KOOLAIR

series

VFK 600

Active chilled beams

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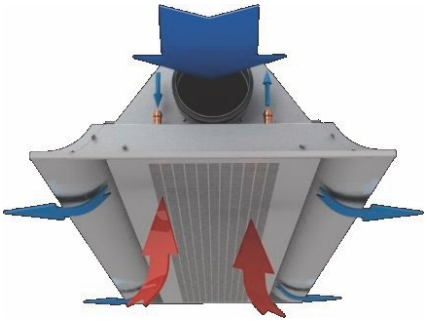
Active Chilled Beam VFK 600

CONTENTS

General Features

Active Chilled Beam, lateral primary air connection

VFK



Detailed view of operating principle

Description

The VFK ceiling-mounted induction terminal units (also known as active chilled beams) for air diffusion are used in air-water systems to provide a high level of comfort in interior environments with high internal thermal loads in cooling operation. The units include the following components:

- Primary air plenum, with one or two round duct connections for primary air inlet and a distribution of small nozzles with alternative settings.
- Hot or chilled water (two-pipe installation) or hot and chilled water (four-pipe installation) coil.
- Linear slot diffusers, for supply and diffusion of the combined primary and induced air to the room.
- Hinged perforated front face, used as access for unit cleaning. 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 slot diffusers (depending on model), for the purpose of providing alternative air jet patterns.

As primary air exits the nozzles, this induces air from the room (which we will call secondary), that flows through the coil, cooling and/or heating, as applicable, and is mixed with the primary air inside the beam before it is supplied to the room through the diffusers.

As in all air-water air conditioning systems, choosing an active chilled beam has the advantage of using water as a vehicle to carry the cooling or heating power to the rooms, which saves on energy and space compared to all-air A/C systems. In addition, the temperature of each room or independent area can be controlled by adding a 2- or 3-way valve to the termi- nal unit controlled by the respective room control.

General Features

VFK 600

Air flow tests in Koolair R&D-Innovation laboratory

VFK 600 Chilled Beam Installation

Advantages

The VFK are terminal units for central air conditioning ins- tallations that provide solutions to meet the needs of the following:

- Ventilation achieved with primary air
- Cooling, based on the primary air itself and the water circulation coil Heating, based on a water circulation coil
- Control. Possibility of individual or combined unit control by room or area, using control and regulation valves in the unit to adjust the water volume and room thermostats.
- Air diffusion based on linear slot diffusers that ensure effetive air diffusion.

In addition to the functional advantages described, the VFK units have the following main advantages over conventional HVAC systems (fan coils, VRV, all air, etc.):

- High energy efficiency and low life-cycle or operating costs; this advantage is mainly due to the absence of a fan in the terminal unit.
- Lowest maintenance costs; the unit contains no filter or condensate pan to replace or clean and only cleaning of the coil surface is needed (recommended every 2 years).
- Low noise level.
- No draughts in occupied area.
- Extremely hygienic systems, since no filters and conden- sate pans are used.
- Space-saving: smaller air ductwork and equipment units
- Easy to mount.
- Adaptation to all types of false ceilings and sections.

Applications

The induction air diffusion terminal units are suitable for HVAC of various kinds of premises, such as:

- Office buildings
- Hospitals
- Hotels
- Bank offices
- Etc.

General Features VFK 600

Active Chilled Beam, lateral primary air connection

Description

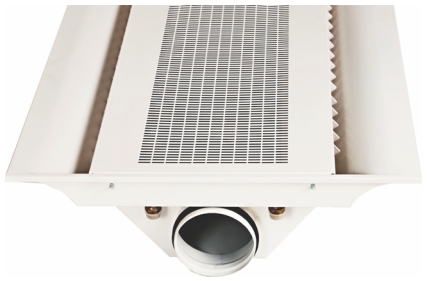
The VFK 600 ceiling-mounted induction terminal units (also known as active chilled beams) for two-way air diffusion are used in air-water systems to provide a high level of comfort in interior environments with high internal thermal loads in cooling operation. The units include the following components:

- Hinged perforated front face, used as access for unit cleaning. Available in different perforation designs.
- Nozzle control mechanism, to configure different air discharge patterns in the nozzles.
- Integrated air deflectors in the linear slot diffusers, for the purpose of providing alternative air jet patterns.

VFK 600 Active Chilled Beam, front face primary air connection

Materials

The outer and inner housings, nozzle plate and induction grille are of galvanised steel sheet construction and have a stan- dard powder-paint finish of RAL 9010. Other RAL colours are available upon request. The coil is manufactured of copper pipes and aluminium fins.



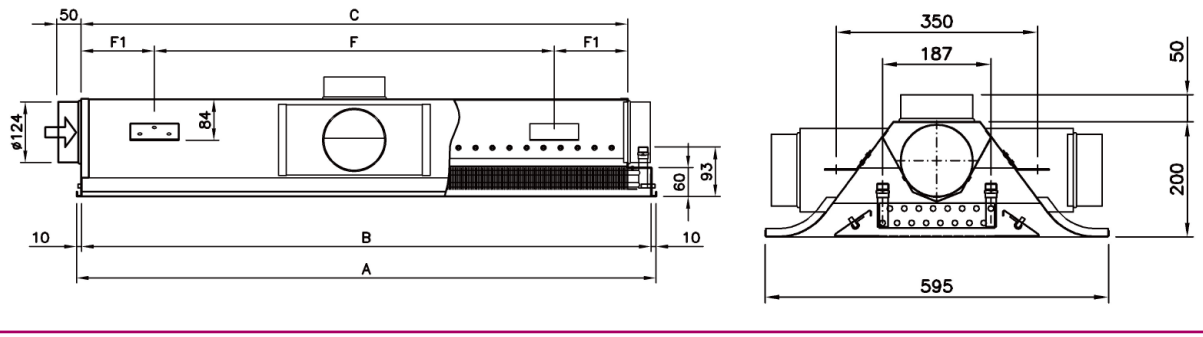
Dimensions. Configurations

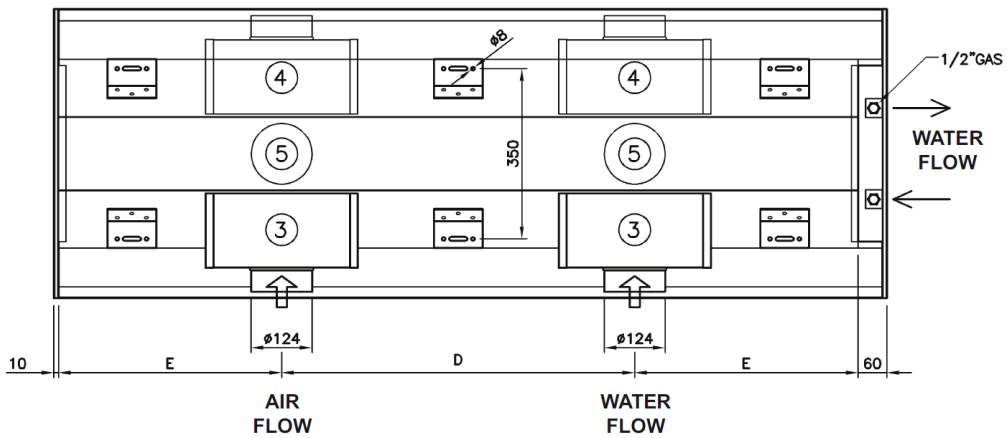
VFK 600 Model

Sizes 600 to 1800 - 2-pipe system (for 4-pipe system connections, refer to page 7)
Five types of configurations are available, defined according to the position of the primary air connection with regard to the water connections (with the water connection viewed from the front), namely:

1. Front face primary air connection, on opposite side to water connections, (-F) type
2. Rear face primary air connection, on same side as water connections, (-FT) type
3. Lateral primary air connection on left side, (-LI) type
4. Lateral primary air connection on right side, (-LD) type
5. Primary air connection at top, (-S) type

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





Size	A	B	C	E	F	F1
600	592	572	522	261	392	65
900	892	872	822	411	522	150
1200	1192	1172	1122	561	822	
1500	1492	1472	1422	711	1122	
1800	1792	1772	1722	861	1422	

Size	Front inlet	Lateral inlet
	Weight (Kg)	Weight (Kg)
600	10	11
900	13	14
1200	20	21
1500	23	24
1800	26	27

The beam width measurement (595) listed corresponds to the ceiling-mounted design using a T-section with a width of 25 mm. For installations in other types of ceilings, see page 8.

Dimensions. Configurations

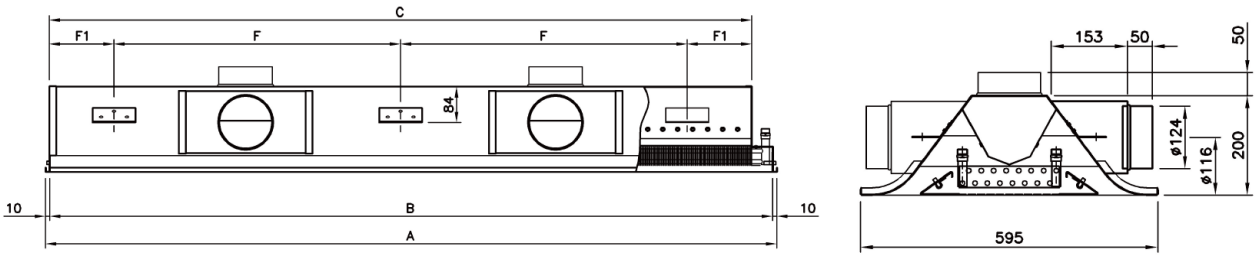
VFK 600 Model

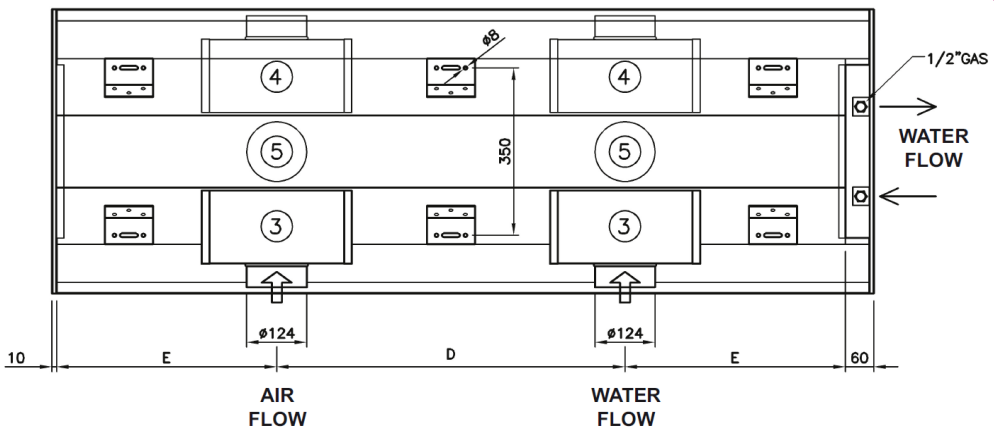
Sizes 2100 to 3000 - 2-pipe system (for 4-pipe system connections, refer to page 7)
Three types of configurations are available, defined according to the location of the primary air connection with regard to the water connections (with the water connection viewed from the front), namely:

3. Lateral primary air connections on left, (-LI) type
4. Lateral primary air connections on right, (-LD) type
5. Primary air connections at top, (-S) type

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

Front air connection available for flow rates <= 50 L/s. For technical information, please contact our Sales Department.





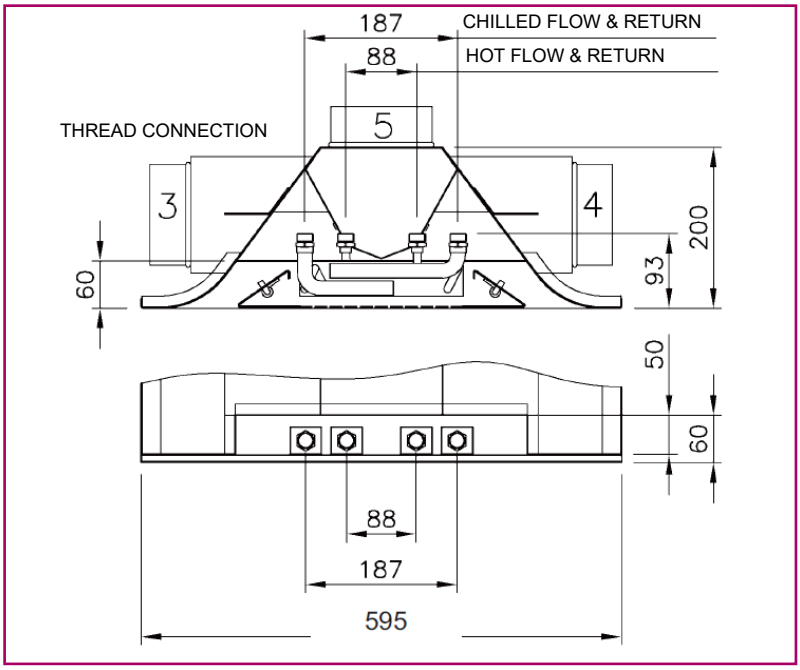
Size	A	B	C	D	E	F	F1
2100	2092	2072	2022	1011	506	861	150
2400	2392	2372	2322	1161	581	1011	
2700	2692	2672	2622	1311	656	1161	
3000	2992	2972	2922	1461	731	1311	

Size	Front inlet	Lateral inlet
	Weight (Kg)	Weight (Kg)
2100	34	35
2400	41	41
2700	45	46
3000	48	49

The beam width measurement (595) listed corresponds to the ceiling-based design using a T-section with a width of 25 mm. For installations in other types of ceilings, see page 8.

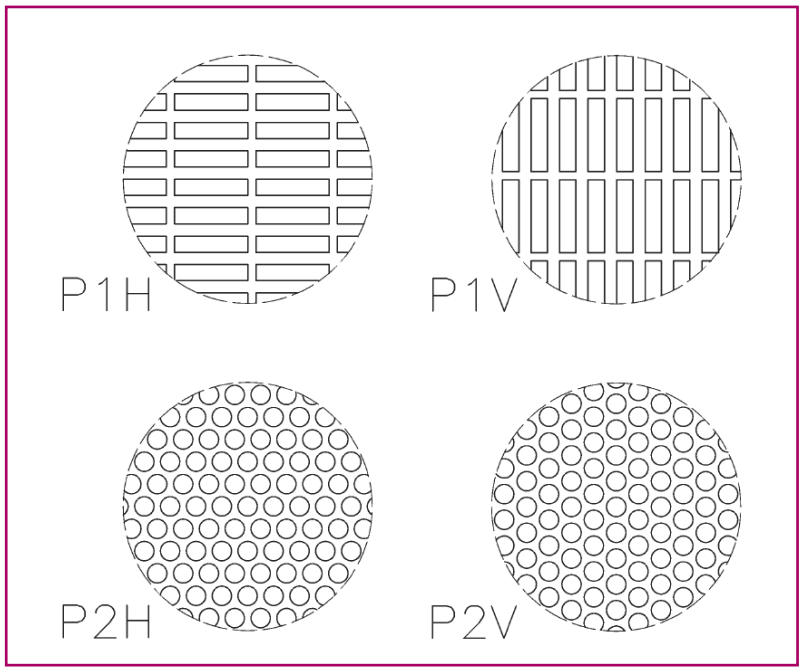
Dimensions. Configurations

4-PIPE SYSTEM.VFK 600 MODEL



Same identification criteria for primary air connections as in a 2-pipe system, except that this system does not include the rear face configuration (-FT), i.e., on the same side as the water connections.

PERFORATED INDUCTION RACK DESIGNS
The following front induction rack designs are available for standard projects, when the order is placed:



- 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.

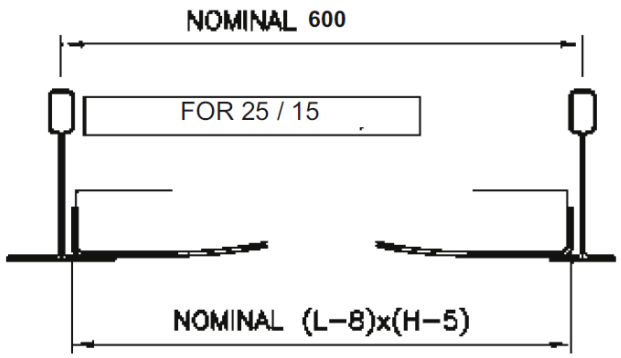
By special order, the unit can be manufactured with other perforation designs.

Installation

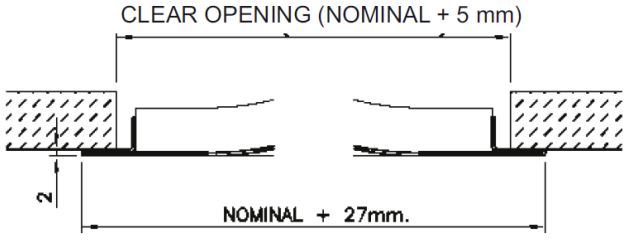
- Chilled beam designs for different types of ceilings

All VFK beam sizes are made to be installed in different kinds of false ceilings. The most common are listed below::

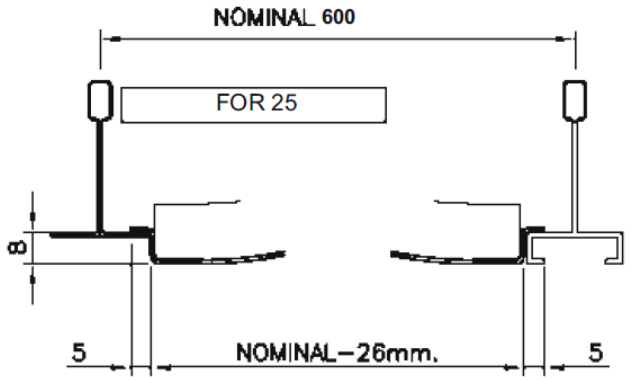
- Lay-in grid with T-support section with a width of 25 and 15 mm (1)
- Continuous or plasterboard ceiling (2)
- Tegular ceiling with drop face tile (3)

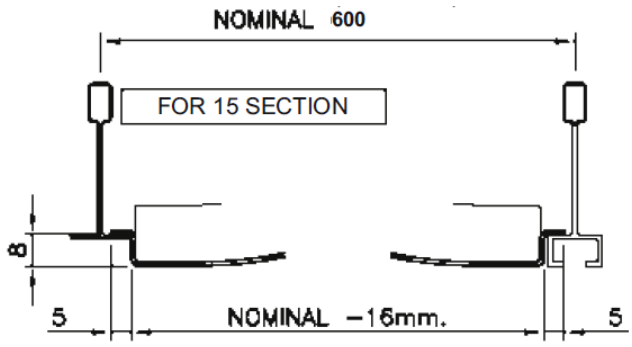


1



2





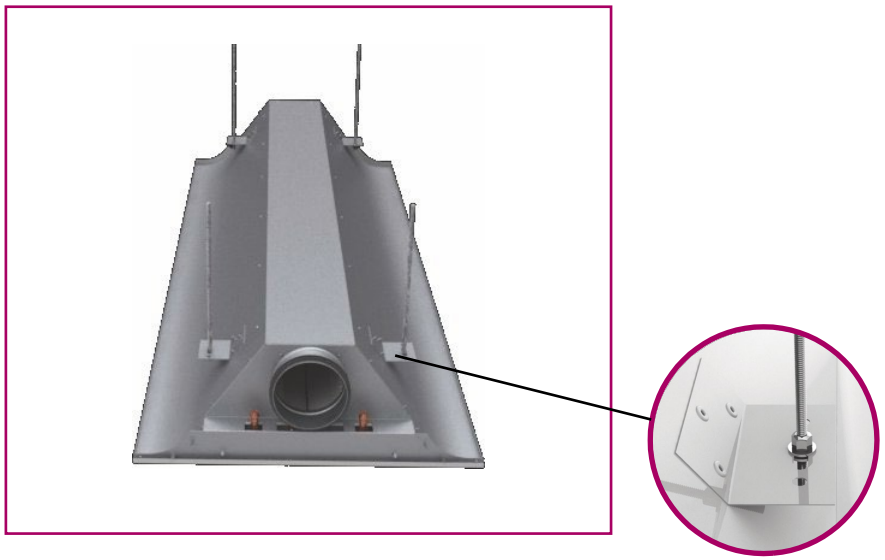
3

Installation

- **Fastening**

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

These brackets have a slot hole to hold a Ø6 mm threaded rod, which is first attached to the ceiling slab to hang the unit.



Access rack

2 hinged latches

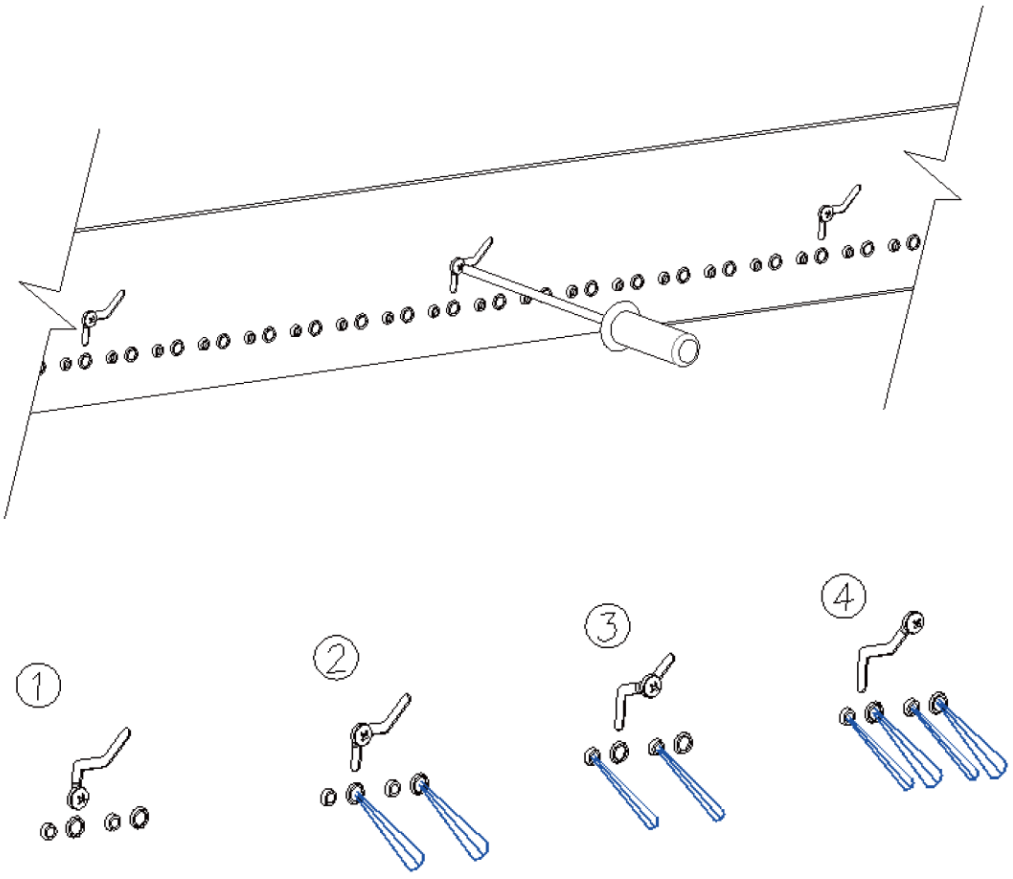
4 hinged latches

The induction grille or front perforated rack can swing 90º by operating small latches on the side of the rack or by complete removal using the locks. This provides access to the interior of the chilled beam to clean the inner surfaces of the unit and to adjust the nozzles.

Nozzle Control Mechanism

As an optional accessory, the unit can include a nozzle regulation mechanism (-SR). In this case, the chilled beams would be fitted with the two nozzle types or sizes, in which different air discharge configurations can be combined, making the installation highly flexible and able to adapt to various changes, situations or applications. The system allows the following nozzle configurations or types:

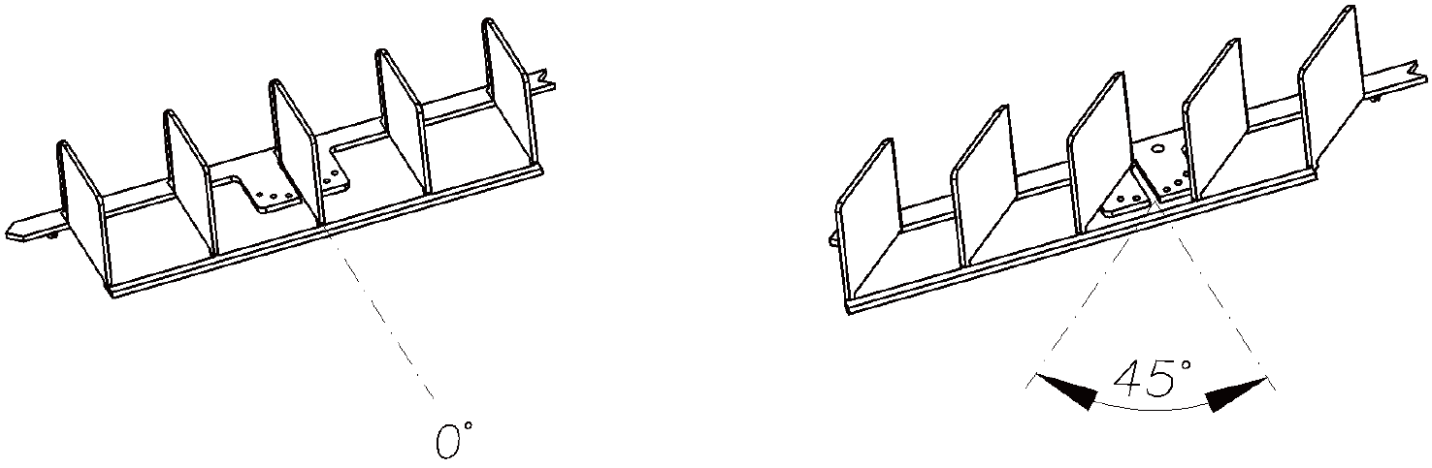
- **Position 1**: Closure of all nozzles prevents the air from flowing out in one or two directions of the chilled beam.
- **Position 2**: M-type large nozzle opening, to move medium air volumes, obtaining an intermediate induction rate.
- **Position 3**: P-type small nozzle opening, to move smaller air volumes, but obtaining a higher induction rate.
- **Position 4**: G type-location, opening of both nozzle types to move large air volumes..



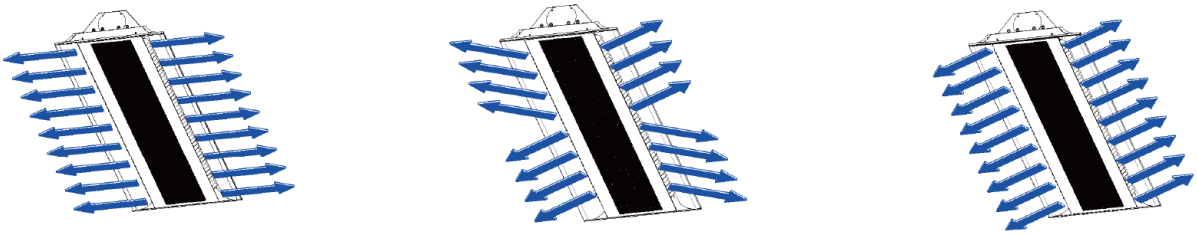
To access the operating mechanism of the regulation mechanism, the front rack should first be swung back and a Phillips screwdriver used to loosen the screws in the strip, and then slide along the slot to the position at the desired point.

Air deflectors

As an optional accessory, the VFK 600 chilled beams can be fitted with air deflector slats (-DF) manufactured of M1 plastic, longitudinally built into the diffusers. By modifying the position, the air jet can be adjusted to different directions, making it a highly flexible unit to adapt to different situations in the installation. This makes it possible to handle obstacles, to broaden the width of the air jet and to slow the velocity of the jet over a specific throw, in short, to ensure an environment free of air currents. Several applications are shown below in the following figures:



Air deflector design. This allows the air jet to be oriented in 1 of 4 deflection angles (0-15-30-45º).



Examples of diffusion in different directions

Koolair laboratory test. V-shaped air jet orientation

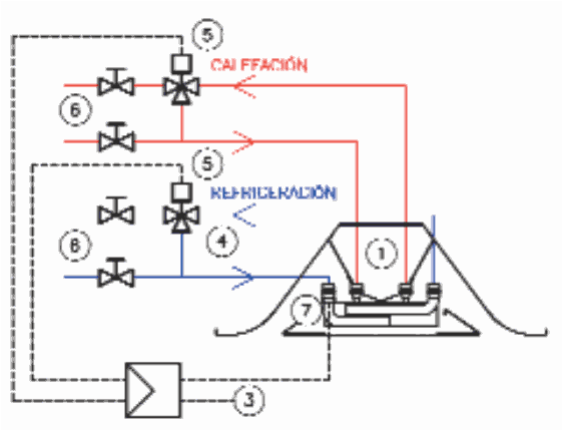
Koolair laboratory test. 45º deviation of the air jet

Volume Regulation and Control Components

- Water

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

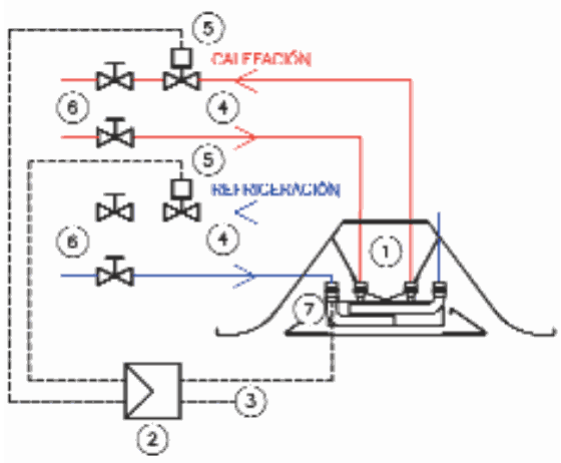
Constant water flow rate system



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

1. Active chilled beam
2. Room controller or regulator (on-site installation) Can be individual or integrated in a centralised regulation system.
3. Room temperature sensor (usually integrated with the controller).
4. 3-way valve.
5. Electrical servo drive of the 3-way valve (on-off, 3 points, 0-10 VDC proportional, electrothermal operation). 24 V or 230 V power based on the type of actuator.
6. Shut-off valve. Depending on the water grid, a balancing or other type of valve will be necessary.
7. Dew point detector (condensation protection sensor).

Variable water flow rate system



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

1. Active chilled beam.
2. Room compact controller or regulator (on-site installation). Can be individual or inte- grated in a centralised regulation system.
3. Room temperature sensor (usually inte- grated with the controller).
4. 2-way valve (possibility of thermostatic valves; do not include actuator or electric power).
5. Electrical servo drive of the 2-way valve (on-off, 3 points, 0-10 VDC proportional, electro- thermal operation). 24 V or 230 V power based on the type of actuator.
6. Shut-off valve. Depending on the water grid, a balancing or other type of valve will be necessary.
7. Dew point detector (condensation pro- tection sensor).

Volume Regulation and Control Components

Mechanical constant air flow self-regulator, KCRK model

Circular constant air volumen regulator, RCCK model

- Air control

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 because they ensure self-balancing of the installation. CRC-M manual volume control dampers can be selected but require manual balancing of the installation.

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

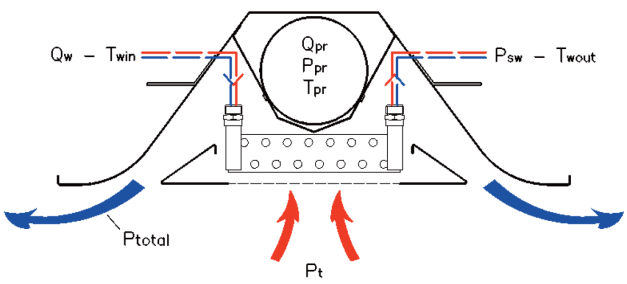
If a variable air flow system based on occupancy, for example, is designed, then the minimum design flow rate per unit should correspond to a minimum inlet pressure of approximately 40 Pa to the beam.

Technical Data

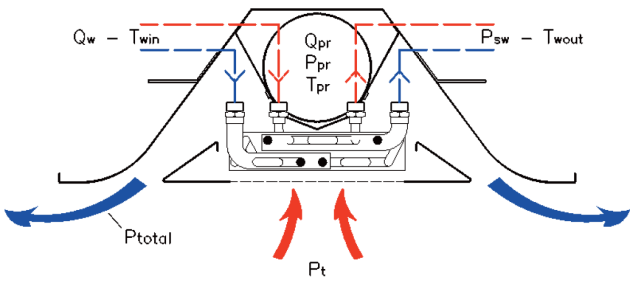
Symbols

The symbols used in the selection tables on page 15 to 26 for the VFK 600 chilled beam are the following:

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 ºC
T_R	Room air temperatura ºC
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 ºC
ΔT_W	Water temperature difference in the coil
ΔT_{SWIN}	Temperature difference between room and unit 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	Throw of the air jet, in m, for a maximum velocity of 0.25 m/s in the occupied area, installation height of 3 m and ΔT = 0 ºC (supply - room)



2-pipe system



4-pipe system

Technical Data. Selection Tables

COOLING - 2-PIPE SYSTEM - P-TYPE NOZZLE

Reference water flow (Q_W) of 250 L/h

For other water flow rates, correct the unit capacity (P_{SW}) in the table by the factors listed in the attached table.

VFK 600 - 2-PIPE COOLING SYSTEM									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Q_W (l/h)	Power Factor Correction in battery								
80	0,59	0,60	0,59	0,58	0,57	0,56	0,54	0,52	0,51
100	0,74	0,70	0,69	0,69	0,66	0,66	0,64	0,62	0,60
120	0,83	0,81	0,80	0,78	0,76	0,75	0,74	0,72	0,71
150	0,89	0,87	0,86	0,85	0,84	0,83	0,82	0,80	0,79
180	0,94	0,93	0,91	0,92	0,91	0,90	0,90	0,89	0,88
210	0,98	0,96	0,95	0,96	0,96	0,94	0,95	0,94	0,94
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,02	1,02	1,03	1,03	1,03	1,04	1,04	1,03	1,04
340	1,04	1,05	1,06	1,06	1,07	1,07	1,08	1,08	1,07

VFK 600 - P NOZZLE - 2-PIPE SYSTEM - COOLING																	
Length	Q_{pr}		L_W dB(A)	ΔP_{pr} (Pa)	X (m)	ΔT_{pr} (K)					ΔT_{SWIN} (K)						ΔP_W (kPa)
						6	7	8	9	10	6	7	8	9	10	12	
	l/s	m³/h				P_{pr} (W)					P_{SW} (W)						
600	4,4	16	<20	51	0,9	32	37	42	48	53	152	172	202	227	256	309	2,0
	5,3	19	20	72	1,0	38	44	50	57	63	173	196	231	259	292	351	
	6,7	24	24	116	1,3	48	56	64	72	80	205	234	275	308	346	416	
	8,9	32	30	205	1,7	64	74	85	96	106	250	287	336	374	419	502	
	11,7	42	35	354	2,2	84	98	112	126	140	294	341	394	438	489	585	
900	6,4	23	<20	47	0,0	46	53	61	69	76	206	237	269	306	339	406	4,3
	7,8	28	20	70	1,2	56	65	74	84	93	239	274	313	353	393	471	
	10,0	36	24	116	1,6	72	84	96	108	120	287	331	379	425	474	568	
	13,1	47	29	197	2,0	94	109	125	141	156	345	402	460	514	573	688	
	17,2	62	34	343	2,7	124	144	165	186	206	408	481	548	615	683	820	
1200	8,6	31	<20	48	1,2	62	72	82	93	103	255	296	341	382	428	515	5,8
	10,6	38	20	72	1,4	76	88	101	114	126	297	347	398	445	498	598	
	13,6	49	25	49	1,8	98	114	130	147	163	358	418	478	535	598	716	
	18,1	65	30	212	2,4	130	151	173	195	216	434	507	577	649	723	865	
	22,8	82	34	337	3,1	164	191	218	246	273	501	586	666	750	834	999	
1500	11,7	42	<20	49	1,4	84	98	112	126	140	333	385	442	495	553	663	7,2
	13,1	47	20	62	1,6	94	109	125	141	156	362	418	480	538	600	720	
	16,7	60	24	100	2,0	120	140	160	180	200	429	498	571	639	713	855	
	21,7	78	29	170	2,6	156	182	208	234	260	511	594	679	761	848	1016	
	28,6	103	34	296	3,5	206	240	274	309	343	604	704	803	902	1001	1199	
1800	13,3	48	<20	45	1,5	96	112	128	144	160	379	439	505	566	635	763	8,6
	15,8	57	20	63	1,8	114	133	152	171	190	430	498	573	640	719	863	
	20,0	72	24	100	2,2	144	168	192	216	240	505	586	673	752	843	1011	
	26,4	95	29	175	2,9	190	221	253	285	316	602	700	803	898	1000	1200	
	33,9	122	34	288	3,7	244	284	325	366	406	694	808	926	1039	1148	1380	
2100	14,4	52	<20	33	1,5	104	121	138	156	173	411	479	555	624	691	835	10,1
	16,9	61	20	46	1,7	122	142	162	183	203	463	540	622	702	775	934	
	21,7	78	25	75	2,2	156	182	208	234	260	551	640	736	831	917	1101	
	27,5	99	30	121	2,8	198	231	264	297	330	641	745	855	962	1064	1276	
	35,0	126	35	196	3,6	252	294	336	378	420	734	852	980	1097	1219	1460	
2400	16,7	60	<20	34	1,6	120	140	160	180	200	469	550	629	705	782	938	11,3
	21,7	78	20	58	2,1	156	182	208	234	260	564	659	755	846	938	1127	
	26,9	97	24	89	2,6	194	226	258	291	323	650	758	869	974	1080	1297	
	34,2	123	29	143	3,3	246	287	328	369	410	748	872	999	1118	1243	1491	
	43,9	158	34	236	4,2	316	368	421	474	526	855	997	1140	1273	1419	1701	
2700	18,9	68	<20	41	1,7	136	158	181	204	226	523	611	703	787	877	1056	12,7
	23,6	85	<20	64	2,1	170	198	226	255	283	609	712	817	917	1019	1225	
	27,2	98	20	85	2,5	196	228	261	294	326	668	781	894	1005	1116	1340	
	33,9	122	24	132	3,1	244	284	325	366	406	763	891	1017	1144	1272	1525	
	43,1	155	29	213	3,9	310	361	413	465	516	869	1014	1156	1298	1447	1733	
3000	20,6	74	<20	39	1,8	148	172	197	222	246	571	662	758	849	947	1133	14,2
	26,9	97	<20	68	2,3	194	226	258	291	323	682	791	908	1017	1133	1356	
	33,3	120	20	103	2,9	240	280	320	360	400	777	901	1035	1160	1291	1546	
	41,4	149	24	159	3,5	298	347	397	447	496	876	1015	1167	1309	1457	1747	
	52,5	189	29	256	4,5	378	441	504	567	630	987	1141	1312	1475	1640	1967	

Technical Data. Selection Tables

COOLING - 2-PIPE SYSTEM - M-TYPE NOZZLE

Reference water flow (Q_W) of 250 L/h

For other water flow rates, correct the unit capacity (P_{SW}) in the table by the factors listed in the attached table.

VFK 600 - 2-PIPE COOLING SYSTEM									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Q_W (l/h)	Power Factor Correction in battery								
80	0,59	0,60	0,59	0,58	0,57	0,56	0,54	0,52	0,51
100	0,74	0,70	0,69	0,69	0,66	0,66	0,64	0,62	0,60
120	0,83	0,81	0,80	0,78	0,76	0,75	0,74	0,72	0,71
150	0,89	0,87	0,86	0,85	0,84	0,83	0,82	0,80	0,79
180	0,94	0,93	0,91	0,92	0,91	0,90	0,90	0,89	0,88
210	0,98	0,96	0,95	0,96	0,96	0,94	0,95	0,94	0,94
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,02	1,02	1,03	1,03	1,03	1,04	1,04	1,03	1,04
340	1,04	1,05	1,06	1,06	1,07	1,07	1,08	1,08	1,07

VFK 600 - M NOZZLE - 2-PIPE SYSTEM - COOLING																	
Length	Q_{pr}		L_W dB(A)	ΔP_{pr} (Pa)	X (m)	ΔT_{pr} (K)					ΔT_{SWIN} (K)						ΔP_W (kPa)
						6	7	8	9	10	6	7	8	9	10	12	
	l/s	m³/h				P_{pr} (W)					P_{SW} (W)						
600	7,8	28	<20	51	1,2	56	65	74	84	93	147	166	195	219	247	299	2,0
	9,3	33	20	73	1,4	67	78	89	100	111	168	191	224	252	284	342	
	11,1	40	24	104	1,7	80	93	106	120	133	192	218	257	288	324	389	
	13,6	49	30	156	2,1	98	114	130	147	163	222	253	298	332	373	448	
	16,1	58	34	218	2,5	116	135	154	174	193	248	286	334	372	417	500	
900	11,7	42	<20	45	1,5	84	98	112	126	140	222	255	290	328	364	437	4,3
	13,9	50	20	64	1,7	100	116	133	150	166	252	290	332	373	415	498	
	16,7	60	25	92	2,1	120	140	160	180	200	288	332	381	427	476	571	
	20,0	72	30	133	2,5	144	168	192	216	240	327	380	436	487	543	652	
	23,9	86	35	189	2,0	172	200	229	258	286	367	430	492	550	613	736	
1200	15,3	55	<20	44	1,7	110	128	146	165	183	281	327	376	421	472	566	5,8
	18,3	66	20	63	1,0	132	154	176	198	220	322	376	431	482	539	646	
	21,9	79	25	90	2,4	158	184	210	237	263	367	428	489	548	612	733	
	26,4	95	30	130	2,9	190	221	253	285	316	416	486	554	622	693	830	
	31,7	114	35	187	3,4	228	266	304	342	380	468	547	622	700	779	932	
1500	18,9	68	<20	43	1,8	136	158	181	204	226	347	402	461	516	576	692	7,2
	22,8	82	20	62	2,2	164	191	218	246	273	397	460	527	591	659	791	
	27,2	98	25	89	2,6	196	228	261	294	326	449	521	597	669	746	894	
	32,5	117	29	126	3,2	234	273	312	351	390	505	587	671	752	838	1003	
	39,2	141	35	183	3,8	282	329	376	423	470	566	659	752	845	939	1125	
1800	22,5	81	<20	42	1,0	162	189	216	243	270	407	472	543	608	682	819	8,6
	27,2	98	20	62	2,4	196	228	261	294	326	467	541	622	695	780	935	
	32,2	116	24	86	2,9	232	270	309	348	386	523	607	697	778	872	1045	
	38,6	139	29	124	3,4	278	324	370	417	463	586	681	781	874	975	1169	
	46,7	168	35	181	4,1	336	392	448	504	560	655	762	874	979	1086	1303	
2100	25,0	90	<20	36	2,0	180	210	240	270	300	451	526	607	684	756	911	10,1
	28,6	103	20	47	2,3	206	240	274	309	343	498	579	667	753	831	1000	
	35,0	126	25	70	2,9	252	294	336	378	420	571	664	763	860	950	1140	
	42,8	154	30	105	3,5	308	359	410	462	513	647	752	864	971	1075	1288	
	52,2	188	35	156	4,3	376	438	501	564	626	724	841	967	1083	1203	1441	
2400	27,8	100	<20	34	2,1	200	233	266	300	333	499	584	669	750	831	997	11,3
	32,8	118	20	47	2,5	236	275	314	354	393	560	654	749	840	932	1118	
	39,7	143	25	69	3,0	286	333	381	429	476	635	741	849	952	1056	1268	
	48,6	175	30	104	3,7	350	408	466	525	583	718	837	959	1074	1193	1432	
	59,4	214	35	155	4,6	428	499	570	642	713	803	936	1071	1197	1333	1599	
2700	31,7	114	<20	35	2,3	228	266	304	342	380	557	651	749	839	934	1124	12,7
	36,4	131	20	46	2,6	262	305	349	393	436	612	715	821	922	1024	1231	
	44,4	160	25	68	3,2	320	373	426	480	533	696	813	930	1046	1162	1395	
	54,4	196	30	103	3,9	392	457	522	588	653	784	916	1046	1176	1307	1567	
	66,7	240	34	154	4,8	480	560	640	720	800	874	1021	1163	1306	1456	1743	
3000	34,4	124	<20	33	2,4	248	289	330	372	413	607	704	807	904	1007	1205	14,2
	40,6	146	20	46	2,8	292	340	389	438	486	675	783	899	1007	1121	1342	
	49,4	178	25	69	3,4	356	415	474	534	593	763	885	1016	1139	1268	1518	
	60,3	217	29	102	4,1	434	506	578	651	723	854	989	1137	1275	1419	1701	
	73,6	265	34	152	5,0	530	618	706	795	883	946	1095	1259	1415	1573	1887	

Technical Data. Selection Tables

COOLING - 2-PIPE SYSTEM - G-TYPE NOZZLE

Reference water flow (Q_W) of 250 L/h

For other water flow rates, correct the unit capacity (P_{SW}) in the table by the factors listed in the attached table.

VFK 600 - 2-PIPE COOLING SYSTEM									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Q_W (l/h)	Power Factor Correction in battery								
80	0,59	0,60	0,59	0,58	0,57	0,56	0,54	0,52	0,51
100	0,74	0,70	0,69	0,69	0,66	0,66	0,64	0,62	0,60
120	0,83	0,81	0,80	0,78	0,76	0,75	0,74	0,72	0,71
150	0,89	0,87	0,86	0,85	0,84	0,83	0,82	0,80	0,79
180	0,94	0,93	0,91	0,92	0,91	0,90	0,90	0,89	0,88
210	0,98	0,96	0,95	0,96	0,96	0,94	0,95	0,94	0,94
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,02	1,02	1,03	1,03	1,03	1,04	1,04	1,03	1,04
340	1,04	1,05	1,06	1,06	1,07	1,07	1,08	1,08	1,07

VFK 600 - G NOZZLE - 2-PIPE SYSTEM - COOLING																	
Length	Q_{pr}		L_W dB(A)	ΔP_{pr} (Pa)	X (m)	ΔT_{pr} (K)					ΔT_{SWIN} (K)						ΔP_W (kPa)
						6	7	8	9	10	6	7	8	9	10	12	
	l/s	m³/h				P_{pr} (W)					P_{SW} (W)						
600	12,5	45	<20	64	1,2	90	105	120	135	150	200	228	268	300	338	406	2,0
	16,9	61	20	117	1,7	122	142	162	183	203	247	284	332	370	415	497	
	20,0	72	24	164	1,0	144	168	192	216	240	274	317	368	409	458	548	
	24,4	88	29	244	2,4	176	205	234	264	293	306	355	410	455	507	607	
	30,0	108	35	368	2,0	216	252	288	324	360	334	386	444	494	546	658	
900	16,7	60	<20	50	1,4	120	140	160	180	200	251	289	330	372	413	496	4,3
	19,2	69	20	67	1,6	138	161	184	207	230	278	320	367	412	459	551	
	22,8	82	24	94	1,9	164	191	218	246	273	315	364	418	467	521	625	
	27,2	98	29	135	2,2	196	228	261	294	326	354	413	473	529	590	708	
	33,3	120	34	202	2,7	240	280	320	360	400	400	472	538	603	670	805	
1200	20,8	75	20	44	1,5	150	175	200	225	250	299	348	399	447	500	600	5,8
	25,0	90	25	64	1,8	180	210	240	270	300	341	399	456	511	571	684	
	30,6	110	30	95	2,2	220	256	293	330	366	393	459	524	588	656	785	
	36,1	130	34	133	2,5	260	303	346	390	433	439	514	584	657	732	876	
	44,4	160	40	202	3,1	320	373	426	480	533	499	584	663	747	831	995	
1500	26,4	95	24	41	1,7	190	221	253	285	316	374	433	497	557	621	746	7,2
	31,9	115	29	60	2,0	230	268	306	345	383	428	496	569	637	711	852	
	38,9	140	35	88	2,5	280	326	373	420	466	488	567	649	728	811	971	
	47,2	170	40	130	2,0	340	396	453	510	566	552	642	733	823	915	1096	
	56,9	205	45	190	3,6	410	478	546	615	683	615	717	818	919	1020	1221	
1800	27,8	100	24	31	1,6	200	233	266	300	333	390	452	521	583	654	786	8,6
	33,9	122	29	47	1,0	244	284	325	366	406	451	523	601	671	754	904	
	40,6	146	34	67	2,3	292	340	389	438	486	510	591	679	759	850	1020	
	49,7	179	40	100	2,9	358	417	477	537	596	581	674	774	866	966	1158	
	60,8	219	45	150	3,5	438	511	584	657	730	654	761	872	977	1084	1301	
2100	38,9	140	25	37	2,1	280	326	373	420	466	512	595	685	773	853	1026	10,1
	47,2	170	30	55	2,5	340	396	453	510	566	583	677	778	877	969	1163	
	56,9	205	35	80	3,0	410	478	546	615	683	654	760	873	981	1086	1302	
	69,4	250	40	119	3,7	500	583	666	750	833	731	849	975	1093	1214	1454	
	83,3	300	44	171	4,4	600	700	800	900	1000	803	931	1072	1199	1335	1600	
2400	45,8	165	25	40	2,3	330	385	440	495	550	585	683	783	878	974	1170	11,3
	56,1	202	30	59	2,8	404	471	538	606	673	666	777	890	998	1108	1330	
	66,7	240	34	84	3,3	480	560	640	720	800	738	860	985	1103	1226	1471	
	81,9	295	39	127	4,1	590	688	786	885	983	825	962	1101	1230	1370	1643	
	101,4	365	45	194	5,1	730	851	973	1095	1216	918	1071	1224	1365	1524	1826	
2700	51,9	187	25	40	2,4	374	436	498	561	623	648	758	868	976	1083	1302	12,7
	62,5	225	30	58	2,9	450	525	600	675	750	727	850	971	1092	1213	1456	
	76,4	275	35	87	3,6	550	641	733	825	916	815	952	1086	1221	1359	1628	
	93,1	335	40	129	4,4	670	781	893	1005	1116	903	1055	1201	1348	1505	1801	
	114,4	412	45	195	5,4	824	961	1098	1236	1373	995	1166	1327	1487	1665	1993	
3000	58,3	210	24	41	2,6	420	490	560	630	700	717	832	955	1069	1191	1426	14,2
	72,2	260	30	63	3,2	520	606	693	780	866	814	943	1083	1215	1352	1620	
	87,5	315	35	92	3,9	630	735	840	945	1050	902	1045	1201	1348	1500	1798	
	104,2	375	39	131	4,6	750	875	1000	1125	1250	983	1137	1308	1470	1634	1960	
	127,8	460	44	197	5,7	920	1073	1226	1380	1533	1082	1248	1437	1615	1796	2151	

Technical Data. Selection Tables

COOLING - 4-PIPE SYSTEM - P-TYPE NOZZLE

Reference water flow (Q_W) of 250 L/h

For other water flow rates, correct the unit capacity (P_{SW}) in the table by the factors listed in the attached table.

VFK 600 - 4-PIPE COOLING SYSTEM									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Q_W (l/h)	Power Factor Correction in battery								
80	0,59	0,60	0,59	0,58	0,57	0,56	0,54	0,52	0,51
100	0,74	0,70	0,69	0,69	0,66	0,66	0,64	0,62	0,60
120	0,83	0,81	0,80	0,78	0,76	0,75	0,74	0,72	0,71
150	0,89	0,87	0,86	0,85	0,84	0,83	0,82	0,80	0,79
180	0,94	0,93	0,91	0,92	0,91	0,90	0,90	0,89	0,88
210	0,98	0,96	0,95	0,96	0,96	0,94	0,95	0,94	0,94
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,02	1,02	1,03	1,03	1,03	1,04	1,04	1,03	1,04
340	1,04	1,05	1,06	1,06	1,07	1,07	1,08	1,08	1,07

VFK 600 - P NOZZLE - 4-PIPE SYSTEM - COOLING																	
Length	Q_{pr}		L_W dB(A)	ΔP_{pr} (Pa)	X (m)	ΔT_{pr} (K)					ΔT_{SWIN} (K)						ΔP_W (kPa)
						6	7	8	9	10	6	7	8	9	10	12	
	l/s	m^3/h				P_{pr} (W)					P_{SW} (W)						
600	4,4	16	<20	51	0,9	32	37	42	48	53	142	163	184	209	232	277	2,2
	5,3	19	20	72	1,0	38	44	50	57	63	162	186	210	238	264	313	
	6,7	24	24	116	1,3	48	56	64	72	80	192	221	251	282	313	370	
	8,9	32	30	205	1,7	64	74	85	96	106	233	270	308	346	381	453	
	11,7	42	35	354	2,2	84	98	112	126	140	271	315	364	407	448	536	
900	6,4	23	<20	47	0,0	46	53	61	69	76	180	217	253	288	327	400	3,5
	7,8	28	20	70	1,2	56	65	74	84	93	215	256	294	332	371	448	
	10,0	36	24	116	1,6	72	84	96	108	120	263	311	353	395	437	524	
	13,1	47	29	197	2,0	94	109	125	141	156	319	372	420	472	521	622	
	17,2	62	34	343	2,7	124	144	165	186	206	379	438	495	560	620	741	
1200	8,6	31	<20	48	1,2	62	72	82	93	103	236	279	310	349	383	446	4,6
	10,6	38	20	72	1,4	76	88	101	114	126	273	322	361	405	450	532	
	13,6	49	25	120	1,8	98	114	130	147	163	326	384	435	487	543	649	
	18,1	65	30	212	2,4	130	151	173	195	216	393	461	528	589	654	787	
	22,8	82	34	337	3,1	164	191	218	246	273	453	530	611	681	749	903	
1500	11,7	42	<20	49	1,4	84	98	112	126	140	302	354	400	455	512	621	5,8
	13,1	47	20	62	1,6	94	109	125	141	156	330	385	435	492	552	665	
	16,7	60	24	100	2,0	120	140	160	180	200	394	459	519	581	647	775	
	21,7	78	29	170	2,6	156	182	208	234	260	467	543	616	688	763	912	
	28,6	103	34	296	3,5	206	240	274	309	343	546	635	723	811	899	1077	
1800	13,3	48	<20	45	1,5	96	112	128	144	160	336	395	449	507	574	699	6,9
	15,8	57	20	63	1,8	114	133	152	171	190	388	455	513	580	650	781	
	20,0	72	24	100	2,2	144	168	192	216	240	462	541	609	688	763	910	
	26,4	95	29	175	2,9	190	221	253	285	316	552	646	731	825	910	1086	
	33,9	122	34	288	3,7	244	284	325	366	406	631	739	845	953	1049	1260	
2100	14,4	52	<20	33	1,5	104	121	138	156	173	381	446	518	580	637	761	8,1
	16,9	61	20	46	1,7	122	142	162	183	203	426	499	573	644	710	850	
	21,7	78	25	75	2,2	156	182	208	234	260	504	588	669	754	835	1000	
	27,5	99	30	121	2,8	198	231	264	297	330	584	682	774	871	968	1160	
	35,0	126	35	196	3,6	252	294	336	378	420	669	781	889	998	1110	1330	
2400	16,7	60	<20	34	1,6	120	140	160	180	200	448	521	577	659	722	856	9,0
	21,7	78	20	58	2,1	156	182	208	234	260	523	611	687	777	854	1019	
	26,9	97	24	89	2,6	194	226	258	291	323	594	694	787	886	977	1170	
	34,2	123	29	143	3,3	246	287	328	369	410	681	794	904	1016	1123	1347	
	43,9	158	34	236	4,2	316	368	421	474	526	780	905	1030	1159	1285	1541	
2700	18,9	68	<20	41	1,7	136	158	181	204	226	488	572	645	733	808	967	10,4
	23,6	85	<20	64	2,1	170	198	226	255	283	558	654	741	838	927	1112	
	27,2	98	20	85	2,5	196	228	261	294	326	607	711	809	912	1011	1213	
	33,9	122	24	132	3,1	244	284	325	366	406	691	807	921	1036	1149	1380	
	43,1	155	29	213	3,9	310	361	413	465	516	790	919	1051	1181	1310	1572	
3000	20,6	74	<20	39	1,8	148	172	197	222	246	521	622	694	796	884	1065	11,3
	26,9	97	<20	68	2,3	194	226	258	291	323	618	727	822	932	1030	1237	
	33,3	120	20	103	2,9	240	280	320	360	400	702	821	934	1053	1162	1392	
	41,4	149	24	159	3,5	298	347	397	447	496	792	923	1056	1187	1308	1567	
	52,5	189	29	256	4,5	378	441	504	567	630	892	1041	1193	1340	1478	1774	

Technical Data. Selection Tables

COOLING - 4-PIPE SYSTEM - M-TYPE NOZZLE

Reference water flow (Q_W) of 250 L/h

For other water flow rates, correct the unit capacity (P_{SW}) in the table by the factors listed in the attached table.

VFK 600 - 4-PIPE COOLING SYSTEM									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Q_W (l/h)	Power Factor Correction in battery								
80	0,59	0,60	0,59	0,58	0,57	0,56	0,54	0,52	0,51
100	0,74	0,70	0,69	0,69	0,66	0,66	0,64	0,62	0,60
120	0,83	0,81	0,80	0,78	0,76	0,75	0,74	0,72	0,71
150	0,89	0,87	0,86	0,85	0,84	0,83	0,82	0,80	0,79
180	0,94	0,93	0,91	0,92	0,91	0,90	0,90	0,89	0,88
210	0,98	0,96	0,95	0,96	0,96	0,94	0,95	0,94	0,94
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,02	1,02	1,03	1,03	1,03	1,04	1,04	1,03	1,04
340	1,04	1,05	1,06	1,06	1,07	1,07	1,08	1,08	1,07

VFK 600 - M NOZZLE - 4-PIPE SYSTEM - COOLING																	
Length	Q_{pr}		L_W - dB(A)	ΔP_{pr} (Pa)	X (m)	ΔT_{pr} (K)					ΔT_{SWIN} (K)						ΔP_W (kPa)
						6	7	8	9	10	6	7	8	9	10	12	
	l/s	m³/h				P_{pr} (W)					P_{SW} (W)						
600	7,8	28	<20	51	1,2	56	65	74	84	93	137	157	178	202	225	268	2,2
	9,3	33	20	73	1,4	67	78	89	100	111	157	181	204	231	257	305	
	11,1	40	24	104	1,7	80	93	106	120	133	180	207	234	264	292	346	
	13,6	49	30	156	2,1	98	114	130	147	163	207	239	272	306	338	400	
	16,1	58	34	218	2,5	116	135	154	174	193	231	268	306	344	379	450	
900	11,7	42	<20	45	1,5	84	98	112	126	140	196	236	273	309	348	423	3,5
	13,9	50	20	64	1,7	100	116	133	150	166	229	272	311	350	389	469	
	16,7	60	25	92	2,1	120	140	160	180	200	265	312	354	397	439	525	
	20,0	72	30	133	2,5	144	168	192	216	240	302	354	400	449	495	591	
	23,9	86	35	189	2,0	172	200	229	258	286	340	395	446	502	555	663	
1200	15,3	55	<20	44	1,7	110	128	146	165	183	259	306	342	384	425	500	4,6
	18,3	66	20	63	1,0	132	154	176	198	220	294	348	391	439	489	580	
	21,9	79	25	90	2,4	158	184	210	237	263	333	393	446	498	556	665	
	26,4	95	30	130	2,9	190	221	253	285	316	377	443	506	565	628	755	
	31,7	114	35	187	3,4	228	266	304	342	380	423	496	570	635	702	846	
1500	18,9	68	<20	43	1,8	136	158	181	204	226	316	370	418	473	532	643	5,8
	22,8	82	20	62	2,2	164	191	218	246	273	364	424	479	539	602	722	
	27,2	98	25	89	2,6	196	228	261	294	326	412	479	543	607	675	807	
	32,5	117	29	126	3,2	234	273	312	351	390	462	536	608	680	754	901	
	39,2	141	35	183	3,8	282	329	376	423	470	515	598	680	761	844	1009	
1800	22,5	81	<20	42	1,0	162	189	216	243	270	366	428	485	548	617	745	6,9
	27,2	98	20	62	2,4	196	228	261	294	326	425	497	560	633	705	844	
	32,2	116	24	86	2,9	232	270	309	348	386	479	561	631	713	790	942	
	38,6	139	29	124	3,4	278	324	370	417	463	538	629	711	803	886	1057	
	46,7	168	35	181	4,1	336	392	448	504	560	599	700	797	899	990	1186	
2100	25,0	90	<20	36	2,0	180	210	240	270	300	416	487	560	629	693	829	8,1
	28,6	103	20	47	2,3	206	240	274	309	343	457	534	610	687	759	908	
	35,0	126	25	70	2,9	252	294	336	378	420	522	609	692	780	864	1036	
	42,8	154	30	105	3,5	308	359	410	462	513	590	689	781	880	977	1172	
	52,2	188	35	156	4,3	376	438	501	564	626	661	771	877	985	1095	1313	
2400	27,8	100	<20	34	2,1	200	233	266	300	333	471	549	612	696	763	907	9,0
	32,8	118	20	47	2,5	236	275	314	354	393	520	607	682	771	848	1012	
	39,7	143	25	69	3,0	286	333	381	429	476	582	680	770	867	956	1144	
	48,6	175	30	104	3,7	350	408	466	525	583	654	763	868	976	1078	1292	
	59,4	214	35	155	4,6	428	499	570	642	713	731	850	969	1089	1206	1446	
2700	31,7	114	<20	35	2,3	228	266	304	342	380	516	604	683	775	855	1025	10,4
	36,4	131	20	46	2,6	262	305	349	393	436	560	657	745	842	932	1118	
	44,4	160	25	68	3,2	320	373	426	480	533	631	739	841	948	1051	1262	
	54,4	196	30	103	3,9	392	457	522	588	653	711	830	947	1065	1181	1419	
	66,7	240	34	154	4,8	480	560	640	720	800	795	925	1058	1189	1319	1582	
3000	34,4	124	<20	33	2,4	248	289	330	372	413	552	656	735	839	930	1120	11,3
	40,6	146	20	46	2,8	292	340	389	438	486	612	721	814	923	1021	1226	
	49,4	178	25	69	3,4	356	415	474	534	593	690	807	917	1035	1142	1369	
	60,3	217	29	102	4,1	434	506	578	651	723	772	900	1028	1156	1274	1527	
	73,6	265	34	152	5,0	530	618	706	795	883	856	998	1143	1284	1415	1697	

Technical Data. Selection Tables

COOLING - 4-PIPE SYSTEM - G-TYPE NOZZLE

Reference water flow (Q_W) of 250 L/h

For other water flow rates, correct the unit capacity (P_{SW}) in the table by the factors listed in the attached table.

VFK 600 - 4-PIPE COOLING SYSTEM									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Q_W (l/h)	Power Factor Correction in battery								
80	0,59	0,60	0,59	0,58	0,57	0,56	0,54	0,52	0,51
100	0,74	0,70	0,69	0,69	0,66	0,66	0,64	0,62	0,60
120	0,83	0,81	0,80	0,78	0,76	0,75	0,74	0,72	0,71
150	0,89	0,87	0,86	0,85	0,84	0,83	0,82	0,80	0,79
180	0,94	0,93	0,91	0,92	0,91	0,90	0,90	0,89	0,88
210	0,98	0,96	0,95	0,96	0,96	0,94	0,95	0,94	0,94
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,02	1,02	1,03	1,03	1,03	1,04	1,04	1,03	1,04
340	1,04	1,05	1,06	1,06	1,07	1,07	1,08	1,08	1,07

VFK 600 - G NOZZLE - 4-PIPE SYSTEM - COOLING																	
Length	Q_{pr}		L_W - dB(A)	ΔP_{pr} (Pa)	X (m)	ΔT_{pr} (K)					ΔT_{SWIN} (K)						ΔP_W (kPa)
						6	7	8	9	10	6	7	8	9	10	12	
	l/s	m³/h				P_{pr} (W)					P_{SW} (W)						
600	12,5	45	<20	64	1,9	90	105	120	135	150	188	216	245	276	305	361	2,2
	16,9	61	20	117	2,6	122	142	162	183	203	230	267	304	342	377	448	
	20,0	72	24	164	3,1	144	168	192	216	240	254	295	339	380	418	499	
	24,4	88	29	244	3,7	176	205	234	264	293	280	327	378	424	464	558	
	30,0	108	35	368	4,6	216	252	288	324	360	301	351	405	456	496	602	
900	16,7	60	<20	50	2,1	120	140	160	180	200	228	271	310	348	388	467	3,5
	19,2	69	20	67	2,4	138	161	184	207	230	255	301	343	384	425	510	
	22,8	82	24	94	2,9	164	191	218	246	273	290	340	385	432	476	569	
	27,2	98	29	135	3,4	196	228	261	294	326	328	382	431	485	535	639	
	33,3	120	34	202	4,2	240	280	320	360	400	371	430	486	549	608	727	
1200	20,8	75	20	44	2,3	150	175	200	225	250	274	324	363	407	452	534	4,6
	25,0	90	25	64	2,7	180	210	240	270	300	311	367	415	464	518	617	
	30,6	110	30	95	3,3	220	256	293	330	366	356	420	478	534	595	714	
	36,1	130	34	133	3,9	260	303	346	390	433	397	466	535	596	661	796	
	44,4	160	40	202	4,8	320	373	426	480	533	452	528	608	678	746	900	
1500	26,4	95	24	41	2,6	190	221	253	285	316	342	399	451	509	570	685	5,8
	31,9	115	29	60	3,1	230	268	306	345	383	393	457	517	579	645	772	
	38,9	140	35	88	3,8	280	326	373	420	466	447	520	589	659	731	873	
	47,2	170	40	130	4,6	340	396	453	510	566	502	584	663	742	822	983	
	56,9	205	45	190	5,5	410	478	546	615	683	556	646	736	826	916	1098	
1800	27,8	100	24	31	2,5	200	233	266	300	333	348	408	464	524	592	718	6,9
	33,9	122	29	47	2,0	244	284	325	366	406	409	479	540	610	681	817	
	40,6	146	34	67	3,6	292	340	389	438	486	467	546	615	694	770	918	
	49,7	179	40	100	4,4	358	417	477	537	596	533	624	704	795	878	1047	
	60,8	219	45	150	5,4	438	511	584	657	730	598	699	796	898	989	1184	
2100	38,9	140	25	37	3,2	280	326	373	420	466	469	548	625	704	778	932	8,1
	47,2	170	30	55	3,9	340	396	453	510	566	532	622	705	795	881	1057	
	56,9	205	35	80	4,7	410	478	546	615	683	596	696	790	889	988	1184	
	69,4	250	40	119	5,7	500	583	666	750	833	667	778	885	994	1105	1325	
	83,3	300	44	171	6,8	600	700	800	900	1000	732	854	976	1093	1216	1457	
2400	45,8	165	25	40	3,5	330	385	440	495	550	541	632	712	804	885	1056	9,0
	56,1	202	30	59	4,3	404	471	538	606	673	609	711	807	908	1001	1199	
	66,7	240	34	84	5,1	480	560	640	720	800	672	783	892	1002	1108	1328	
	81,9	295	39	127	6,3	590	688	786	885	983	752	874	995	1119	1240	1487	
	101,4	365	45	194	7,8	730	851	973	1095	1216	839	972	1104	1243	1380	1653	
2700	51,9	187	25	40	3,8	374	436	498	561	623	591	692	786	887	983	1179	10,4
	62,5	225	30	58	4,5	450	525	600	675	750	659	771	879	989	1097	1317	
	76,4	275	35	87	5,5	550	641	733	825	916	740	862	985	1108	1229	1475	
	93,1	335	40	129	6,7	670	781	893	1005	1116	823	956	1094	1230	1364	1635	
	114,4	412	45	195	8,3	824	961	1098	1236	1373	911	1056	1208	1360	1508	1806	
3000	58,3	210	24	41	3,0	420	490	560	630	700	649	761	862	975	1078	1293	11,3
	72,2	260	30	63	4,0	520	606	693	780	866	735	858	978	1101	1214	1455	
	87,5	315	35	92	5,0	630	735	840	945	1050	815	951	1088	1222	1347	1615	
	104,2	375	39	131	7,1	750	875	1000	1125	1250	889	1037	1188	1335	1472	1767	
	127,8	460	44	197	8,8	920	1073	1226	1380	1533	974	1139	1303	1467	1620	1948	

Technical Data. Selection Tables

HEATING - 2-PIPE SYSTEM - P-TYPE NOZZLE

Reference water flow (Q_W) of 250 L/h

For other water flow rates, correct the unit capacity (P_{SW}) in the table by the factors listed in the attached table.

VFK 600 - 2-PIPE HEATING SYSTEM									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Q_W (l/h)	Power Factor Correction in battery								
80	0,59	0,60	0,59	0,58	0,57	0,56	0,54	0,52	0,51
100	0,74	0,70	0,69	0,69	0,66	0,66	0,64	0,62	0,60
120	0,83	0,81	0,80	0,78	0,76	0,75	0,74	0,72	0,71
150	0,89	0,87	0,86	0,85	0,84	0,83	0,82	0,80	0,79
180	0,94	0,93	0,91	0,92	0,91	0,90	0,90	0,89	0,88
210	0,98	0,96	0,95	0,96	0,96	0,94	0,95	0,94	0,94
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,02	1,02	1,03	1,03	1,03	1,04	1,04	1,03	1,04
340	1,04	1,05	1,06	1,06	1,07	1,07	1,08	1,08	1,07

VFK 600 - P NOZZLE - 2-PIPE SYSTEM - HEATING																	
Length	Q_{pr}		L_W dB(A)	ΔP_{pr} (Pa)	X (m)	ΔT_{pr} (K)					ΔT_{SWIN} (K)						ΔP_W (kPa)
						6	7	8	9	10	10	15	20	25	30	35	
	l/s	m³/h				P_{pr} (W)					P_{SW} (W)						
600	4,4	16	<20	51	0,6	32	37	42	48	53	242	366	490	616	740	864	2,0
	5,3	19	20	72	0,7	38	44	50	57	63	277	418	559	703	845	987	
	6,7	24	24	116	0,9	48	56	64	72	80	332	501	669	841	1010	1182	
	8,9	32	30	205	1,2	64	74	85	96	106	411	620	829	1041	1249	1463	
	11,7	42	35	354	1,6	84	98	112	126	140	492	742	994	1247	1497	1753	
900	6,4	23	<20	47	0,7	46	53	61	69	76	316	477	639	801	963	1125	4,3
	7,8	28	20	70	0,9	56	65	74	84	93	369	557	745	935	1124	1314	
	10,0	36	24	116	1,1	72	84	96	108	120	447	674	902	1132	1360	1591	
	13,1	47	29	197	1,4	94	109	125	141	156	542	816	1092	1370	1648	1928	
	17,2	62	34	343	1,9	124	144	165	186	206	653	980	1312	1647	1981	2318	
1200	8,6	31	<20	48	0,8	62	72	82	93	103	425	638	852	1067	1283	1503	5,8
	10,6	38	20	72	1,0	76	88	101	114	126	496	746	996	1248	1500	1758	
	13,6	49	25	120	1,3	98	114	130	147	163	600	900	1203	1507	1812	2121	
	18,1	65	30	212	1,7	130	151	173	195	216	730	1094	1463	1833	2205	2578	
	22,8	82	34	337	2,2	164	191	218	246	273	843	1266	1694	2124	2555	2987	
1500	11,7	42	<20	49	0,0	84	98	112	126	140	561	842	1124	1406	1690	1976	7,2
	13,1	47	20	62	1,1	94	109	125	141	156	610	915	1223	1530	1839	2150	
	16,7	60	24	100	1,4	120	140	160	180	200	728	1091	1458	1827	2195	2566	
	21,7	78	29	170	1,8	156	182	208	234	260	868	1301	1739	2179	2618	3061	
	28,6	103	34	296	2,4	206	240	274	309	343	1025	1540	2057	2577	3098	3622	
1800	13,3	48	<20	45	1,0	96	112	128	144	160	640	960	1284	1608	1933	2257	8,6
	15,8	57	20	63	1,2	114	133	152	171	190	727	1091	1458	1826	2194	2563	
	20,0	72	24	100	1,5	144	168	192	216	240	855	1285	1718	2151	2585	3019	
	26,4	95	29	175	2,0	190	221	253	285	316	1022	1535	2052	2569	3088	3608	
	33,9	122	34	288	2,6	244	284	325	366	406	1179	1771	2367	2963	3562	4164	
2100	14,4	52	<20	33	1,0	104	121	138	156	173	701	1052	1403	1755	2108	2464	10,1
	16,9	61	20	46	1,2	122	142	162	183	203	786	1180	1575	1972	2369	2769	
	21,7	78	25	75	1,6	156	182	208	234	260	931	1398	1867	2338	2811	3284	
	27,5	99	30	121	1,0	198	231	264	297	330	1084	1627	2173	2723	3274	3826	
	35,0	126	35	196	2,5	252	294	336	378	420	1246	1869	2497	3129	3761	4396	
2400	16,7	60	<20	34	1,1	120	140	160	180	200	796	1193	1591	1993	2395	2801	11,3
	21,7	78	20	58	1,5	156	182	208	234	260	953	1433	1913	2396	2880	3364	
	26,9	97	24	89	1,8	194	226	258	291	323	1098	1653	2208	2764	3324	3879	
	34,2	123	29	143	2,3	246	287	328	369	410	1265	1906	2546	3186	3833	4470	
	43,9	158	34	236	2,9	316	368	421	474	526	1446	2178	2909	3640	4381	5108	
2700	18,9	68	<20	41	1,2	136	158	181	204	226	886	1332	1781	2229	2677	3128	12,7
	23,6	85	<20	64	1,5	170	198	226	255	283	1029	1548	2070	2591	3113	3637	
	27,2	98	20	85	1,7	196	228	261	294	326	1128	1697	2268	2840	3412	3987	
	33,9	122	24	132	2,1	244	284	325	366	406	1289	1938	2590	3243	3897	4554	
	43,1	155	29	213	2,7	310	361	413	465	516	1472	2212	2953	3697	4441	5193	
3000	20,6	74	<20	39	1,2	148	172	197	222	246	959	1439	1920	2402	2889	3377	14,2
	26,9	97	<20	68	1,6	194	226	258	291	323	1144	1717	2293	2872	3453	4034	
	33,3	120	20	103	1,0	240	280	320	360	400	1304	1958	2616	3276	3938	4600	
	41,4	149	24	159	2,5	298	347	397	447	496	1476	2214	2958	3706	4455	5203	
	52,5	189	29	256	3,1	378	441	504	567	630	1666	2498	3337	4181	5026	5869	

Technical Data. Selection Tables

HEATING - 2-PIPE SYSTEM - M-TYPE NOZZLE

Reference water flow (Q_W) of 250 L/h

For other water flow rates, correct the unit capacity (P_{SW}) in the table by the factors listed in the attached table.

VFK 600 - 2-PIPE HEATING SYSTEM									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Q_W (l/h)	Power Factor Correction in battery								
80	0,59	0,60	0,59	0,58	0,57	0,56	0,54	0,52	0,51
100	0,74	0,70	0,69	0,69	0,66	0,66	0,64	0,62	0,60
120	0,83	0,81	0,80	0,78	0,76	0,75	0,74	0,72	0,71
150	0,89	0,87	0,86	0,85	0,84	0,83	0,82	0,80	0,79
180	0,94	0,93	0,91	0,92	0,91	0,90	0,90	0,89	0,88
210	0,98	0,96	0,95	0,96	0,96	0,94	0,95	0,94	0,94
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,02	1,02	1,03	1,03	1,03	1,04	1,04	1,03	1,04
340	1,04	1,05	1,06	1,06	1,07	1,07	1,08	1,08	1,07

VFK 600 - M NOZZLE - 2-PIPE SYSTEM - HEATING																	
Length	Q_{pr}		L_W dB(A)	ΔP_{pr} (Pa)	X (m)	ΔT_{pr} (K)					ΔT_{SWIN} (K)						ΔP_W (kPa)
						6	7	8	9	10	10	15	20	25	30	35	
	l/s	m³/h				P_{pr} (W)					P_{SW} (W)						
600	7,8	28	<20	51	0,8	56	65	74	84	93	289	436	583	734	881	1030	2,0
	9,3	33	20	73	0,0	67	78	89	100	111	332	501	669	842	1011	1182	
	11,1	40	24	104	1,2	80	93	106	120	133	380	572	765	961	1154	1350	
	13,6	49	30	156	1,5	98	114	130	147	163	439	661	885	1111	1333	1561	
	16,1	58	34	218	1,7	116	135	154	174	193	489	737	988	1239	1488	1742	
900	11,7	42	<20	45	1,0	84	98	112	126	140	404	610	816	1024	1230	1439	4,3
	13,9	50	20	64	1,2	100	116	133	150	166	461	694	929	1166	1402	1640	
	16,7	60	25	92	1,5	120	140	160	180	200	526	792	1059	1329	1598	1870	
	20,0	72	30	133	1,8	144	168	192	216	240	596	896	1200	1506	1811	2119	
	23,9	86	35	189	2,1	172	200	229	258	286	670	1005	1345	1688	2031	2377	
1200	15,3	55	<20	44	1,2	110	128	146	165	183	518	778	1039	1302	1565	1834	5,8
	18,3	66	20	63	1,4	132	154	176	198	220	593	890	1189	1490	1791	2097	
	21,9	79	25	90	1,7	158	184	210	237	263	673	1010	1351	1692	2035	2380	
	26,4	95	30	130	2,0	190	221	253	285	316	762	1142	1528	1914	2302	2691	
	31,7	114	35	187	2,4	228	266	304	342	380	851	1278	1710	2144	2580	3015	
1500	18,9	68	<20	43	1,3	136	158	181	204	226	636	953	1274	1595	1917	2241	7,2
	22,8	82	20	62	1,5	164	191	218	246	273	728	1090	1457	1825	2193	2563	
	27,2	98	25	89	1,8	196	228	261	294	326	821	1231	1645	2061	2477	2895	
	32,5	117	29	126	2,2	234	273	312	351	390	919	1379	1843	2308	2774	3243	
	39,2	141	35	183	2,7	282	329	376	423	470	1025	1540	2058	2577	3098	3623	
1800	22,5	81	<20	42	1,4	162	189	216	243	270	746	1121	1498	1876	2255	2633	8,6
	27,2	98	20	62	1,7	196	228	261	294	326	852	1280	1711	2143	2575	3008	
	32,2	116	24	86	1,0	232	270	309	348	386	952	1431	1912	2394	2877	3361	
	38,6	139	29	124	2,4	278	324	370	417	463	1063	1598	2135	2673	3213	3755	
	46,7	168	35	181	2,9	336	392	448	504	560	1183	1777	2375	2973	3574	4178	
2100	25,0	90	<20	36	1,4	180	210	240	270	300	828	1245	1661	2080	2500	2921	10,1
	28,6	103	20	47	1,6	206	240	274	309	343	909	1365	1823	2283	2744	3207	
	35,0	126	25	70	2,0	252	294	336	378	420	1036	1556	2078	2604	3130	3658	
	42,8	154	30	105	2,5	308	359	410	462	513	1169	1755	2344	2937	3531	4127	
	52,2	188	35	156	2,0	376	438	501	564	626	1305	1958	2615	3276	3938	4604	
2400	27,8	100	<20	34	1,5	200	233	266	300	333	912	1371	1829	2291	2754	3218	11,3
	32,8	118	20	47	1,8	236	275	314	354	393	1019	1532	2046	2562	3081	3597	
	39,7	143	25	69	2,1	286	333	381	429	476	1150	1731	2312	2894	3482	4062	
	48,6	175	30	104	2,6	350	408	466	525	583	1293	1948	2602	3257	3918	4569	
	59,4	214	35	155	3,2	428	499	570	642	713	1438	2166	2895	3622	4358	5081	
2700	31,7	114	<20	35	1,6	228	266	304	342	380	1016	1528	2042	2557	3072	3589	12,7
	36,4	131	20	46	1,8	262	305	349	393	436	1112	1672	2235	2798	3362	3928	
	44,4	160	25	68	2,2	320	373	426	480	533	1257	1890	2526	3164	3801	4442	
	54,4	196	30	103	2,8	392	457	522	588	653	1411	2121	2833	3546	4261	4982	
	66,7	240	34	154	3,4	480	560	640	720	800	1566	2354	3141	3932	4723	5525	
3000	34,4	124	<20	33	1,7	248	289	330	372	413	1095	1644	2195	2748	3304	3861	14,2
	40,6	146	20	46	1,9	292	340	389	438	486	1214	1823	2435	3050	3666	4283	
	49,4	178	25	69	2,4	356	415	474	534	593	1368	2053	2742	3435	4129	4823	
	60,3	217	29	102	2,9	434	506	578	651	723	1526	2289	3058	3831	4605	5378	
	73,6	265	34	152	3,5	530	618	706	795	883	1685	2527	3375	4229	5083	5937	

Technical Data. Selection Tables

HEATING - 2-PIPE SYSTEM - G-TYPE NOZZLE

Reference water flow (Q_W) of 250 L/h

For other water flow rates, correct the unit capacity (P_{SW}) in the table by the factors listed in the attached table.

VFK 600 - 2-PIPE HEATING SYSTEM									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Q_W (l/h)	Power Factor Correction in battery								
80	0,59	0,60	0,59	0,58	0,57	0,56	0,54	0,52	0,51
100	0,74	0,70	0,69	0,69	0,66	0,66	0,64	0,62	0,60
120	0,83	0,81	0,80	0,78	0,76	0,75	0,74	0,72	0,71
150	0,89	0,87	0,86	0,85	0,84	0,83	0,82	0,80	0,79
180	0,94	0,93	0,91	0,92	0,91	0,90	0,90	0,89	0,88
210	0,98	0,96	0,95	0,96	0,96	0,94	0,95	0,94	0,94
250	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
290	1,02	1,02	1,03	1,03	1,03	1,04	1,04	1,03	1,04
340	1,04	1,05	1,06	1,06	1,07	1,07	1,08	1,08	1,07

VFK 600 - G NOZZLE - 2-PIPE SYSTEM - HEATING																	
Length	Q_{pr}		L_W dB(A)	ΔP_{pr} (Pa)	X (m)	ΔT_{pr} (K)					ΔT_{SWIN} (K)						ΔP_W (kPa)
						6	7	8	9	10	10	15	20	25	30	35	
	l/s	m³/h				P_{pr} (W)					P_{SW} (W)						
600	12,5	45	<20	64	0,0	90	105	120	135	150	340	512	685	861	1034	1210	2,0
	16,9	61	20	117	1,4	122	142	162	183	203	425	641	857	1076	1292	1512	
	20,0	72	24	164	1,6	144	168	192	216	240	474	715	958	1202	1443	1690	
	24,4	88	29	244	1,0	176	205	234	264	293	531	802	1075	1350	1623	1899	
	30,0	108	35	368	2,4	216	252	288	324	360	573	868	1163	1465	1770	2065	
900	16,7	60	<20	50	1,1	120	140	160	180	200	423	638	854	1072	1288	1506	4,3
	19,2	69	20	67	1,2	138	161	184	207	230	470	708	947	1189	1429	1671	
	22,8	82	24	94	1,5	164	191	218	246	273	532	801	1071	1345	1616	1891	
	27,2	98	29	135	1,8	196	228	261	294	326	601	904	1209	1518	1825	2136	
	33,3	120	34	202	2,2	240	280	320	360	400	685	1028	1376	1727	2078	2433	
1200	20,8	75	20	44	1,2	150	175	200	225	250	506	760	1015	1271	1529	1791	5,8
	25,0	90	25	64	1,4	180	210	240	270	300	579	870	1162	1456	1751	2050	
	30,6	110	30	95	1,7	220	256	293	330	366	669	1003	1341	1680	2020	2362	
	36,1	130	34	133	2,0	260	303	346	390	433	748	1122	1500	1879	2261	2642	
	44,4	160	40	202	2,5	320	373	426	480	533	850	1276	1707	2140	2576	3010	
1500	26,4	95	24	41	1,3	190	221	253	285	316	633	948	1267	1586	1906	2229	7,2
	31,9	115	29	60	1,6	230	268	306	345	383	726	1087	1454	1820	2188	2557	
	38,9	140	35	88	1,0	280	326	373	420	466	829	1243	1662	2081	2501	2923	
	47,2	170	40	130	2,4	340	396	453	510	566	937	1406	1879	2353	2829	3307	
	56,9	205	45	190	2,9	410	478	546	615	683	1044	1569	2096	2625	3156	3690	
1800	27,8	100	24	31	1,3	200	233	266	300	333	660	990	1324	1658	1993	2327	8,6
	33,9	122	29	47	1,6	244	284	325	366	406	763	1145	1531	1917	2304	2691	
	40,6	146	34	67	1,9	292	340	389	438	486	863	1297	1734	2171	2609	3048	
	49,7	179	40	100	2,3	358	417	477	537	596	985	1480	1978	2477	2977	3478	
	60,8	219	45	150	2,8	438	511	584	657	730	1111	1669	2230	2791	3355	3922	
2100	38,9	140	25	37	1,7	280	326	373	420	466	865	1300	1735	2172	2611	3051	10,1
	47,2	170	30	55	2,0	340	396	453	510	566	985	1479	1975	2474	2974	3476	
	56,9	205	35	80	2,4	410	478	546	615	683	1107	1662	2219	2781	3343	3907	
	69,4	250	40	119	2,0	500	583	666	750	833	1240	1861	2486	3115	3745	4377	
	83,3	300	44	171	3,6	600	700	800	900	1000	1365	2048	2736	3427	4119	4816	
2400	45,8	165	25	40	1,8	330	385	440	495	550	990	1488	1987	2488	2992	3493	11,3
	56,1	202	30	59	2,2	404	471	538	606	673	1126	1695	2264	2834	3409	3978	
	66,7	240	34	84	2,7	480	560	640	720	800	1247	1879	2510	3142	3780	4408	
	81,9	295	39	127	3,3	590	688	786	885	983	1396	2103	2810	3515	4230	4932	
	101,4	365	45	194	4,0	730	851	973	1095	1216	1551	2335	3119	3904	4699	5480	
2700	51,9	187	25	40	1,0	374	436	498	561	623	1095	1647	2202	2757	3312	3869	12,7
	62,5	225	30	58	2,4	450	525	600	675	750	1229	1847	2469	3092	3715	4341	
	76,4	275	35	87	2,9	550	641	733	825	916	1380	2074	2771	3469	4168	4872	
	93,1	335	40	129	3,5	670	781	893	1005	1116	1531	2301	3071	3844	4618	5401	
	114,4	412	45	195	4,3	824	961	1098	1236	1373	1690	2540	3387	4239	5092	5957	
3000	58,3	210	24	41	2,1	420	490	560	630	700	1202	1805	2411	3019	3630	4241	14,2
	72,2	260	30	63	2,6	520	606	693	780	866	1367	2052	2741	3434	4128	4821	
	87,5	315	35	92	3,1	630	735	840	945	1050	1520	2281	3047	3817	4588	5359	
	104,2	375	39	131	3,7	750	875	1000	1125	1250	1660	2489	3324	4165	5007	5847	
	127,8	460	44	197	4,6	920	1073	1226	1380	1533	1820	2729	3644	4567	5490	6410	

Technical Data. Selection Tables

HEATING - 4-PIPE SYSTEM - P-TYPE NOZZLE

Reference water flow (Q_W) of 50 L/h for sizes 600 to 1800.
Reference water flow (Q_W) of 110 L/h for sizes 2100 to 3000.
For other water flow rates, correct the coil capacity (P_{SW}) in the table by the factors listed in the attached table.

VFK 600 - 4-PIPE HEATING SYSTEM									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Q_W (l/h)	Power Factor Correction in battery								
30	0,64	0,64	0,64	0,64	0,64	0,41	0,42	0,39	0,37
50	1,00	1,00	1,00	1,00	1,00	0,64	0,66	0,63	0,61
70	1,12	1,16	1,17	1,20	1,23	0,82	0,82	0,81	0,78
90	1,19	1,25	1,30	1,36	1,38	0,93	0,94	0,93	0,91
110	1,25	1,32	1,38	1,45	1,48	1,00	1,00	1,00	1,00
130	1,29	1,37	1,45	1,51	1,56	1,07	1,08	1,06	1,07
150	1,33	1,42	1,50	1,57	1,65	1,14	1,14	1,13	1,14
180	1,36	1,46	1,55	1,64	1,72	1,18	1,19	1,21	1,21
210	1,39	1,51	1,60	1,69	1,78	1,23	1,25	1,27	1,27
250	1,42	1,56	1,64	1,74	1,83	1,27	1,28	1,32	1,33

VFK 600 - P NOZZLE - 4-PIPE SYSTEM - HEATING																	
Length	Q_{pr}		L_W dB(A)	ΔP_{pr} (Pa)	X (m)	ΔT_{pr} (K)					ΔT_{SWIN} (K)						ΔP_W (kPa)
	l/s	m³/h				6	7	8	9	10	10	15	20	25	30	35	
						P_{pr} (W)					P_{SW} (W)						
600	4,4	16	<20	51	0,6	32	37	42	48	53	110	168	230	290	350	412	0,2
	5,3	19	20	72	0,7	38	44	50	57	63	121	185	253	318	383	452	
	6,7	24	24	116	0,9	48	56	64	72	80	138	210	286	361	434	512	
	8,9	32	30	205	1,2	64	74	85	96	106	161	243	330	417	503	591	
	11,7	42	35	354	1,6	84	98	112	126	140	181	272	369	469	568	666	
900	6,4	23	<20	47	0,7	46	53	61	69	76	147	227	301	378	456	534	0,3
	7,8	28	20	70	0,9	56	65	74	84	93	165	254	335	419	503	591	
	10,0	36	24	116	1,1	72	84	96	108	120	189	289	380	475	570	670	
	13,1	47	29	197	1,4	94	109	125	141	156	214	325	428	538	646	760	
	17,2	62	34	343	1,9	124	144	165	186	206	237	358	475	602	725	853	
1200	8,6	31	<20	48	0,8	62	72	82	93	103	184	281	381	482	579	675	0,3
	10,6	38	20	72	1,0	76	88	101	114	126	203	310	421	533	638	744	
	13,6	49	25	120	1,3	98	114	130	147	163	230	349	474	600	717	838	
	18,1	65	30	212	1,7	130	151	173	195	216	261	394	534	675	807	947	
	22,8	82	34	337	2,2	164	191	218	246	273	287	429	581	732	878	1033	
1500	11,7	42	<20	49	0,0	84	98	112	126	140	228	343	468	592	710	832	0,4
	13,1	47	20	62	1,1	94	109	125	141	156	239	361	493	623	748	877	
	16,7	60	24	100	1,4	120	140	160	180	200	266	402	548	694	833	977	
	21,7	78	29	170	1,8	156	182	208	234	260	296	445	606	767	921	1082	
	28,6	103	34	296	2,4	206	240	274	309	343	325	488	660	832	1000	1175	
1800	13,3	48	<20	45	1,0	96	112	128	144	160	258	386	518	653	784	917	0,5
	15,8	57	20	63	1,2	114	133	152	171	190	277	415	558	704	844	988	
	20,0	72	24	100	1,5	144	168	192	216	240	304	455	613	773	926	1085	
	26,4	95	29	175	2,0	190	221	253	285	316	333	500	672	848	1014	1192	
	33,9	122	34	288	2,6	244	284	325	366	406	355	534	715	901	1078	1271	
2100	14,4	52	<20	33	1,0	104	121	138	156	173	363	544	726	906	1088	1270	3,8
	16,9	61	20	46	1,2	122	142	162	183	203	394	592	789	986	1184	1385	
	21,7	78	25	75	1,6	156	182	208	234	260	447	675	898	1122	1349	1581	
	27,5	99	30	121	1,0	198	231	264	297	330	504	762	1013	1267	1524	1788	
	35,0	126	35	196	2,5	252	294	336	378	420	566	854	1135	1420	1708	2005	
2400	16,7	60	<20	34	1,1	120	140	160	180	200	407	608	809	1011	1216	1419	4,3
	21,7	78	20	58	1,5	156	182	208	234	260	464	699	934	1167	1399	1634	
	26,9	97	24	89	1,8	194	226	258	291	323	517	782	1045	1306	1566	1830	
	34,2	123	29	143	2,3	246	287	328	369	410	577	874	1169	1462	1755	2051	
	43,9	158	34	236	2,9	316	368	421	474	526	642	968	1294	1620	1949	2279	
2700	18,9	68	<20	41	1,2	136	158	181	204	226	444	669	891	1113	1337	1561	4,8
	23,6	85	<20	64	1,5	170	198	226	255	283	494	750	998	1245	1498	1756	
	27,2	98	20	85	1,7	196	228	261	294	326	529	804	1070	1336	1608	1887	
	33,9	122	24	132	2,1	244	284	325	366	406	587	892	1186	1481	1784	2095	
	43,1	155	29	213	2,7	310	361	413	465	516	653	988	1314	1640	1975	2318	
3000	20,6	74	<20	39	1,2	148	172	197	222	246	476	715	956	1194	1433	1673	5,4
	26,9	97	<20	68	1,6	194	226	258	291	323	544	819	1093	1367	1642	1919	
	33,3	120	20	103	1,0	240	280	320	360	400	601	904	1207	1511	1816	2124	
	41,4	149	24	159	2,5	298	347	397	447	496	659	990	1322	1657	1992	2332	
	52,5	189	29	256	3,1	378	441	504	567	630	721	1078	1441	1808	2171	2544	

Technical Data. Selection Tables

HEATING - 4-PIPE SYSTEM - M-TYPE NOZZLE

Reference water flow (Q_W) of 50 L/h for sizes 600 to 1800.
Reference water flow (Q_W) of 110 L/h for sizes 2100 to 3000.
For other water flow rates, correct the coil capacity (P_{SW}) in the table by the factors listed in the attached table.

VFK 600 - 4-PIPE HEATING SYSTEM									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Q_W (l/h)	Power Factor Correction in battery								
30	0,64	0,64	0,64	0,64	0,64	0,41	0,42	0,39	0,37
50	1,00	1,00	1,00	1,00	1,00	0,64	0,66	0,63	0,61
70	1,12	1,16	1,17	1,20	1,23	0,82	0,82	0,81	0,78
90	1,19	1,25	1,30	1,36	1,38	0,93	0,94	0,93	0,91
110	1,25	1,32	1,38	1,45	1,48	1,00	1,00	1,00	1,00
130	1,29	1,37	1,45	1,51	1,56	1,07	1,08	1,06	1,07
150	1,33	1,42	1,50	1,57	1,65	1,14	1,14	1,13	1,14
180	1,36	1,46	1,55	1,64	1,72	1,18	1,19	1,21	1,21
210	1,39	1,51	1,60	1,69	1,78	1,23	1,25	1,27	1,27
250	1,42	1,56	1,64	1,74	1,83	1,27	1,28	1,32	1,33

VFK 600 - M NOZZLE - 4-PIPE SYSTEM - HEATING																	
Length	Q_{pr}		L_W dB(A)	ΔP_{pr} (Pa)	X (m)	ΔT_{pr} (K)					ΔT_{SWIN} (K)						ΔP_W (kPa)
						6	7	8	9	10	10	15	20	25	30	35	
	l/s	m³/h				P_{pr} (W)					P_{SW} (W)						
600	7,8	28	<20	51	0,8	56	65	74	84	93	125	191	260	328	395	465	0,2
	9,3	33	20	73	0,0	67	78	89	100	111	138	210	286	361	434	512	
	11,1	40	24	104	1,2	80	93	106	120	133	152	230	313	395	476	560	
	13,6	49	30	156	1,5	98	114	130	147	163	168	253	344	435	526	617	
	16,1	58	34	218	1,7	116	135	154	174	193	181	271	368	468	566	663	
900	11,7	42	<20	45	1,0	84	98	112	126	140	176	270	356	445	534	627	0,3
	13,9	50	20	64	1,2	100	116	133	150	166	193	295	387	485	581	684	
	16,7	60	25	92	1,5	120	140	160	180	200	210	320	421	528	633	745	
	20,0	72	30	133	1,8	144	168	192	216	240	226	342	452	571	686	807	
	23,9	86	35	189	2,1	172	200	229	258	286	240	362	482	611	736	866	
1200	15,3	55	<20	44	1,2	110	128	146	165	183	209	319	432	547	655	764	0,3
	18,3	66	20	63	1,4	132	154	176	198	220	228	347	471	596	712	832	
	21,9	79	25	90	1,7	158	184	210	237	263	248	375	509	644	770	902	
	26,4	95	30	130	2,0	190	221	253	285	316	268	404	548	692	828	972	
	31,7	114	35	187	2,4	228	266	304	342	380	288	431	584	736	882	1039	
1500	18,9	68	<20	43	1,3	136	158	181	204	226	245	370	505	639	767	900	0,4
	22,8	82	20	62	1,5	164	191	218	246	273	266	401	548	694	832	977	
	27,2	98	25	89	1,8	196	228	261	294	326	286	431	588	744	893	1049	
	32,5	117	29	126	2,2	234	273	312	351	390	306	460	625	790	949	1115	
	39,2	141	35	183	2,7	282	329	376	423	470	325	488	660	832	1000	1175	
1800	22,5	81	<20	42	1,4	162	189	216	243	270	282	421	567	715	857	1003	0,5
	27,2	98	20	62	1,7	196	228	261	294	326	303	454	611	771	924	1082	
	32,2	116	24	86	1,0	232	270	309	348	386	322	482	649	819	980	1149	
	38,6	139	29	124	2,4	278	324	370	417	463	340	510	685	864	1033	1215	
	46,7	168	35	181	2,9	336	392	448	504	560	356	535	716	902	1080	1272	
2100	25,0	90	<20	36	1,4	180	210	240	270	300	410	617	821	1026	1233	1443	3,8
	28,6	103	20	47	1,6	206	240	274	309	343	439	662	881	1102	1324	1551	
	35,0	126	25	70	2,0	252	294	336	378	420	487	735	977	1222	1469	1724	
	42,8	154	30	105	2,5	308	359	410	462	513	537	811	1078	1348	1621	1903	
	52,2	188	35	156	2,0	376	438	501	564	626	588	887	1179	1476	1775	2083	
2400	27,8	100	<20	34	1,5	200	233	266	300	333	450	676	902	1126	1352	1579	4,3
	32,8	118	20	47	1,8	236	275	314	354	393	488	737	984	1230	1475	1723	
	39,7	143	25	69	2,1	286	333	381	429	476	536	810	1084	1355	1625	1899	
	48,6	175	30	104	2,6	350	408	466	525	583	587	889	1189	1487	1786	2088	
	59,4	214	35	155	3,2	428	499	570	642	713	639	964	1289	1614	1942	2270	
2700	31,7	114	<20	35	1,6	228	266	304	342	380	490	742	988	1233	1483	1737	4,8
	36,4	131	20	46	1,8	262	305	349	393	436	524	795	1058	1321	1590	1865	
	44,4	160	25	68	2,2	320	373	426	480	533	576	875	1164	1453	1749	2054	
	54,4	196	30	103	2,8	392	457	522	588	653	631	957	1272	1588	1912	2246	
	66,7	240	34	154	3,4	480	560	640	720	800	687	1036	1377	1719	2069	2427	
3000	34,4	124	<20	33	1,7	248	289	330	372	413	526	792	1057	1322	1588	1855	5,4
	40,6	146	20	46	1,9	292	340	389	438	486	569	857	1144	1431	1719	2010	
	49,4	178	25	69	2,4	356	415	474	534	593	623	937	1250	1566	1882	2203	
	60,3	217	29	102	2,9	434	506	578	651	723	676	1014	1355	1698	2041	2390	
	73,6	265	34	152	3,5	530	618	706	795	883	727	1086	1452	1822	2189	2565	

Technical Data. Selection Tables

HEATING - 4-PIPE SYSTEM - G-TYPE NOZZLE

Reference water flow (Q_W) of 50 L/h for sizes 600 to 1800.
Reference water flow (Q_W) of 110 L/h for sizes 2100 to 3000.
For other water flow rates, correct the coil capacity (P_{SW}) in the table by the factors listed in the attached table.

VFK 600 - 4-PIPE HEATING SYSTEM									
SIZE	600	900	1200	1500	1800	2100	2400	2700	3000
Q_W (l/h)	Power Factor Correction in battery								
30	0,64	0,64	0,64	0,64	0,64	0,41	0,42	0,39	0,37
50	1,00	1,00	1,00	1,00	1,00	0,64	0,66	0,63	0,61
70	1,12	1,16	1,17	1,20	1,23	0,82	0,82	0,81	0,78
90	1,19	1,25	1,30	1,36	1,38	0,93	0,94	0,93	0,91
110	1,25	1,32	1,38	1,45	1,48	1,00	1,00	1,00	1,00
130	1,29	1,37	1,45	1,51	1,56	1,07	1,08	1,06	1,07
150	1,33	1,42	1,50	1,57	1,65	1,14	1,14	1,13	1,14
180	1,36	1,46	1,55	1,64	1,72	1,18	1,19	1,21	1,21
210	1,39	1,51	1,60	1,69	1,78	1,23	1,25	1,27	1,27
250	1,42	1,56	1,64	1,74	1,83	1,27	1,28	1,32	1,33

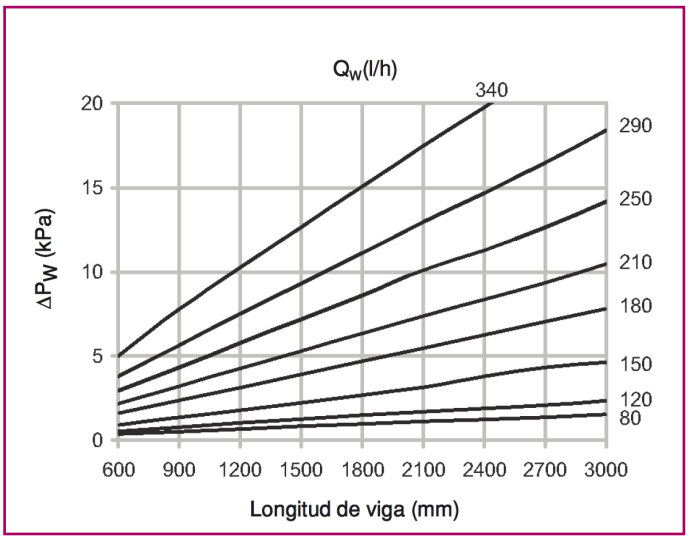
VFK 600 - G NOZZLE - 4-PIPE SYSTEM - HEATING																	
Length	Q_{pr}		L_W dB(A)	ΔP_{pr} (Pa)	X (m)	ΔT_{pr} (K)					ΔT_{SWIN} (K)						ΔP_W (kPa)
						6	7	8	9	10	10	15	20	25	30	35	
	l/s	m³/h				P_{pr} (W)					P_{SW} (W)						
600	12,5	45	<20	64	0,0	90	105	120	135	150	140	214	291	367	441	520	0,2
	16,9	61	20	117	1,4	122	142	162	183	203	164	248	337	426	515	605	
	20,0	72	24	164	1,6	144	168	192	216	240	177	266	361	459	555	651	
	24,4	88	29	244	1,0	176	205	234	264	293	190	284	386	493	598	701	
	30,0	108	35	368	2,4	216	252	288	324	360	198	293	402	518	630	742	
900	16,7	60	<20	50	1,1	120	140	160	180	200	182	279	367	458	550	646	0,3
	19,2	69	20	67	1,2	138	161	184	207	230	196	299	392	491	589	692	
	22,8	82	24	94	1,5	164	191	218	246	273	212	322	423	532	638	750	
	27,2	98	29	135	1,8	196	228	261	294	326	227	344	455	573	689	811	
	33,3	120	34	202	2,2	240	280	320	360	400	242	366	488	619	746	878	
1200	20,8	75	20	44	1,2	150	175	200	225	250	206	314	426	539	645	753	0,3
	25,0	90	25	64	1,4	180	210	240	270	300	225	342	464	587	702	820	
	30,6	110	30	95	1,7	220	256	293	330	366	247	374	507	641	766	897	
	36,1	130	34	133	2,0	260	303	346	390	433	265	400	542	684	819	961	
	44,4	160	40	202	2,5	320	373	426	480	533	288	431	583	735	881	1038	
1500	26,4	95	24	41	1,3	190	221	253	285	316	244	369	504	637	765	897	0,4
	31,9	115	29	60	1,6	230	268	306	345	383	265	401	547	693	831	975	
	38,9	140	35	88	1,0	280	326	373	420	466	288	434	591	748	898	1055	
	47,2	170	40	130	2,4	340	396	453	510	566	309	465	632	798	958	1126	
	56,9	205	45	190	2,9	410	478	546	615	683	328	492	665	839	1008	1185	
1800	27,8	100	24	31	1,3	200	233	266	300	333	263	393	528	665	798	934	0,5
	33,9	122	29	47	1,6	244	284	325	366	406	285	427	574	724	868	1016	
	40,6	146	34	67	1,9	292	340	389	438	486	305	457	616	777	930	1090	
	49,7	179	40	100	2,3	358	417	477	537	596	327	491	660	833	997	1170	
	60,8	219	45	150	2,8	438	511	584	657	730	346	520	698	880	1053	1239	
2100	38,9	140	25	37	1,7	280	326	373	420	466	423	637	849	1060	1274	1492	3,8
	47,2	170	30	55	2,0	340	396	453	510	566	467	706	938	1173	1411	1654	
	56,9	205	35	80	2,4	410	478	546	615	683	513	775	1030	1289	1550	1819	
	69,4	250	40	119	2,0	500	583	666	750	833	564	851	1131	1415	1702	1998	
	83,3	300	44	171	3,6	600	700	800	900	1000	611	919	1223	1531	1842	2160	
2400	45,8	165	25	40	1,8	330	385	440	495	550	478	720	962	1202	1441	1684	4,3
	56,1	202	30	59	2,2	404	471	538	606	673	527	797	1066	1333	1598	1868	
	66,7	240	34	84	2,7	480	560	640	720	800	571	864	1156	1446	1735	2028	
	81,9	295	39	127	3,3	590	688	786	885	983	624	943	1261	1578	1897	2218	
	101,4	365	45	194	4,0	730	851	973	1095	1216	677	1018	1361	1705	2053	2401	
2700	51,9	187	25	40	1,0	374	436	498	561	623	518	786	1046	1306	1571	1843	4,8
	62,5	225	30	58	2,4	450	525	600	675	750	565	859	1143	1427	1718	2018	
	76,4	275	35	87	2,9	550	641	733	825	916	620	941	1250	1561	1880	2208	
	93,1	335	40	129	3,5	670	781	893	1005	1116	675	1019	1354	1690	2034	2387	
	114,4	412	45	195	4,3	824	961	1098	1236	1373	730	1096	1455	1816	2184	2558	
3000	58,3	210	24	41	2,1	420	490	560	630	700	565	850	1135	1420	1706	1995	5,4
	72,2	260	30	63	2,6	520	606	693	780	866	622	936	1250	1565	1881	2202	
	87,5	315	35	92	3,1	630	735	840	945	1050	674	1011	1351	1694	2035	2384	
	104,2	375	39	131	3,7	750	875	1000	1125	1250	719	1075	1437	1803	2166	2538	
	127,8	460	44	197	4,6	920	1073	1226	1380	1533	767	1145	1529	1918	2303	2698	

Technical Data

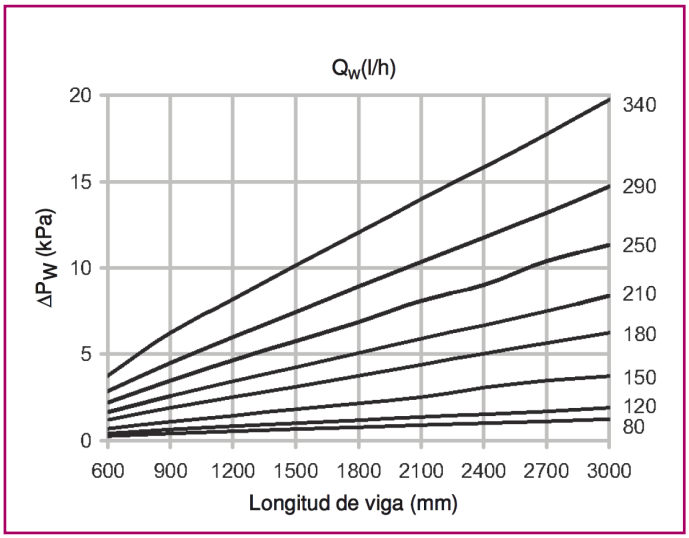
Pressure drop in water

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

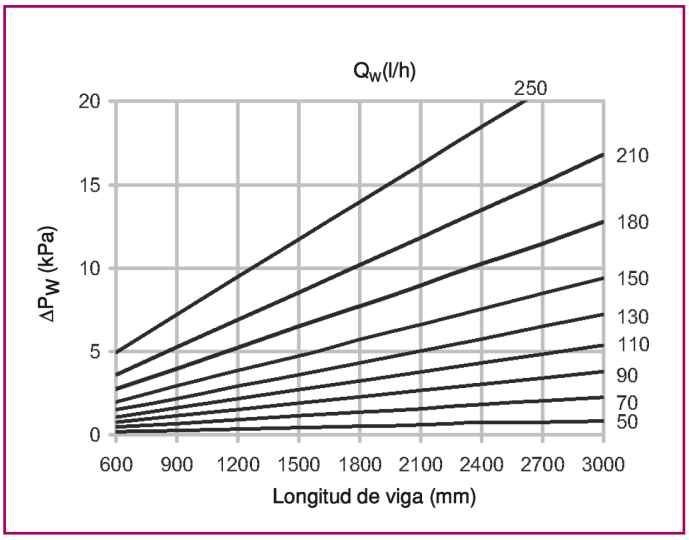
2-pipe system. Cooling - Heating



4-pipe system. Cooling



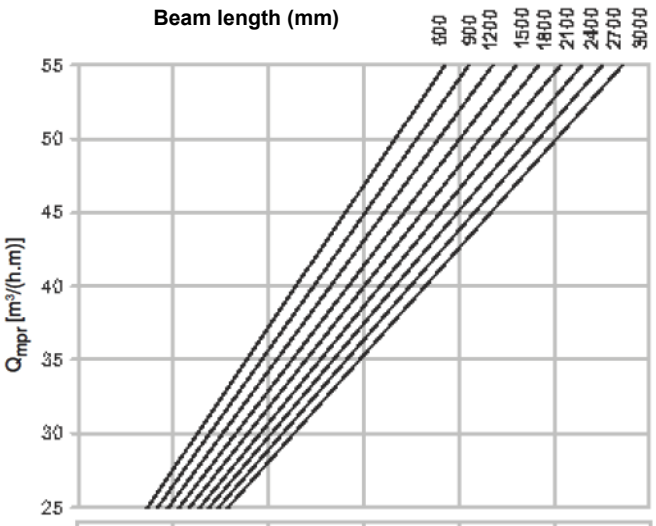
4-pipe system. Heating

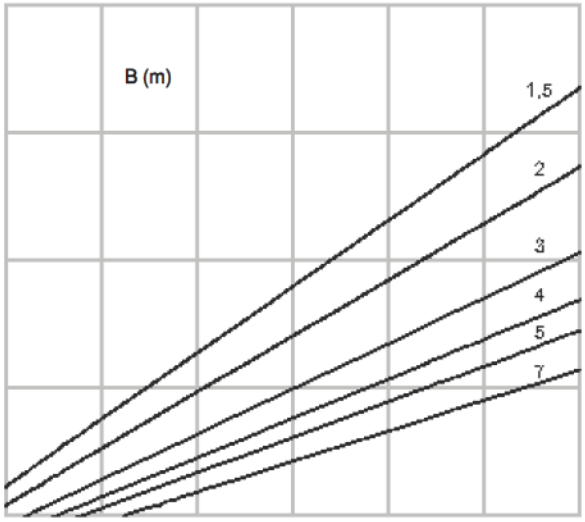


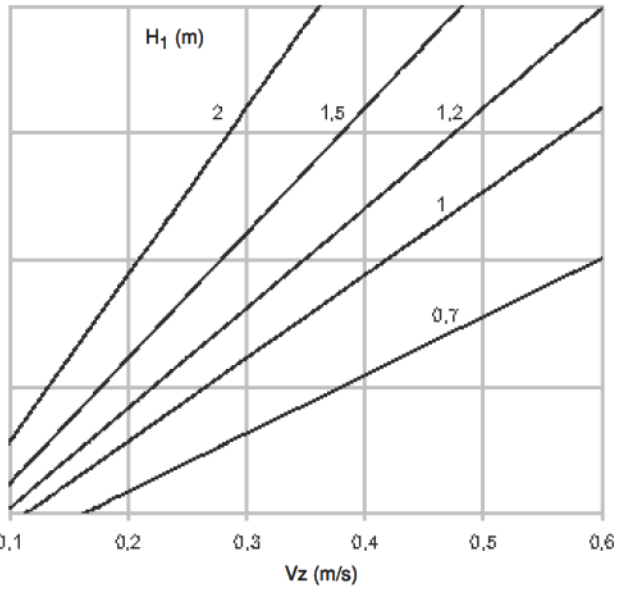
Technical Data

Velocity in occupied area. Air jet facing air jet

P-TYPE NOZZLE







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

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

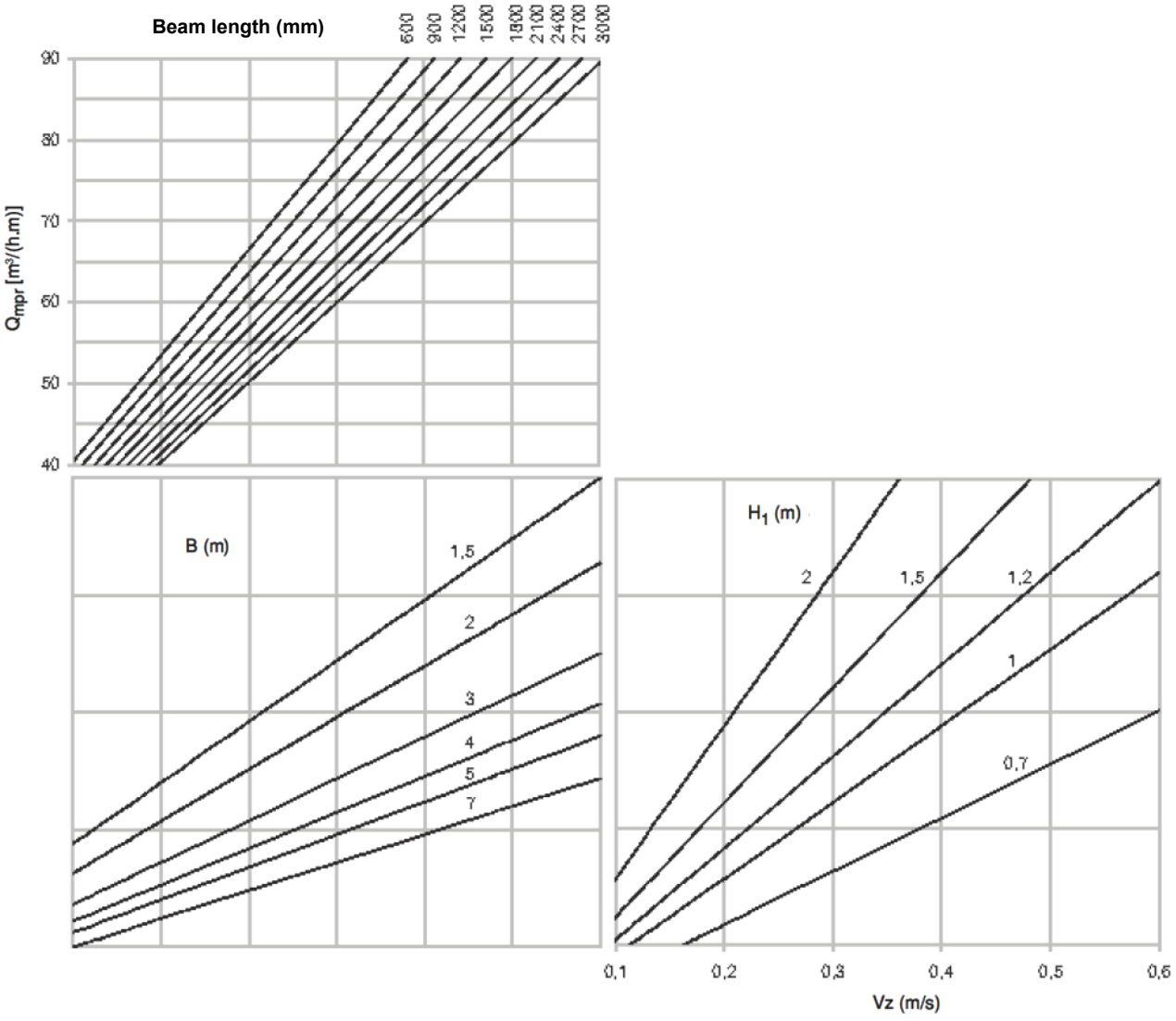
H_1: distance between the ceiling and the point where it is necessary to know the velocity, in m

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

Technical Data

Velocity in occupied area. Air jet facing air jet

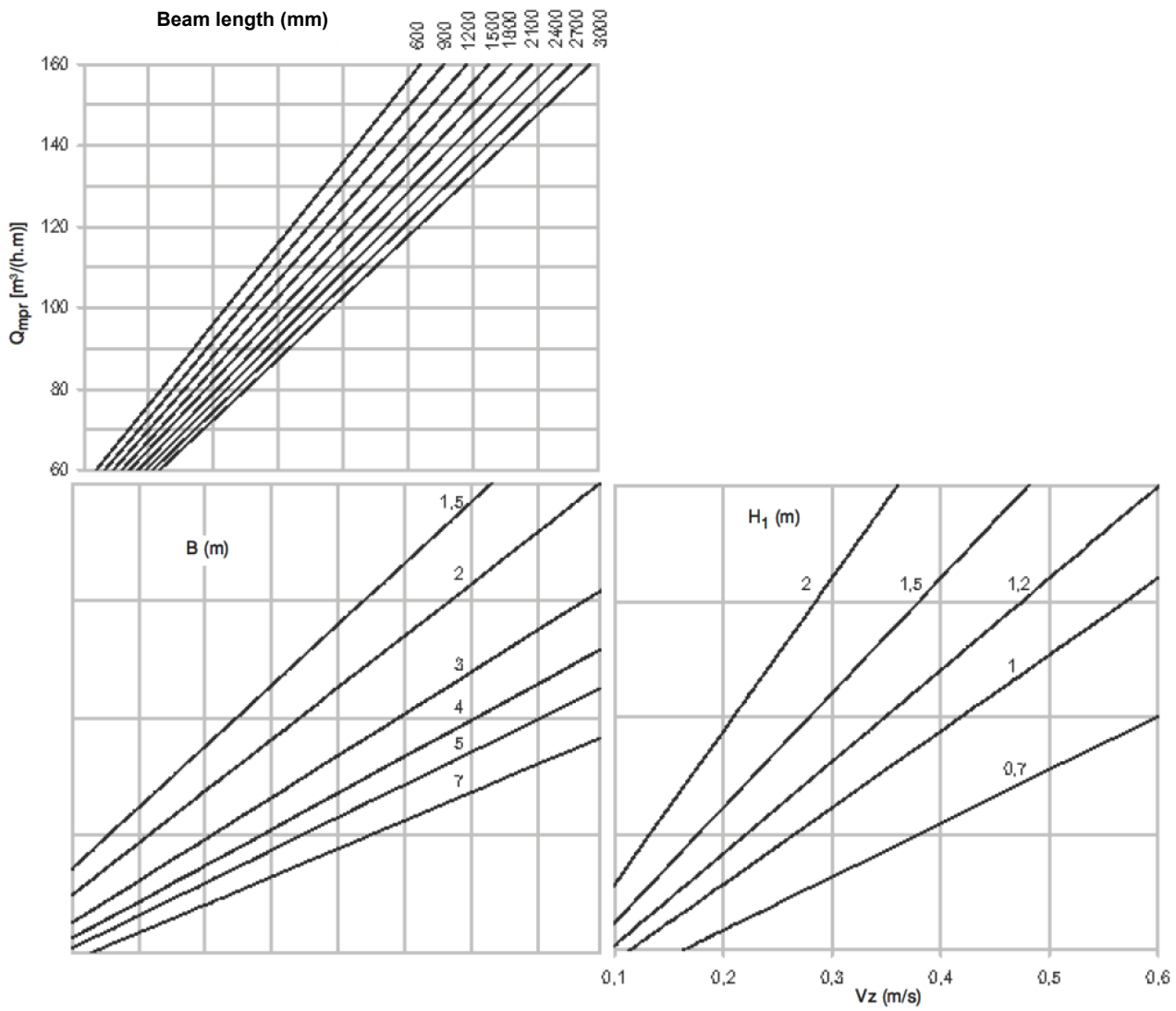
M-TYPE NOZZLE



Technical Data

Velocity in occupied area. Air jet facing air jet

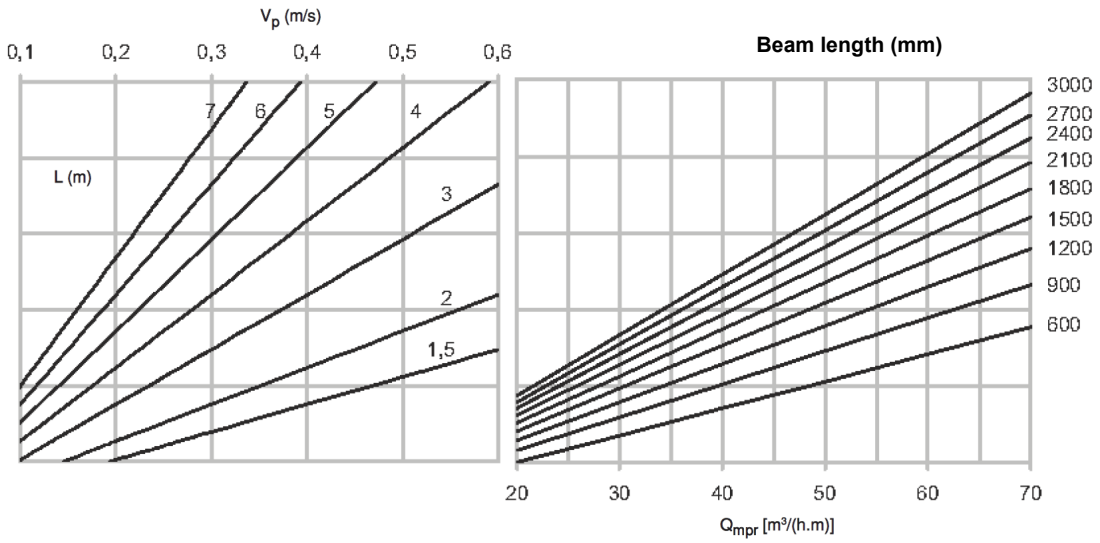
G-TYPE NOZZLE



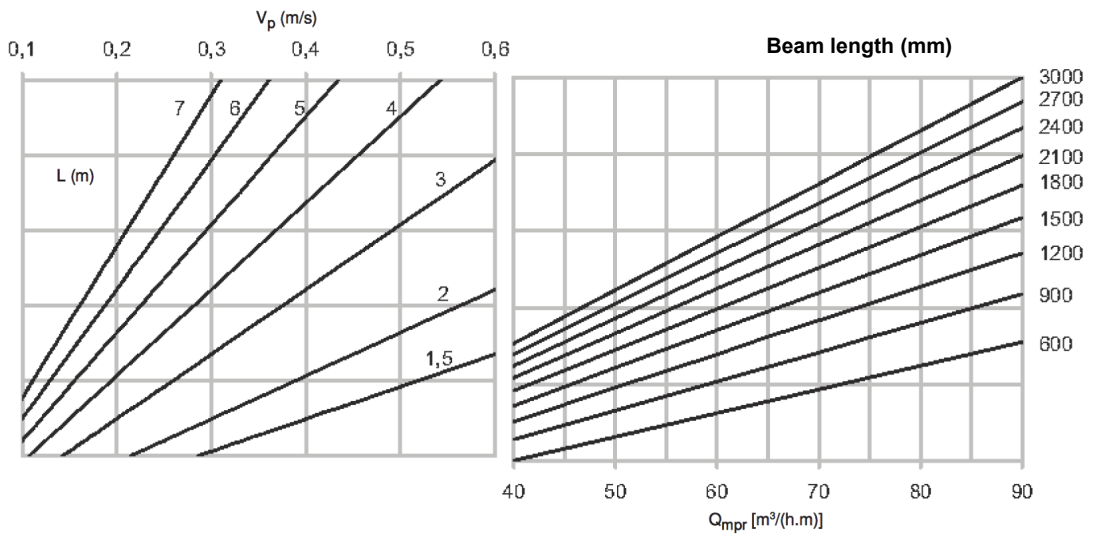
Technical Data

Velocity in occupied area. Air jet facing wall

P-TYPE NOZZLE



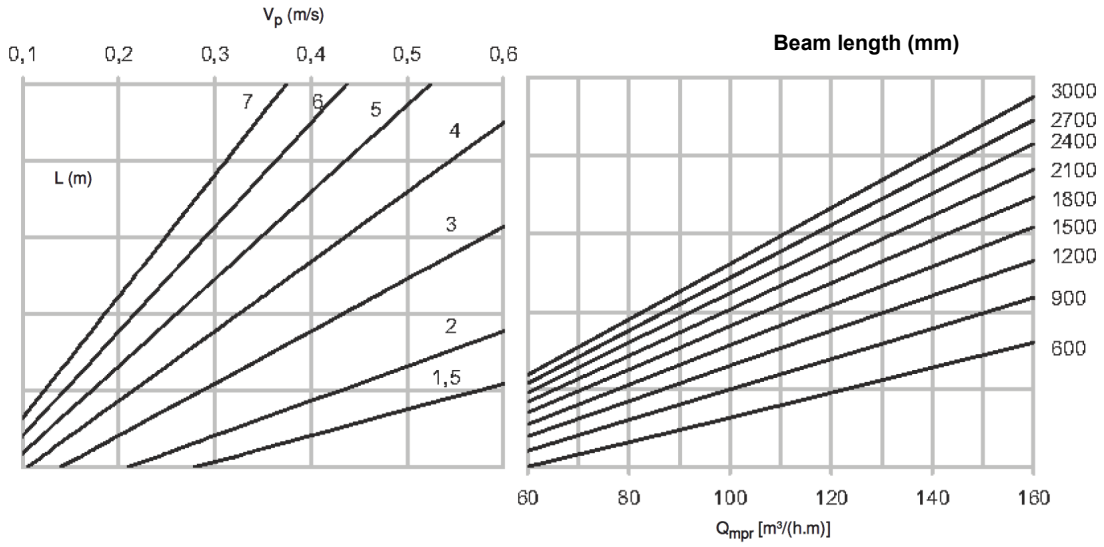
M-TYPE NOZZLE



Technical Data

Velocity in occupied area. Air jet facing wall

G-TYPE NOZZLE



Symbols

The symbols used in the selection charts on page 27 to 31 for the VFK 600 chilled beam are the following:

Q_{mpr} Primary air flow per linear metre of chilled beam, in $m^3/(h.m)$

B Distance between chilled beam centres, in m

H_1 Distance between the ceiling and the point where it is necessary to know the velocity, in m

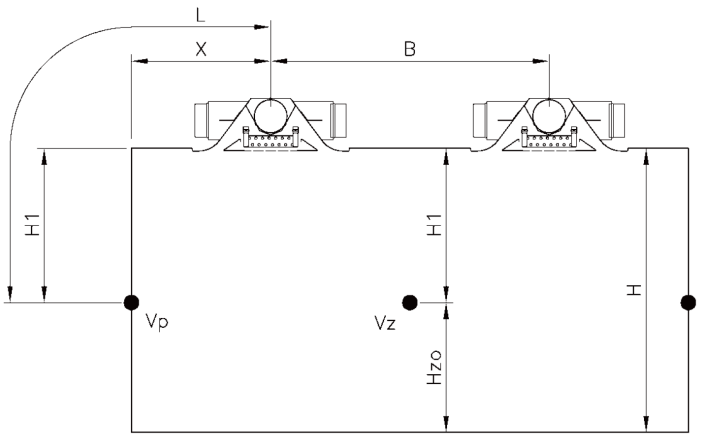
V_Z Maximum velocity in the occupied area, caused by convergence of two air jets together, in m/s

H_{Z0} Height of occupied area, in m

X Horizontal distance between chilled beam centre and wall, in m

L $= X + H_1$

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



Technical Data. Selection in a Sample Project

Air conditioning is to be provided using a 2-pipe air-water active chilled beam system, a single facade office module of 6x6x3 m (LxWxH). The thermal loads were calculated, giving a cooling requirement of 85 W/m^2.

Design conditions (cooling):

- Total sensible cooling load in the room to be handled, 3060 W.

- Ventilation air flow supply, 45 m^3/h per person, according to RITE Regulation, IDA 2.

- Maximum occupancy: 8

- Primary air temperature, 15º C.

- Internal room temperature of 24º , with a relative humidity of 50%, dew point 12,9º C.

- Water inlet temperature for beam, 15º C.

- Maximum water flow per beam, 150 L/h.

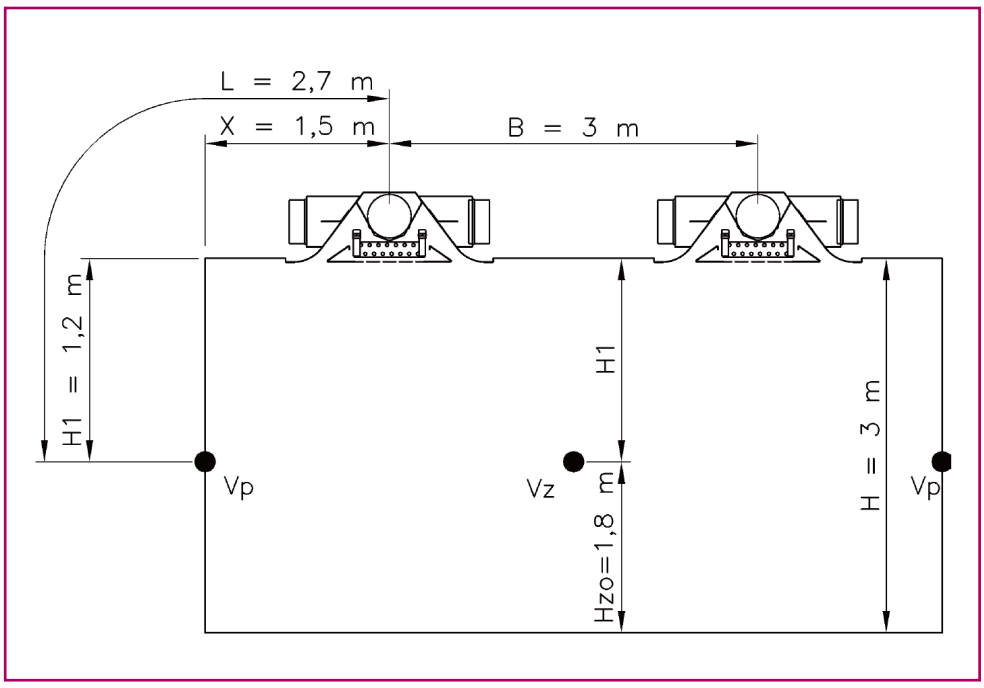
- Architectural conditions, ceiling grid of 1200x600 mm

- Maximum acceptable noise level, 35 dB(A).

- Maximum pressure drop of 150 Pa in the chilled beam

Solution:

An initial analysis of the selection table on page 15, i.e., if the preliminary calculations are done by assuming the various previously indicated design conditions, the selection can be started with 4 chilled beam units, VFK 600-1200-M-2 model, distributed (2x2) symmetrically in the room, as shown in the following drawings:



Technical Data. Selection in a Sample Project

Calculation of the technical data for the unit and primary air

Based on design conditions, the following are obtained as input data from the selection table on page 15:

- Previously selected chilled beam length: 1200 mm

- Primary air flow per beam, 90 m^3/h.

- Temperature difference between room and primary air, ΔT_{pr} = 9º C.

- Temperature difference between room and water inlet, ΔT_{SWIN} = 9º 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 W**, obtained from the expression, P_{pr} (W) = Q_{pr} (l/s) * 1,232 * ΔT_{pr}

- Capacity supplied per beam coil for a water flow rate of 250 l/h, P_{sw} = 600 W (data obtained directly from Table 1, after interpolation)

- Corrected coil power for a water flow rate of 150 l/h, **P_{sw} = 516 W**. Referring to the table of correction factors for water flow rate on page 17, the value of 600 W listed above must be multiplied by a factor of 0,86.

- Total capacity supplied per beam, **P_t = 786 W**, obtained from the expression Pt = Ppr + Psw

- Pressure drop in water for a flow rate of 150 l/h, **ΔP_w = 1,8 kPa**. (data obtained from the chart on page 26)

- Water temperature difference in coil, **ΔT_w = 3 ºC**, obtained from the expression P_{sw} (W) * 0,86 = Q_w (l/h) * ΔT_w

- Sound power level per beam, **L_w = 29 dB(A)** (data obtained directly from the table, after interpolation)

- Primary air pressure loss, **ΔP_{pr} = 114 Pa** (data obtained directly from table, after interpolation)

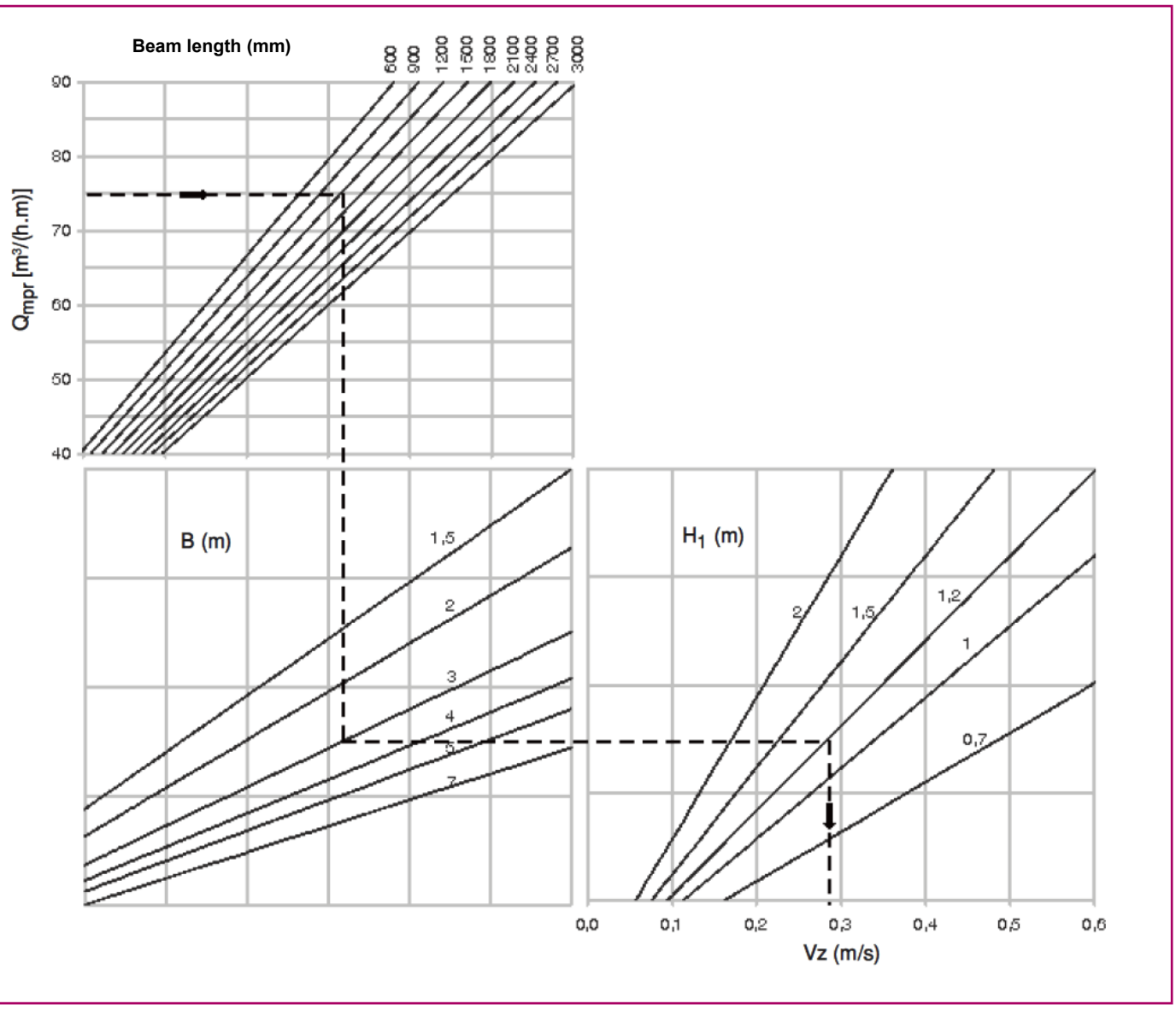
The total capacity supplied by the 4 active chilled beams installed in the room is P_t = 3.144 W, which is higher than the ma- ximum demand (3060 W), in other words, the selection by coil power is considered to be correct.

Technical Data. Selection in a Sample Project

Air flow calculations. Maximum velocity in occupied area (V_z) and air jet velocity at perimeter (V_p).

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

Flow per linear metre, Q_{mpr} = 90/1,2 = 75 m3/h*m
Distance between beam centres, B = 3 m
Height from ceiling to occupied area, H_1 = 3 - 1,8 = 1,2 m

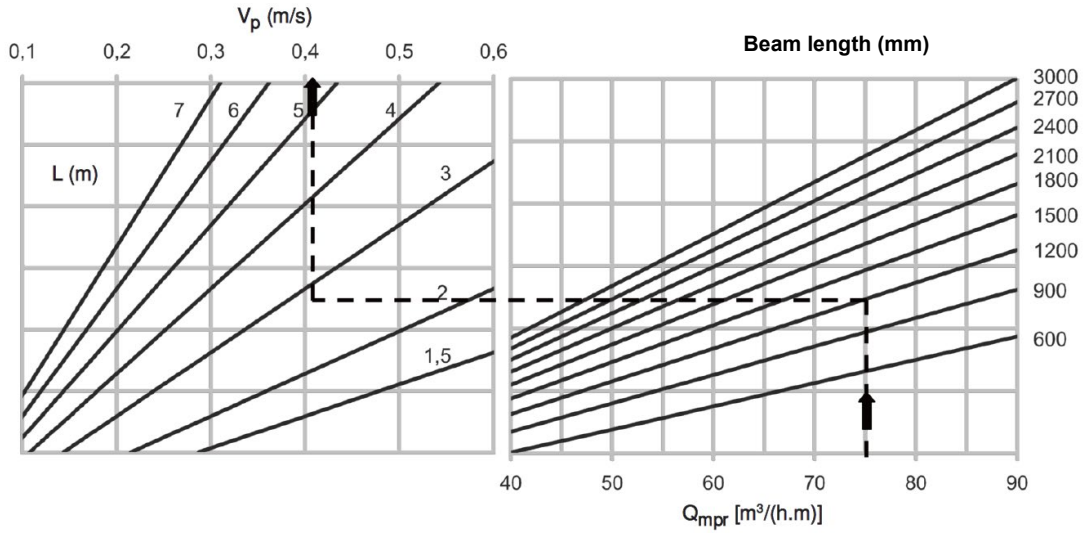


Value obtained from V_z = 0,28 m/s

Technical Data. Selection in a Sample Project

To obtain the terminal velocity of the air jet at the perimeter (V_p at a specific height from the floor, based on the 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 $m^3/h*m$
Distance L = X + H_1 = 2,7 m, where in X is the distance between the centre of the beams and the wall
Height from ceiling to occupied area, H_1 = 3 - 1,8 = 1,2 m



Value obtained from V_p = 0,41 m/s

Product Codes

Coding example of an order. All of the different models, sizes, accessories, etc., existing in the KOOLAIR VFK active chilled beam series are listed.

- Coding example

(a) (b) (c) (d) (e) (f) (g) (h) (i) (j) (k)
VFK 600 – 1200 – M – 2 – LD – P1V – E – SR – DF – RAL 9010 – others

(a): Model

VFK 600

(b): Length

VFK 600 : 600 – 900 – 1200 – 1500 – 1800 – 2100 – 2400 – 2700 – 3000 (mm)

(c): Nozzle configuration

- P
- M
- G

(d): Coil. Type of system.

- 2 2-pipe system coil
- 4 4-pipe system coil

(e): Air/water connection configuration

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

(f): Perforated induction rack design

- 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

(g): Type of ceiling

- Design of standard lay-in grid T-Bar ceiling
- E Unit design for continuous or plasterboard ceiling
- FL Tegular ceiling with drop face tiles

(h): Nozzle regulation system

- No nozzle adjustment
- SR Nozzle adjustment

Product Codes

(i): Air deflectors

- No deflector slats
- DF Deflector slats

(j): Finish

- RAL 9010 Standard finish in RAL 9010
- RAL … Finish in RAL paint upon request

(k): Other accessories or components

By special request on the order, other components can be requested, e.g.:

- Electric resistor For 2-pipe systems (chilled water), included inside the unit. Specify the power in watts (W) provided by it.

- Control valve Control and/or balancing valves can be included in the water connections by special order. Specify the model and type, as well as the respective servo drive if applicable.

- Condensation detector The unit can be fitted with a condensation detector attached to the surface of the chilled water inlet pipe by special order.

- Air flow adjustment Koolair has several different air regulation accessories that can be supplied along with the active chilled beam order. Refer to page 13.

Technical specifications

Induction active chilled beam, **VFK 600** model, of length **L** mm, width **B** mm and height 200 mm, for installation in modular or continuous false ceilings. Two linear slot diffusers are included on the sides, with M1 plastic air deflectors for horizontal air supply and Coanda effect of mixed (primary and secondary) air. Hinged front face for unit cleaning, with different perforation designs for room air induction. The interior of the unit includes a plenum box with nozzles (**P/M/G** type) to both sides for primary air supply, with a nozzle control mechanism. Inner horizontal coil of (**2/4 pipe**) for cooling and/or heating, copper pipes with thread connections (outer diameter, 12 mm) and aluminium fins. Equipped with (one/two) primary air connection(s) (**front/side/top**) of diameter Ø124 mm. Front tray, enclosures, sections manufactured entirely of galvanised steel sheet. The unit is fitted with supports for hanging from top slab. Standard finish paint (RAL9010). Other **RAL** colours upon request.

Multi-Service Active Chilled Beams, VFK 600-MS Series

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

Because the product is very specific, it should be customized to the project needs at the beginning. The technical data in this beam are of the VFK 600 listed on pages 14-36.

An example of a VFK 600-MS active chilled beam with a row of LEDs, an sprinkler and an speaker flush-mounted in the beam housing is shown below:

VFK 600-MS chilled beams with row of lights, an sprinkler and an speaker.

The elements that are integrated into the VFK 600-MS are:

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

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