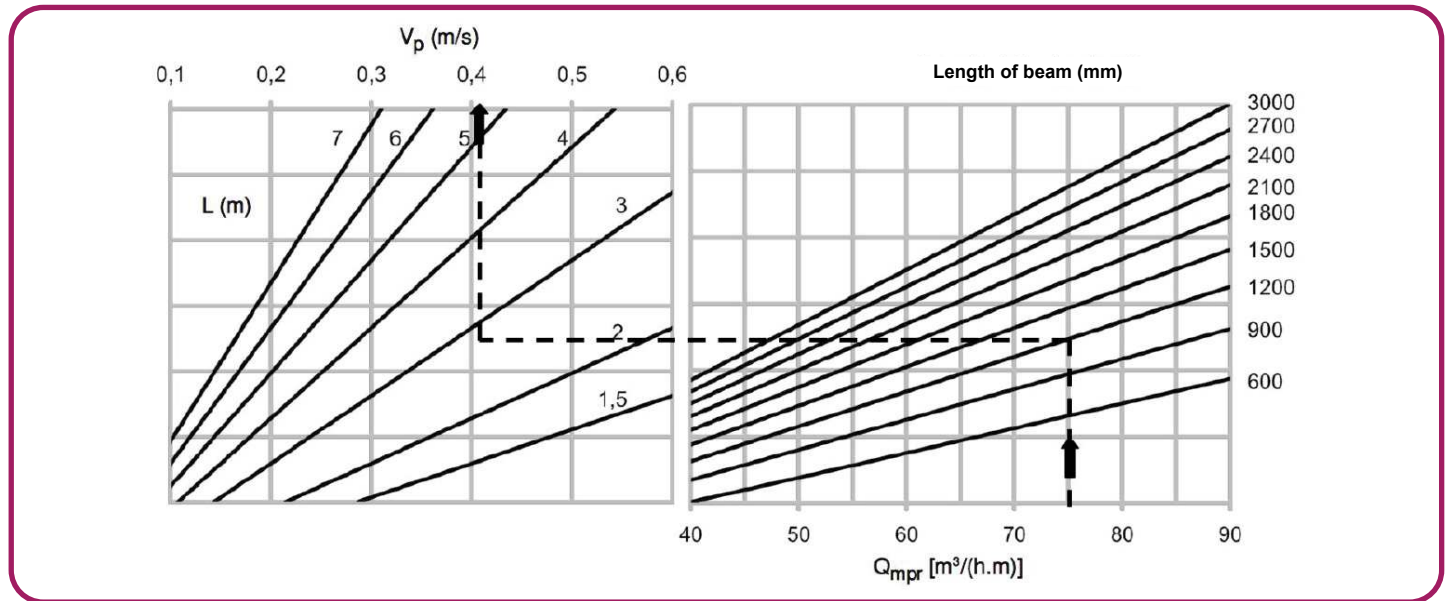


Value obtained for $V_z = 0.28 \text{ m/s}$

Technical Specifications. Selection Example

To obtain the terminal velocity of the air flow at the perimeter (V_p) at a specific height from the floor, based on the aforementioned design conditions, refer to the chart on page 30 (M-type nozzle) with the following parameters:

- Flow per linear metre, $Q_{mpr} = 90/1.2 = 75 \text{ m}^3/\text{h}\cdot\text{m}$
- Distance $L = X + H1 = 2.7 \text{ m}$, where X is the distance between the centre of the beam and the wall
- Height from the ceiling to the occupied area, $H1 = 3 - 1.8 = 1.2 \text{ m}$



Value obtained for $V_p = 0.41 \text{ m/s}$

Codes

Model

- VAK
- Active chilled beam

Length

- L
- 600 – 900 – 1200 – 1500 – 1800 – 2100 – 2400 – 2700 – 3000 (mm)

Nozzle configuration

- P
- M
- G
- Small
- Medium
- Large

Coil type

- 2
- 4
- Coil for 2-pipe system
- Coil for 4-pipe system

Water connection configuration

- F
- FT
- LI
- LD
- S
- Front face primary air connection on opposite side to water connections
- Rear face primary air connection, on same side as water connections (available in 2-pipe system)
- Left side primary air connection
- Right side primary air connection
- Primary air connection at the top

Perforated induction grille design

- P1H
- P1V
- P2H
- P2V
- Rectangular perforations parallel to the length of the beam
- Rectangular perforations parallel to the width of the beam
- Round perforations distributed continuously along the width of the beam
- Round perforations distributed continuously along the length of the beam

Codes

Type of ceiling

- Unit design for standard lay-in grid T-Bar ceiling
- F Unit design for continuous or plasterboard ceiling
- L Unit design for tegular ceiling with drop face tiles

Nozzle regulation system

- SR Without nozzle regulation system
- With nozzle regulation system

Air deflectors

- DF Without deflector blades
- With deflector blades

Finish

- RAL 9010 Standard finish in white gloss RAL 9010
- RAL Other RAL colours are available upon request

Other accessories or components (K)

- Electrical resistance For 2-pipe systems (cold water), included inside the unit. Specify power in watts (W) provided.
- Control valve Control and/or balancing valves can be included in the water connections upon request. Specify model and type, as well as the respective servomotor if applicable.
- Dew point detector (anticondensation sensor) The unit can be fitted, upon request, with a dew point detector (anticondensation sensor) attached to the surface of the cold water inlet pipe.
- Air flow regulator Koolair has several different air regulation accessories that can be supplied along with the active chilled beam order.

VAK Multifunctional Active Chilled Beams

According to the requirements of each installation, Koolair can design multi-function active chilled beams specifically adapted to each project. This new chilled beam development provides various additional services, such as, different kinds of lighting (LED, linear, halogen, etc.), public-address systems, smoke detectors, sprinklers, etc., apart from the inherent advantages in the cooling and heating system.

As the product is very specific, it should be customised to the project needs at the very beginning.

This beam's technical data corresponds to the VAK model detailed on pages 14 to 36.

An example of a VAK active chilled beam with a row of LEDs, a speaker, and sprinkler flush-mounted in the beam housing is shown below:



VAK chilled beam with row of lights, a speaker, and a sprinkler

The elements integrated into the VAK are:

- L - Lighting
- A - Speaker
- R - Sprinkler
- O - Others

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