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AIR VOLUME CONTROL SYSTEMS

11/2016

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AIR VOLUME CONTROL SYSTEMS

VENTS

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2016

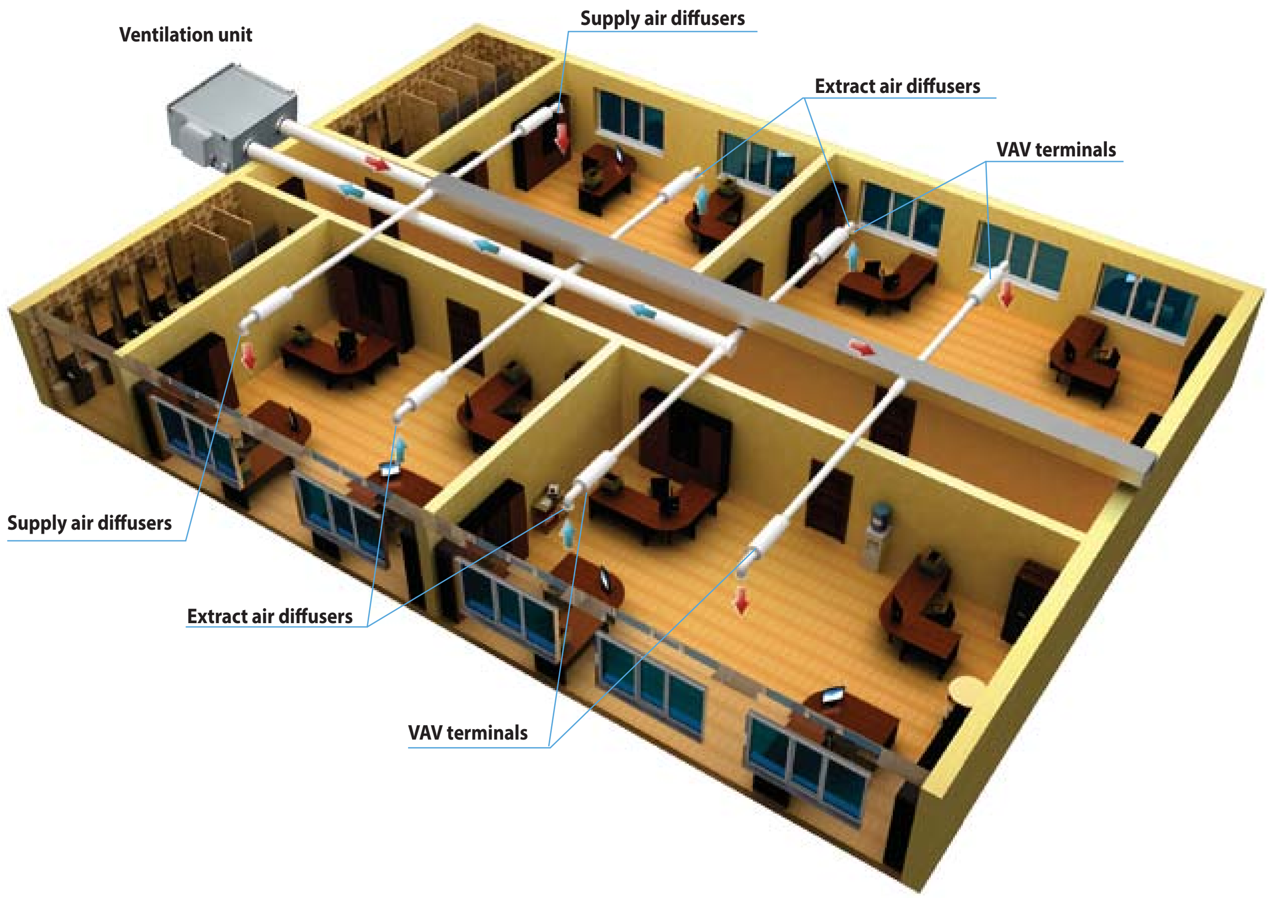
CONTENT

GENERAL INFORMATION

Usually, some of the most important elements of climate control systems go unnoticed. This is because they are ment to. The main goal of any ventilation system is to make people feel comfortable without any interruptions into ther comfort. The air distribution system in a building is responsible for maintaining appropriate levels of comfort in air quality, temperature, and moisture level consuming the least possible amount of energy at the same time. An example of such a system is a variable air volume, or VAV, system. A VAV system is a type of air distribution system that supplies one specific temperature of air to each space in a building but controls the temperatures within the building by changing the amount of air supplied to each space. In other words it compensates heat losses in a way, sufficient to maintain the set temperature. The different parts of this system include the air handling unit, the supply ductwork system, air distribution units and the return/exhaust ductwork system.

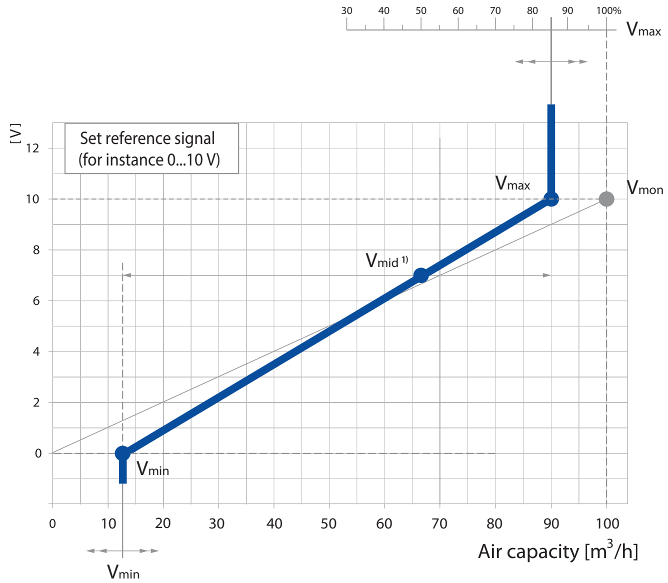
KEY ADVANTAGES OF VAV VENTILATION SYSTEM:

- Individual control of air parameters in separate premises;
- Application of CO_2 sensors, RH sensors, time relays to regulate the airflow;
- Reducing capital investmens, mounting and commissioning costs;
- Reducing energy consumption;
- Simplification of commissioning of the system;
- Continious control of airflow in separate branches of the system;
- Integration into BMS via MPbus, BACnet, MODbus, EIB/KNX;
- Easy redesigning of the system due to new conditions.



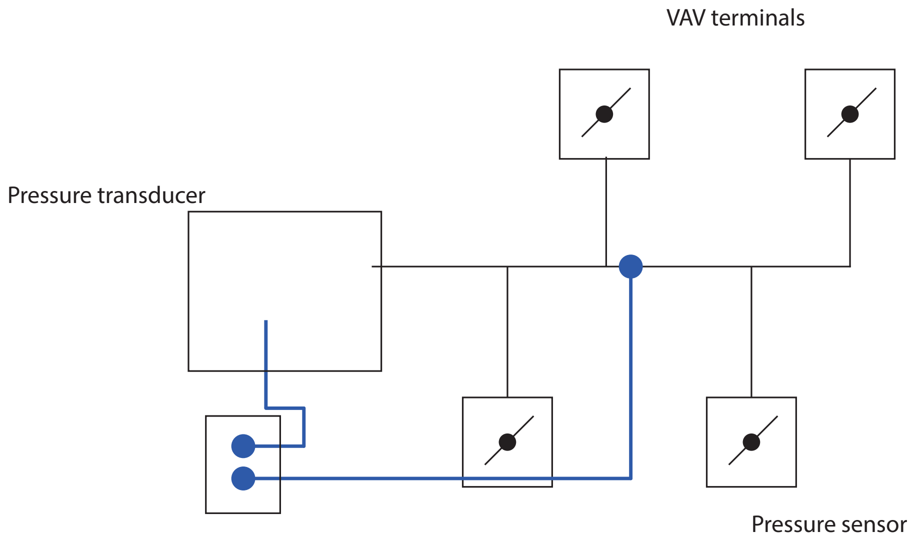
GENERAL CONCEPTS OF VARIABLE AIR VOLUME TERMINALS

As it mentioned before VAV systems are the most energy efficient and effective ventilation systems available at the moment. One of the key specific differences from conventional ventilation systems lies in supplying air with constant temperature. Climate control is ensured by supplying the exact air volume needed at every single moment. The quantity of air to be supplied is determined by the reference set parameter (air temperature, relative humidity, CO_2 level etc.). Therefore demand controlled ventilation principle is provided.

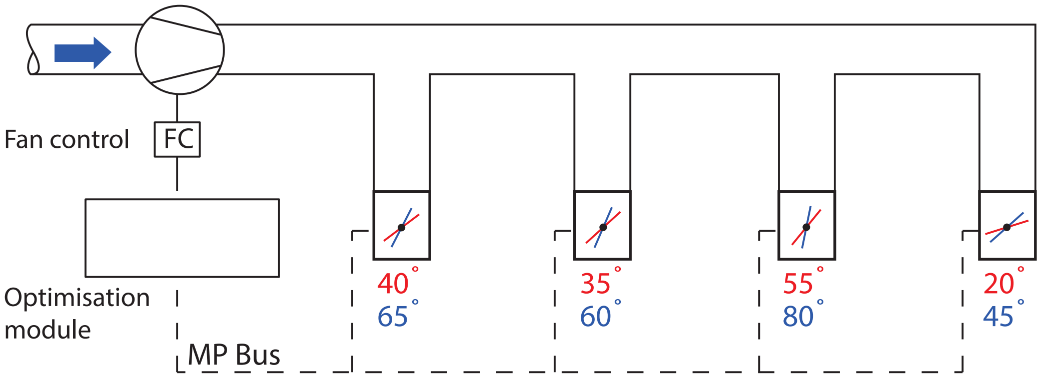


Application of VAV system concepts contains great energy-saving potential. Obviously that primary consumers of energy in any ventilation systems are motor drive and air heater/cooler. As the temperature of air in the system is constant (of course it's different for heating or cooling mode) the air heater/cooler operates at stable parameters. So, fluctuations of temperature are excluded and therefore consuming of energy remanis at permanent level.

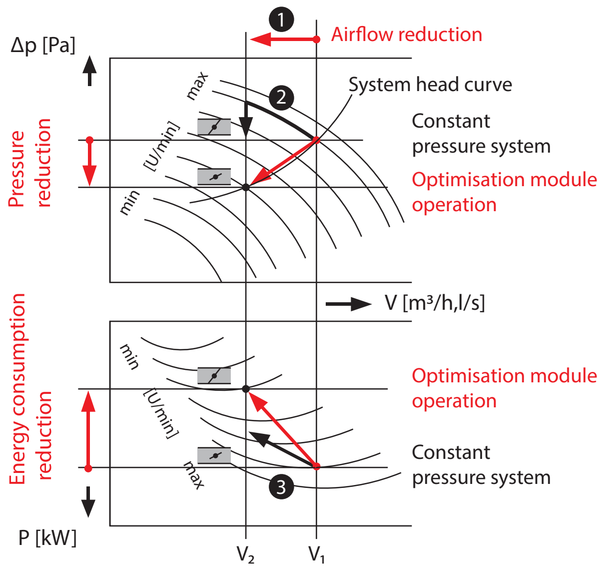
Great attention should be paid to the way how operating of the fan is controlled in VAV ventilation system. Operation of VAV terminal does not depend on the pressure in the system. Every terminal in the system measures the current airflow, compares it to the reference set value and adjusts the damper position duly. Thus, fan does not have to maintain high dynamic pressure in the systems. It rather should provide minum sufficient pressure needed to distribute air to the most distant terminal in the system. So, when the demand decreases, fan RPM also gets down along with the energy consumption. Pressure in the system is measured by the pressure transducer connected to the fan drive. Refference pressure is set while commissioning and the pressure transducer indicates its fluctuations and increases/decreases fan RPM accordingly. Described approach to fan drive controll is called Constant Pressure system.



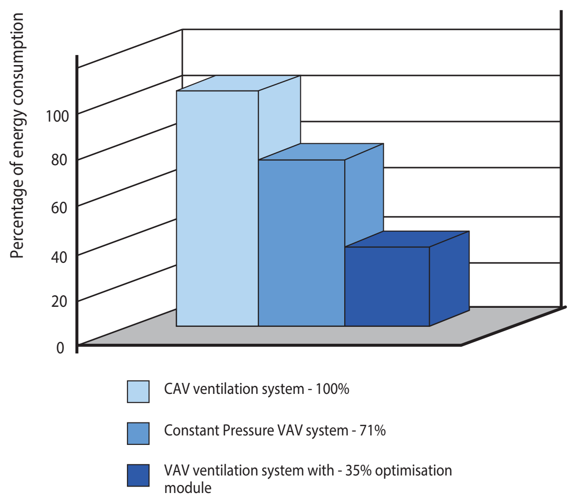
There is also more efficient way (there always is!) to control the fan preformance. It consists in control the damper position of the VAV terminal. Main role in that method is dedicated to the optimisation module. The module seeks the most opened damper in the system and adjusts the fan speed in a way that this damper opens till the angle of 80 degrees, so the other dampers in the system open along with the most opened one. Therefore fan operates at the minimum possible RPM to provide the set airflow.



The following diagrams show undisputable advantage of using the optimisation module compared to Constant Pressure system.

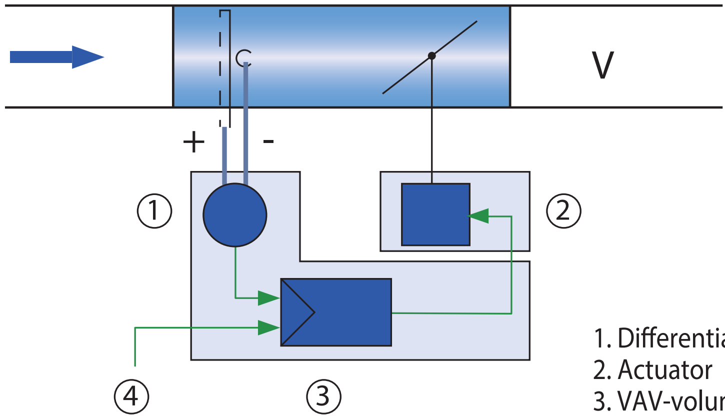


Comparative diagram is given below.



VAV TERMINAL CONSTRUCTION

Variable air volume terminal basically consists of case with damper, differential pressure transducer, volume flow controller and reference setpoint signal device.



1. Differential pressure transducer
2. Actuator
3. VAV-volume flow controller
4. Setpoint value signal

1. Differential pressure transducer

Differential pressure transducer is intended to measure pressure differential between static and full pressure determining air stream velocity and eventually current airflow via VAV terminal. It is crucial to maintain minimum permissible air stream speed to enable correct airflow measurement. In our terminals we use fully tested state-of-the-art duct probes which makes possible to keep inaccuracy in range of +/-5%.

2. Actuator

Actuator smoothly moves the damper due to setpoint signal from the volume flow controller. It has analog signal output. Torque of actuators we apply in VAV terminals makes possible to control dampers with area up to 8 m^2. Initial position of the damper and responce time can be adjusted on site via NFC technolodgy or a programmer. Detailed information available on request.

3. Volume flow controller

Volume flow controller forms a setpoint signal for the acuator. It has two inputs. One among them is meant for differential pressure transducer giving the actual arflow via the valve and another-one is supposed for connection of stepoint value signal device either room thermostat, CO_2 sensor, RH sensor, motion sensor or so-like device. Volume flow controller is programmed for V_{min} and V_{max} on factory but easily can be reprogrammed on site via programmer, PC tool or external protocols MPbus, BACnet, MODbus, EIB/KNX.

KPR
SERIES

■ **Application**

Basically KPR series involves two modifications:

— KPR terminals for constant/variable air volume (VAV/CAV) operation mode;

— KPR STP terminals for static pressure control (STP mode);

KPR terminal units are meant for precise airflow control in zones of ventilation systems based on Demand Control Ventilation principle. Circular non-insulated VAV terminal units are suitable for supply or extract air and are available in wide size ranges. The control unit itself consist of 3 devices in one case:

— Differential pressure sensor used for pressure/airflow indicating;

— VAV controller used for allowing VAV/CAV operating mode;

— Damper Actuator controlled with analog signal 0/2-10 V.

KPR STP terminal units shall be employed at positive/negative pressure control applications (clean rooms, hospitals, laboratories etc.) for precise and highly responsive regulating. Circular non-insulated STP terminal units are suitable for supply or extract air and are available in wide size ranges. The unit itself consist of 3 devices in one case:

— Differential pressure transducer used for pressure indicating;

— VAV controller used for allowing VAV/CAV operating mode;

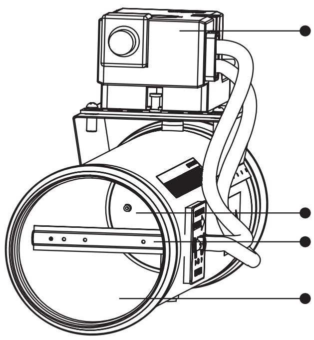
— Damper Actuator controlled with analog signal 0/2-10 V.

■ **Design**

KPR terminals employ measurement and control of volume flow rates based on a Pitot measurement principle jointly with PID VAV controller. Pitot tube communicates the differential pressure to the controller that in turn evaluates the damper position. This results in high control accuracy even in case of unfavorable flow conditions. The differential pressure sensor is resistant to dust and pollution.

KPR STP terminals use measurement and control of volume flow is carried out with employment of static pressure sensor VFP. VRP-M controller operates within the set range of pressure between the minimum and the maximum pressure. There are a few operation modes available: modulating between P-min and P-max, fixed step operation modes: CLOSED/Pmin/Motor stop/Pmax/OPEN and modulating between P-min and P-max with override into one of the following modes: CLOSED/Pmin/Motor stop/Pmax/OPEN. Static pressure sensor VFP uses a high-quality metal diaphragm as a sensor element. Pressure stroke the diagram and its deformation is tracked inductively and further converted into a linearized pressure output signal. Note that the sensor is factory-calibrated to be deployed in its vertical position. Otherwise mounted sensor needs recalibrating.

Factory-set and ready-to-commission unit consists of the mechanical parts and the electronic control components. Optional factory calibrated controls could be provided to meet all control strategies. Spigot with lip seal for circular connecting ducts ensures tight connection to the ducting. Position of the damper blade indicated externally at shaft extension. In addition, units possess an integrated NFC module ensuring non-contact communication and adjustment of application data such as Vmin and Vmax etc. via Android application. Casing and damper leakage are complied with: Closed blade air leakage to EN 1751, class 4; Casing air leakage to EN 1751, class C.

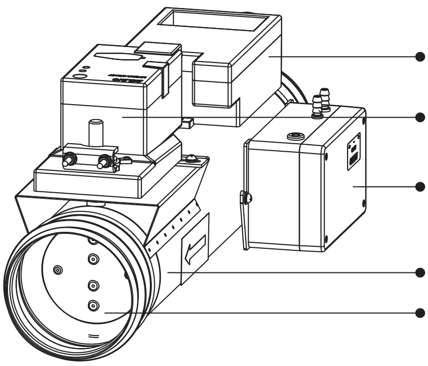


— **VAV controller unit** - contains integrated drive, PID controller and differential pressure transducer;

— **Damper blade** – is sealed to comply with EN 1751. Damper rotates in a self-lubricating, long life, low friction thermoplastic bearing;

— **Differential pressure sensor** – enables measuring the differential pressure even at low velocities between 1 to 10 m\s;

— **Casing** – is sealed with double lip seal on both ends to comply with EN 1506.



Continuously welded to minimaze leakage.

— **VRP-M controller unit -** PID controller with adaptive algorithms as well as communication protocol MP that could be subsequently converted into LONWorks, BACnet, Modbus, KNX;

— **Damper blade –** is sealed to comply with EN 1751;

— **Differential pressure sensor VFP –** enables measuring the differential pressure even at low velocities between 1 to 10 m\s;

— **Casing –** is sealed with double lip seal on both ends to comply with EN 1506 Continuously welded to minimaze leakage;

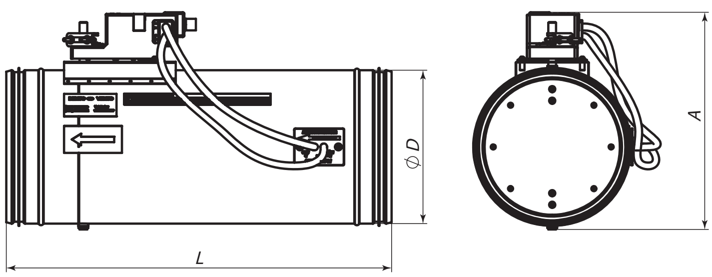
— **Drive MQ24A-SRV-ST –** ensures high precision control by extremely low react time – 2.5 s.

Special features of the control device provide integration into BMS systems via a variety of interfaces

Control function	Controller	Differential pressure transducer	Actuator	Communication protocol	Feedback value
VAV/CAV	LMV-D3-MP	Dynamic, integral	Integral	MPbus	Actual volume, Damper position, dP measurement
VAV/CAV	LMV-D3-LON	Dynamic, integral	Integral	LONWorks	Actual volume, Damper position, dP measurement
VAV/CAV	LMV-D3-KNX	Dynamic, integral	Integral	KNX	Actual volume, Damper position, dP measurement
VAV/CAV	LMV-D3-MOD	Dynamic, integral	Integral	MODbus	Actual volume, Damper position, dP measurement
VAV/CAV	LMV-D3-BAC	Dynamic, integral	Integral	BAC net (additionally requires UK24BAC)	Actual volume, Damper position, dP measurement
STP	VRP-M	VFP-100 (0-100 Pa) Static, external	MQ24A-SRV-ST	MPbus (LON, KNX, MODbus and BACnet can be obtained via UK24LON/BAC/MOD	Damper position
STP	VRP-M	VFP-300 (0-300 Pa) Static, external	MQ24A-SRV-ST	MPbus (LON, KNX, MODbus and BACnet can be obtained via UK24LON/BAC/MOD	Damper position
STP	VRP-M	VFP-600 (0-600 Pa) Static, external	MQ24A-SRV-ST	MPbus (LON, KNX, MODbus and BACnet can be obtained via UK24LON/BAC/MOD	Damper position

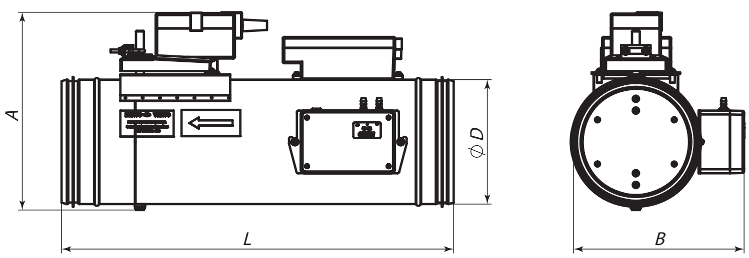
Overall dimensions of KPR terminal units

Designation	Dimensions, [mm]			Mass [kg]
	⌀ D	L	A	
VAV/CAV terminal unit KPR 80	79	500	159	1.64
VAV/CAV terminal unit KPR 100	99	500	185	1.87
VAV/CAV terminal unit KPR 125	124	500	206	2.16
VAV/CAV terminal unit KPR 150	149	500	233	2.45
VAV/CAV terminal unit KPR 160	159	500	242	2.57
VAV/CAV terminal unit KPR 200	199	500	282	3.07
VAV/CAV terminal unit KPR 250	249	500	331	3.73
VAV/CAV terminal unit KPR 315	314	500	398	5.05
VAV/CAV terminal unit KPR 400	399	650	485	8.43
VAV/CAV terminal unit KPR 500	499	760	586	12
VAV/CAV terminal unit KPR 630	629	830	717	16.56

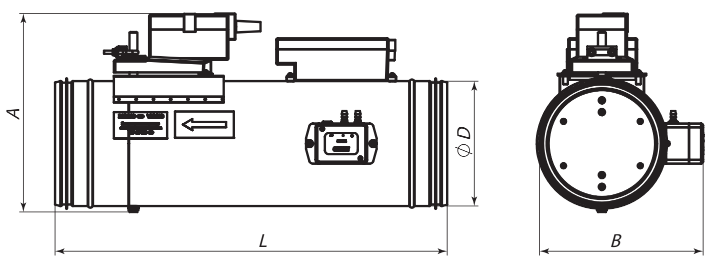


Overall dimensions KPR STP terminals

Designation	Dimensions, [mm]				Mass [kg]
	ø D	A	B	L	
STP terminal unit KPR 80 STP - 100	79	171	154.5	500	2.77
STP terminal unit KPR 80 STP - 300; -600			145.5		2.55
STP terminal unit KPR 100 STP - 100	99	195	164.5	500	2.99
STP terminal unit KPR 100 STP - 300; -600			155.5		2.77
STP terminal unit KPR 125 STP - 100	124	219	182	500	3.27
STP terminal unit KPR 125 STP - 300; -600			173		3.05
STP terminal unit KPR 150 STP - 100	149	243	207	500	3.57
STP terminal unit KPR 150 STP - 300; -600			198		3.35
STP terminal unit KPR 160 STP - 100	159	252	217	500	3.68
STP terminal unit KPR 160 STP - 300; -600			208		3.46
STP terminal unit KPR 200 STP - 100	199	292	257	500	4.17
STP terminal unit KPR 200 STP - 300; -600			244		3.95
STP terminal unit KPR 250 STP - 100	249	342	282	500	4.82
STP terminal unit KPR 250 STP - 300; -600			264		4.6
STP terminal unit KPR 315 STP - 100	314	408	338	500	5.72
STP terminal unit KPR 315 STP - 300; -600			320		5.5
STP terminal unit KPR 400 STP - 100	399	498	399	500	7.99
STP terminal unit KPR 400 STP - 300; -600					7.77
STP terminal unit KPR 500 STP - 100	499	598	499	600	11.09
STP terminal unit KPR 500 STP - 300; -600					10.87
STP terminal unit KPR 630 STP - 100	629	728	629	600	14.04
STP terminal unit KPR 630 STP - 300; -600					13.82



KPR STP-100

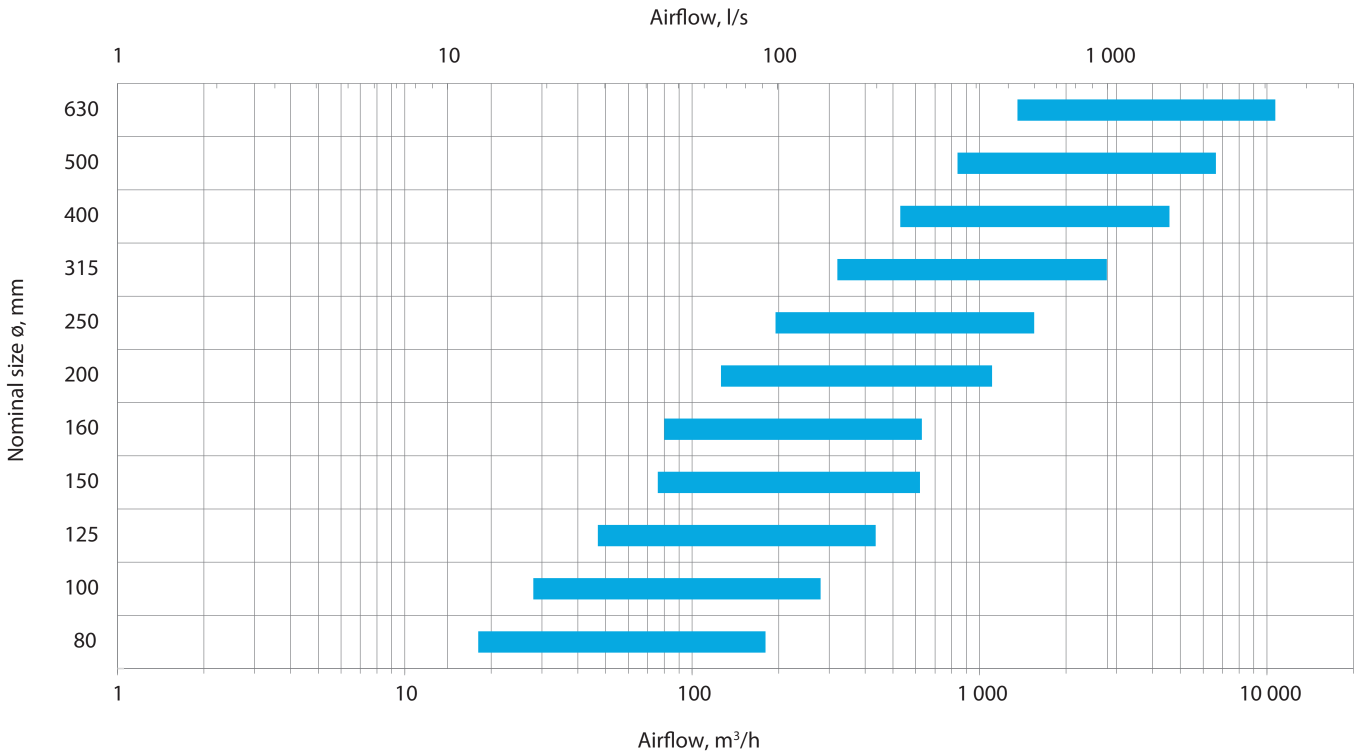


KPR STP-300, 600

Volume flow ranges and effective pressure

Nominal size	Airflow		ΔPef	Δ Airflow
	l/s	m³/h	Pa	%
80	5	18	2	17
	12	44	12	12
	28	100	70	6
	48	180	200	3
100	8	28	2	17
	35	126	40	9
	63	227	125	6
	78	280	198	3
125	13	47	2	17
	30	180	30	9
	80	295	80	5
	121	435	175	3
150	21	76	2	17
	108	389	55	8
	145	522	90	5
	172	620	125	3
160	22	80	2	17
	110	396	50	8
	156	562	100	5
	175	630	125	3
200	35	126	2	17
	194	700	60	9
	280	1010	125	2
	307	1105	150	3
250	54	195	2	17
	258	929	45	9
	365	1314	90	6
	430	1550	125	2
315	89	320	2	17
	562	2023	80	8
	703	2530	125	2
	770	2772	150	3
400	147	530	2	17
	656	2360	40	8
	984	3543	90	5
	1271	4576	150	3
500	233	838	2	17
	1166	4198	50	8
	1475	5310	80	5
	1844	6639	125	2
630	376	1354	2	17
	1878	6761	50	8
	2655	9558	100	4
	2969	10689	125	2

Quick selection diagram



Discharge sound power level depending on airflow and static pressure Legend:

Ps – differential static pressure of the VAV terminal unit. Refference for damper position (nearly closed/nearly open/open/fully open etc.);
Lwa–A-weighted sound power level at discharge.

	Qv, m³/h	Ps, Pa	L_{wa} dB(A)	Non-weighted sound power level, dB/Oct							
				63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
KPR 80	44	100	43	42	44	42	42	39	32	25	20
		250	53	44	45	48	50	49	44	40	35
		500	61	46	47	52	56	57	52	51	47
		750	66	48	48	54	59	62	58	58	54
		1000	69	48	48	56	62	65	61	63	58
	100	100	63	61	64	63	60	58	56	52	48
		250	69	59	63	65	66	64	60	56	53
		500	73	58	63	67	71	69	63	60	56
		750	75	57	63	69	73	72	65	62	59
		1000	77	56	63	70	75	73	66	63	60
	180	100	73	70	73	71	68	67	67	64	60
		250	76	66	71	73	73	71	68	64	60
		500	78	63	70	74	77	74	68	64	61
		750	80	61	69	75	79	76	69	64	61
		1000	81	60	69	76	81	77	69	64	61

	Qv, m³/h	Ps, Pa	L_{wa} dB(A)	Non-weighted sound power level, dB/Oct							
				63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
KPR 100	126	100	50	53	56	50	47	45	39	31	25
		250	58	52	56	55	55	54	48	43	38
		500	64	52	55	60	61	60	55	53	48
		750	68	51	55	62	64	64	59	59	54
		1000	71	51	55	64	67	66	63	63	58
	227	100	57	54	58	54	56	52	49	43	40
		250	67	59	64	65	66	63	58	53	50
		500	75	62	69	72	74	71	65	61	58
		750	79	65	72	77	78	75	69	65	62
		1000	83	66	74	80	82	79	72	68	65
	280	100	61	54	59	56	59	55	54	49	47
		250	72	62	68	69	71	67	63	58	55
		500	80	67	75	78	80	75	70	64	62
		750	85	71	79	83	85	80	74	68	66
		1000	89	73	82	87	88	84	77	70	68
KPR 125	180	100	50	53	56	49	49	44	39	30	25
		250	58	54	56	56	57	52	48	43	38
		500	64	56	56	60	63	58	56	52	49
		750	68	56	57	63	66	62	60	58	55
		1000	71	57	57	65	69	64	64	62	59
	295	100	57	62	65	58	55	51	45	40	35
		250	67	65	69	67	66	62	56	51	47
		500	75	67	72	74	75	70	64	59	56
		750	80	68	75	79	80	75	69	64	61
		1000	83	69	76	82	83	78	72	68	64
	435	100	60	66	68	62	58	54	48	45	40
		250	72	69	75	73	71	66	59	55	51
		500	80	72	80	81	80	75	68	62	59
		750	86	74	83	86	86	80	73	67	63
		1000	90	75	85	89	90	84	76	70	67
KPR 150	389	100	54	63	63	56	53	47	40	33	27
		250	65	65	68	66	64	59	53	47	42
		500	73	66	72	73	72	68	63	58	53
		750	78	67	74	78	77	73	69	64	60
		1000	82	68	75	81	80	77	73	68	65
	522	100	60	63	65	60	58	55	49	46	41
		250	70	68	73	70	69	65	60	56	52
		500	79	72	80	79	78	73	67	63	59
		750	83	75	84	83	82	77	72	67	64
		1000	87	77	87	87	86	81	75	70	67
	620	100	63	63	65	61	60	59	54	51	48
		250	73	70	76	73	71	68	63	59	56
		500	81	75	84	81	80	75	69	65	62
		750	85	78	88	86	85	79	73	69	66
		1000	89	80	92	90	89	82	76	71	68

	Qv, m³/h	Ps, Pa	L_{wa} dB(A)	Non-weighted sound power level, dB/Oct							
				63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
KPR 160	396	100	52	58	59	52	52	46	39	32	25
		250	61	57	61	60	60	56	52	45	40
		500	69	56	62	65	67	64	61	55	51
		750	73	55	63	68	70	68	67	61	58
		1000	77	55	64	71	73	72	71	65	62
	562	100	60	67	65	59	58	55	49	44	39
		250	69	69	72	69	68	64	59	54	50
		500	76	71	77	76	75	71	67	62	58
		750	81	72	81	81	80	75	71	66	63
		1000	84	73	83	84	83	78	74	69	66
	630	100	64	70	68	62	61	59	54	50	45
		250	73	74	77	73	71	68	62	58	55
		500	80	77	84	81	79	74	69	65	61
		750	85	79	88	86	84	78	73	69	66
		1000	88	81	91	89	87	81	76	71	68
KPR 200	700	100	55	66	61	54	55	46	40	33	26
		250	63	63	64	62	63	57	53	46	41
		500	71	62	66	68	70	65	62	56	52
		750	75	61	68	71	73	70	68	62	58
		1000	79	60	69	74	76	74	72	67	63
	1010	100	61	77	69	60	59	55	49	44	39
		250	70	78	75	70	69	64	60	55	50
		500	78	80	80	78	77	71	68	63	58
		750	82	81	83	82	81	75	72	67	63
		1000	85	81	85	86	84	78	75	71	67
	1105	100	65	81	72	62	61	60	54	49	44
		250	74	85	80	74	72	68	63	58	54
		500	81	88	86	82	80	74	70	66	61
		750	86	90	90	87	85	78	74	70	66
		1000	89	91	92	91	88	80	77	73	69
KPR 250	929	100	55	59	60	55	55	48	42	34	27
		250	64	59	63	63	63	58	53	47	41
		500	70	59	66	69	69	65	62	57	52
		750	75	59	68	72	72	70	67	63	59
		1000	78	60	69	75	75	73	71	67	63
	1314	100	59	72	66	60	58	52	47	41	35
		250	69	72	73	70	68	62	58	53	47
		500	76	74	78	77	75	70	66	62	57
		750	81	74	81	82	80	74	71	67	62
		1000	84	75	83	85	83	78	75	71	66
	1550	100	62	78	69	62	60	54	50	44	38
		250	71	79	77	73	70	64	60	55	50
		500	79	81	83	81	78	72	68	64	59
		750	84	82	87	86	83	76	73	69	64
		1000	87	82	90	90	86	80	76	72	68

	Qv, m³/h	Ps, Pa	L_{wa} dB(A)	Non-weighted sound power level, dB/Oct							
				63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
KPR 315	2023	100	57	64	66	57	55	51	46	37	28
		250	67	65	70	67	64	62	57	50	44
		500	74	66	73	75	72	69	65	60	56
		750	79	67	75	80	76	74	70	66	62
		1000	82	68	77	83	79	77	74	71	67
	2530	100	62	71	69	61	62	55	51	45	40
		250	71	75	76	72	70	64	61	56	51
		500	78	78	82	80	76	71	68	64	60
		750	82	80	85	84	80	76	73	69	65
		1000	85	82	88	87	82	79	76	72	69
	2772	100	65	75	70	63	66	57	54	49	45
		250	73	80	79	74	72	66	63	59	54
		500	80	84	86	82	78	73	70	66	62
		750	84	86	90	86	81	76	74	70	66
		1000	87	88	93	90	84	79	76	73	69
KPR 400	2360	100	55	67	61	55	53	50	44	36	28
		250	67	70	69	67	64	62	57	51	45
		500	76	73	76	77	73	71	68	62	57
		750	82	75	80	82	78	77	74	69	65
		1000	86	76	83	86	82	81	78	74	70
	3543	100	65	75	68	63	66	58	54	48	42
		250	73	79	76	72	72	67	64	59	54
		500	79	83	82	79	77	74	71	67	63
		750	84	85	86	84	80	78	76	72	68
		1000	86	87	89	87	82	81	79	75	71
	4576	100	71	78	72	66	73	62	58	53	49
		250	76	83	79	74	76	70	66	62	58
		500	81	87	85	81	79	75	73	69	65
		750	85	90	89	84	81	79	77	73	69
		1000	87	91	91	87	82	81	79	76	72
KPR 500	4198	100	56	64	57	53	52	52	47	40	31
		250	66	69	68	65	63	62	58	53	47
		500	74	73	76	75	71	69	66	63	59
		750	80	75	81	80	76	74	71	69	66
		1000	83	77	85	84	79	77	74	73	71
	5310	100	63	73	66	62	61	58	54	49	41
		250	71	78	74	70	68	66	63	59	53
		500	78	82	81	77	73	72	70	67	63
		750	81	85	85	81	76	75	73	71	68
		1000	84	87	88	84	78	78	76	74	72
	6639	100	67	76	69	66	65	61	57	53	46
		250	73	82	77	73	70	68	65	61	56
		500	79	87	84	78	74	73	71	68	64
		750	82	89	87	81	76	76	75	72	69
		1000	84	91	90	83	78	78	77	75	72

	Qv, m³/h	Ps, Pa	L_{wa} dB(A)	Non-weighted sound power level, dB/Oct							
				63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
KPR 630	6761	100	58	67	66	58	55	52	47	40	31
		250	68	71	71	68	66	63	60	55	49
		500	77	73	76	75	74	72	69	67	63
		750	83	75	80	80	79	77	74	74	71
		1000	86	76	82	83	82	80	78	79	77
	9558	100	66	76	76	67	65	58	54	49	43
		250	73	80	79	73	71	67	64	61	57
		500	80	83	82	78	77	74	72	71	67
		750	84	85	84	80	80	78	77	77	74
		1000	88	86	85	82	82	81	80	81	78
	10689	100	71	80	80	71	70	61	57	52	49
		250	76	84	83	75	74	69	66	64	60
		500	82	88	85	79	78	75	74	73	69
		750	85	89	86	81	80	79	78	78	74
		1000	88	91	87	82	82	82	81	82	78

Radiated sound power level

Legend:

ΔL_w – non-weighted radiated sound power correction values for non-insulated units, dB;

L_w – non-weighted sound power level at frequency band, dB;

L^c_w – non-weighted radiated sound power, dB Lwc = Lw - ΔLw.

ΔL_w [dB], in relation to fm[Hz]	ΔL_w, dB											
	Size	80	100	125	150	160	200	250	315	400	500	600
	63	31	31	30	30	30	29	25	22	20	21	19
	125	30	30	29	30	29	28	24	22	19	20	18
	250	27	27	25	25	24	23	20	19	18	17	16
	500	21	21	21	21	21	22	18	17	17	17	16
	1000	20	19	18	19	19	21	16	15	15	15	14
	2000	11	11	12	14	15	18	14	13	12	15	15
	4000	10	11	12	13	14	16	12	11	10	12	12
	8000	11	9	10	10	12	13	11	10	10	11	11

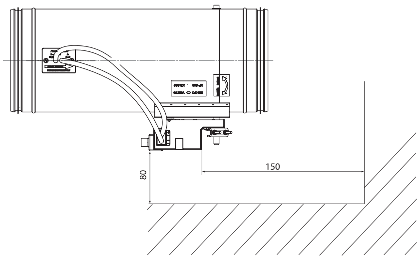
Example of calculation:

Case-radiated a-weighted sound of KPR 630 terminal unit at Ps = 500 Pa airflow = 9558 m³/h:

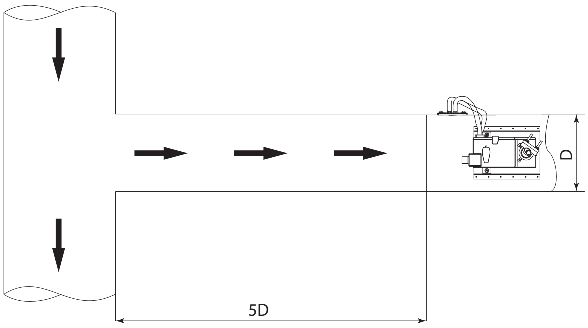
Frequency band	63	125	250	500	1000	2000	4000	8000
KPR 630 sound power level at discharge, dB	83	82	78	77	74	72	71	67
ΔL_w – non-weighted radiated sound power correction values	19	18	16	16	14	15	12	11
L^c_w: non-weighted radiated sound power, dB	64	64	62	61	60	57	59	56
A-weighted radiated sound power level	38	48	53	58	60	58	60	55

Mounting

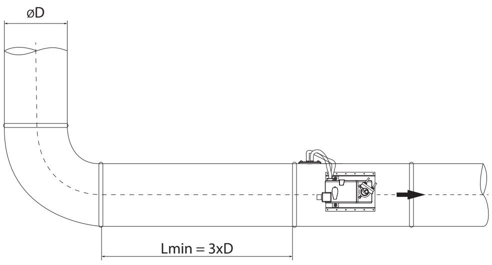
Connect ducting according to airflow direction sticker. While installing sufficient space should be ensured to enable access to the unit.



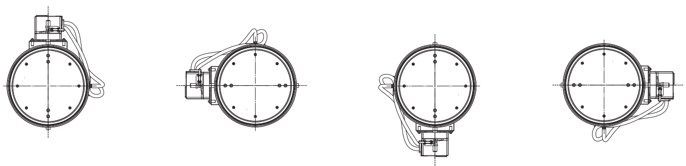
Note that it is mandatory to install the unit at a certain removal from bend, junctions etc. to avoid airflow miscalculating. Mounting position of STP terminal units by default si calibrated at factory to be vertical according to VFP sensor position. Other position should be mentioned upon order and will lead to sensor recalibration.



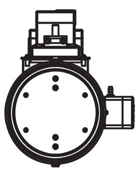
Recommended mounting positions



Front view of VAV/CAV terminal units



Front View of STP terminal units



STP operation mode commissioning

If overpressure in a premise is maintained, "+" tube should be drawn from sensor to the premise, and "-" tube to referent area (hallway, ceiling etc.)

If underpressure in a premise is maintained, "-" tube should be drawn from sensor to the premise, and "+" tube to referent area (hallway, ceiling etc.)

Accessories

Room thermostat:
- On\off or 0-10 V control
- Integrated (NTC) or external Pt1000 sensor
- Detection sensor can be connected
- Three preset operating modes: Stan by, Occupied, Forced ventilation
- Change over function
- Supply: 18-30 V AC 50-60 Hz
- Protection: IP20
- 0-50 C setting range


Regin RC-C3

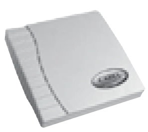
Room controller:
- 3 universal outputs
- On\off or 0-10 V control
- Communication RS485 (ModBus, BACnet, EXOline)
- Supply: 18-30 V AC 50-60 Hz
- Five preset operating modes: Off/Un-occupied/Stan by, Occupied, Forced ventilation
- Integrated (NTC) or external Pt1000 sensor
- Protection: IP20
- CO2 sensor can be connected
- Forced ventilation button
- 0-50 C setting range


Regin RC-C3 DOC

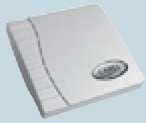
Pressure controller:
- Selectable measuring range 0...100, 0...300, 0...500, 0...1000 Pa
- Pressure signal output 0...10 V and 4...20 mA
- Controls output 0...10 V PID algo-rithm
- Long-service ceramic measurement element
- Protection: IP54
- Maximum overload 20 kPa


Regin DMD-C

VOC sensor:
- Self-calibrated
- Signal output 0...10 V and 4...20 mA
- Protection: IP30


Carel DPWQ 30600

CO2 sensor:
- Self-calibrated
- Signal output 0...10 V
- Measurement range: 0 ppm to 2000ppm CO2.
- Protection: IP30
- Expected lifetime is at least 36 months.


Carel DPWQ 40200

Humidity sensor:
- Signal output 0...10 V
- Measurement range: 10 to 90 % rH
- Protection: IP30.


Carel DPWC 11200

Fan optimiser:
- 1 to 8 VAV terminals per unit
- 0-10 V frequency converter output. Min. fan speed can be set
- Display with overall / individual actual volumes, damper positions, frequency converter setpoint, etc
- Provides communication and ad-justment for every single connected VAV drive
- Supply voltage AC 24 V, 50/60 Hz / DC 24 V
- Supply: 18-30 V AC 50-60 Hz
- Communication MPbus (RJ12)
- Protection: IP10 (IP20 when commis-sioned)


COU24-A-MP

Gateway MP to BACnet MS/TP:
- 1 to 8 VAV terminals per unit
- Provides communication and ad-justment for every single connected VAV drive
- Supply voltage AC 24 V, 50/60 Hz / DC 24 V
- Communication MPbus (RJ12) to BACnet (RS485)
- Parameterization via BACnet client


UK24BAC

Gateway MP to KNX:
- 1 to 8 VAV terminals per unit
- Provides communication and ad-justment for every single connected VAV drive
- Supply voltage AC 24 V, 50/60 Hz / DC 24 V
- Communication MPbus (RJ12) to KNX (twisted pair)
- Parameterization via ETS 2 or higher


UK24EIB

Gateway MP to LON:
- 1 to 8 VAV terminals per unit
- Provides communication and ad-justment for every single connected VAV drive
- Supply voltage AC 24 V, 50/60 Hz / DC 24 V
- Communication MPbus (RJ12) to KNX (3 Pin Weidmüller plug)
- Parameterization via LNS engineer-ing Tool


UK24LON

Gateway MP to MODbus:
- 1 to 8 VAV terminals per unit
- Provides communication and ad-justment for every single connected VAV drive
- Supply voltage AC 24 V, 50/60 Hz / DC 24 V
- Communication MPbus (RJ12) to KNX (RS485)
- Parameterization via DIP switches


UK24MOD

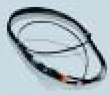
Adjustment tool:
- USB 2.0 interface
- ZK6 GEN cable optional


ZTH EU

Connecting cable:
- Used to communicate with the actuators via ZTH EU or ZIP-USB-MP


ZK1 GEN

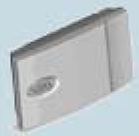
Connecting cable:
- Used to communicate with VRP-M, UK24LON/UK24EIB via ZTH EU or ZIP-USB-MP


ZK4 GEN

Connecting cable:
- Used to communicate with COU24A-MP, UK24MOD/UK24BAC via ZTH EU or ZIP-USB-MP


ZK6 GEN

Humidity sensor:
- Signal output 0...10 V
- Measurement range: 10 to 90 % rH
- Protection: IP30.


Carel DPWC 11200

Adjustment tool:
- Tool used to program actuators, controllers and BUS masters via PC using PC tool

ZIP-USB-MP

KPR - XXX - XXX - XXX

KPR – variable air volume terminal

Size: 080, 100, 125, 150, 160, 200, 250, 315, 400, 500, 630

Operation mode:
_ – variable/constant air volume operation mode;
STP-100 – static pressure control, 0-100 Pa
STP-300 – static pressure control, 0-300 Pa
STP-600 – static pressure control, 0-600 Pa

Communication BMS:
MP – Mpbus
MOD - ModBus
BAC – BACnet
LON – LONworks
KNX - KNX

KPR I20
SERIES

■ **Application**

KPR I20 series involves modifications of KPR terminals for constant/variable air volume (VAV/CAV) operation mode.
KPR I20 terminal units are meant for precise airflow control in zones of ventilation systems with demanding acoustic requirements based on Demand Control Ventilation principle. Acoustically-insulated VAV terminal units with round-to-rectangular collars are suitable for supply or extract air and are available in wide range of sizes.
KPR SR20 terminal units include integrated sound attenuator to provide "whispering" noise characteristics.
KPR SR20 E terminal units with re-heater are used to maintain different cooling/heating loads in different zones within the building. For instance, each zone differs in its location and purpose thus making heat/cooling loads different comparing to all others zones in the building. Given that reheat purpose could be defined as equalizer of cooling loads within the premise. At the cooling mode operation reheat is used to maintain temperature set point after a period of unoccupied mode operation as well as to maintain different cooling loads in different zones. If the room temperature decreases below the cooling setpoint the reheat coil is energized to warm the air entering the room and maintain the room set point. Normally in the heating mode the heater element is modulating from maximum output to its minimum output (off). As the room temperature approaches set point the reheat element ouput is decreased.

■ **Design**

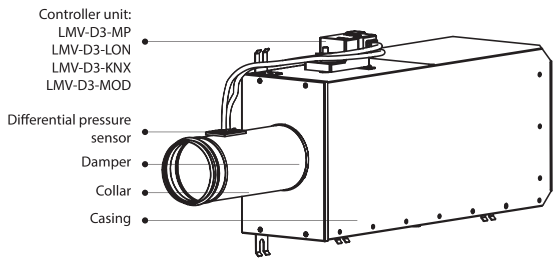
KPR I20 terminals' essentials are a 20 mm-insulated sheet metal box, round inlet damper, flow-measuring device and controls, rectangular outlet.
The control unit itself consists of 3 devices in one case:

— Differential pressure sensor used for pressure/airflow indicating;

— VAV controller used for allowing VAV/CAV operating mode;

— Damper Actuator controlled with analog signal 0/2-10 V.

KPR SR20 terminals basic components are a 20 mm-insulated sheet metal box with integrated sound attenuator, round inlet damper, flow-measuring device and controls, rectangular outlet. Two modifications – for supply and exhaust air applications.
KPR CP20 E terminals consist of 20 mm-insulated sheet metal box with integrated sound attenuator, PTC heater, round inlet damper, flow-measuring device and controls, rectangular outlet. The unit is served by a central air handler and modulates the amount of primary air to the space between a minimum set point and the design airflow. VAV/CAV terminals employ measurement and control of volume flow rates based on a Pitot measurement principle jointly with PID VAV controller. Pitot tube communicates the differential pressure to the controller that in turn evaluates the damper position. This results in high control accuracy even in case of unfavorable flow conditions. The differential pressure sensor is resistant to dust and pollution.
Factory-set and ready-to-commission unit consists of the mechanical parts and the electronic control components. Optional factory calibrated controls could be provided to meet all control strategies. Unit can be ordered both with integrated 230/24 or 120/24 transformers Circular spigot with lip seal for circular connecting ducts ensures tight connection to the ducting. Rectangular discharge with slip and drive cleat duct connection allow flexibility while mounting. Position of the damper blade indicated externally at shaft extension. In addition, units possess an integrated NFC module ensuring non-contact communication and adjustment of application data such as Vmin and Vmax etc. via Android application. Casing and damper leakage are complied with: Closed blade air leakage to EN 1751, class 4; Casing air leakage to EN 1751, class C.

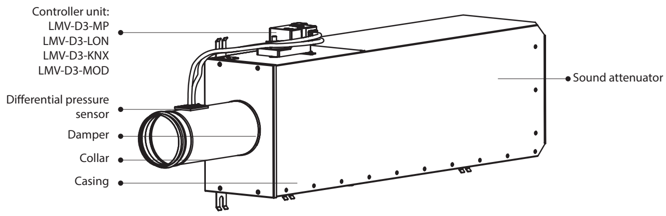


— **VAV controller unit** - contains integrated drive, PID controller and differential pressure transducer;

— **Damper blade** – is sealed to comply with EN 1751. Damper rotates in a self-lubricating, long life, low friction thermoplastic bearing;

— **Differential pressure sensor** – enables measuring the differential pressure even at low velocities between 1 to 10 m\s;

— **Casing** – acoustically insulated with 20 mm thick mineral wool is sealed with double lip seal on inlet. Rectangular discharge with slip and drive cleat duct connection. Continuous welded primary inlet duct to minimize leakage. Round inlet transforms into rectangular outlet to provide outlet speed reduction.



— **VAV controller unit -** contains integrated drive, PID controller and differential pressure transducer;

— **Damper blade –** is sealed to comply with EN 1751. Damper rotates in a self-lubricating, long life, low friction thermoplastic bearing;

— **Differential pressure sensor –** enables measuring the differential pressure even at low velocities between 1 to 10 m\s;

— **Casing –** acoustically insulated with 20 mm thick mineral wool is sealed with double lip seal on inlet. Rectangular discharge with slip and drive cleat duct connection. Continuous welded primary inlet duct to minimize leakage. Round inlet transforms into rectangular outlet to provide outlet speed reduction;

— **Sound attenuator –** provides further reduction of air-born and case-generating noise. Length of the attenuator is 40 inches (app. 1 m);

— **Control box –** include internal controls to ensure safe operation of the heater as well as a transformer to enable direct connection to the network;

— **Heater regulating knob –** is meant for switching the heater on\off;

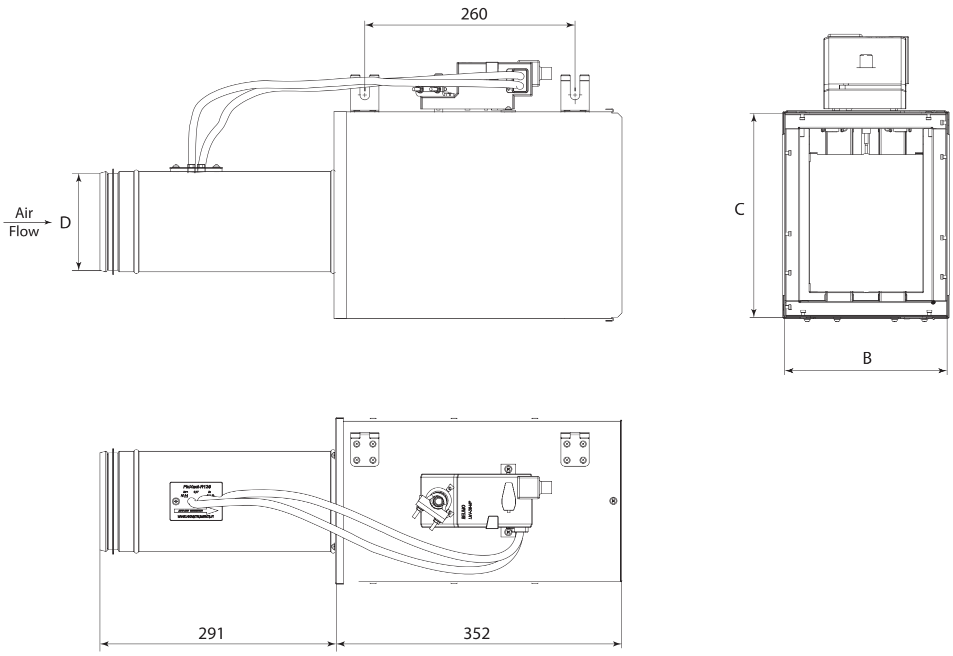
— **PTC heater –** installed in the cabinet on the discharge. Its technical properties and material structure does not allow the heater to heat up to the temperature that exceeds the design parameters (+35 C at max. airflow).

Special features of the control device provide integration into BMS systems via variety of interfaces:

Control function	Controller	Differential pressure transducer	Actuator	Communication protocol	Feedback value
VAV/CAV	LMV-D3-MP	Dynamic, integral	Integral	MPbus	Actual volume, Damper position, dP measurement
VAV/CAV	LMV-D3-LON	Dynamic, integral	Integral	LONWorks	Actual volume, Damper position, dP measurement
VAV/CAV	LMV-D3-KNX	Dynamic, integral	Integral	KNX	Actual volume, Damper position, dP measurement
VAV/CAV	LMV-D3-MOD	Dynamic, integral	Integral	MODbus	Actual volume, Damper position, dP measurement
VAV/CAV	LMV-D3-BAC	Dynamic, integral	Integral	BAC net (additionally requires UK24BAC)	Actual volume, Damper position, dP measurement

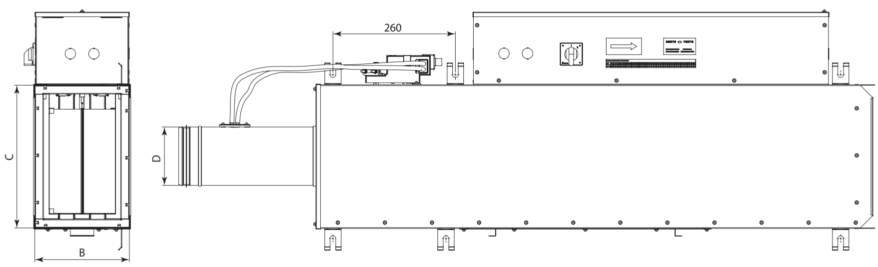
Overall dimensions of KPR terminal units

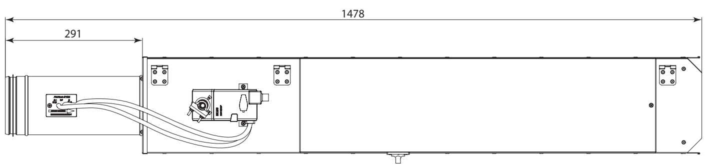
Designation	Ø D, mm	Ø D, in	C, mm	C, in	B, mm	B, in
VAV/CAV terminal unit KPR 04 I20	99	3-7/8	305	12	203	8
VAV/CAV terminal unit KPR 05 I20	124	4-7/8	305	12	203	8
VAV/CAV terminal unit KPR 06 I20	149	5-7/8	305	12	203	8
VAV/CAV terminal unit KPR 08 I20	200	7-7/8	305	12	254	10
VAV/CAV terminal unit KPR 10 I20	251	9-7/8	356	14	318	12-1/2
VAV/CAV terminal unit KPR 12 I20	302	11-7/8	406	16	381	15
VAV/CAV terminal unit KPR 14 I20	353	13-7/8	508	20	445	17-1/2
VAV/CAV terminal unit KPR 16 I20	403	15-7/8	610	24	457	18



Overall dimensions of KPR CP terminal units

Designation	Ø D	C	B
VAV/CAV terminal unit KPR 04 CP20	99 mm (3 7/8")	305 mm (12")	203 mm (8")
VAV/CAV terminal unit KPR 05 CP20	124 mm (4 7/8")	305 mm (12")	203 mm (8")
VAV/CAV terminal unit KPR 06 CP20	149 mm (5 7/8")	305 mm (12")	203 mm (8")
VAV/CAV terminal unit KPR 08 CP20	200 mm (7 7/8")	305 mm (12")	254 mm (10")
VAV/CAV terminal unit KPR 10 CP20	251 mm (9 7/8")	356 mm (14")	318 mm (12 1/2")
VAV/CAV terminal unit KPR 12 CP20	302 mm (11 7/8")	406 mm (16")	381 mm (15")
VAV/CAV terminal unit KPR 14 CP20	353 mm (13 7/8")	508 mm (20")	445 mm (17 1/2")
VAV/CAV terminal unit KPR 16 CP20	403 mm (15 7/8")	610 mm (24")	457 mm (18")





Heater design information

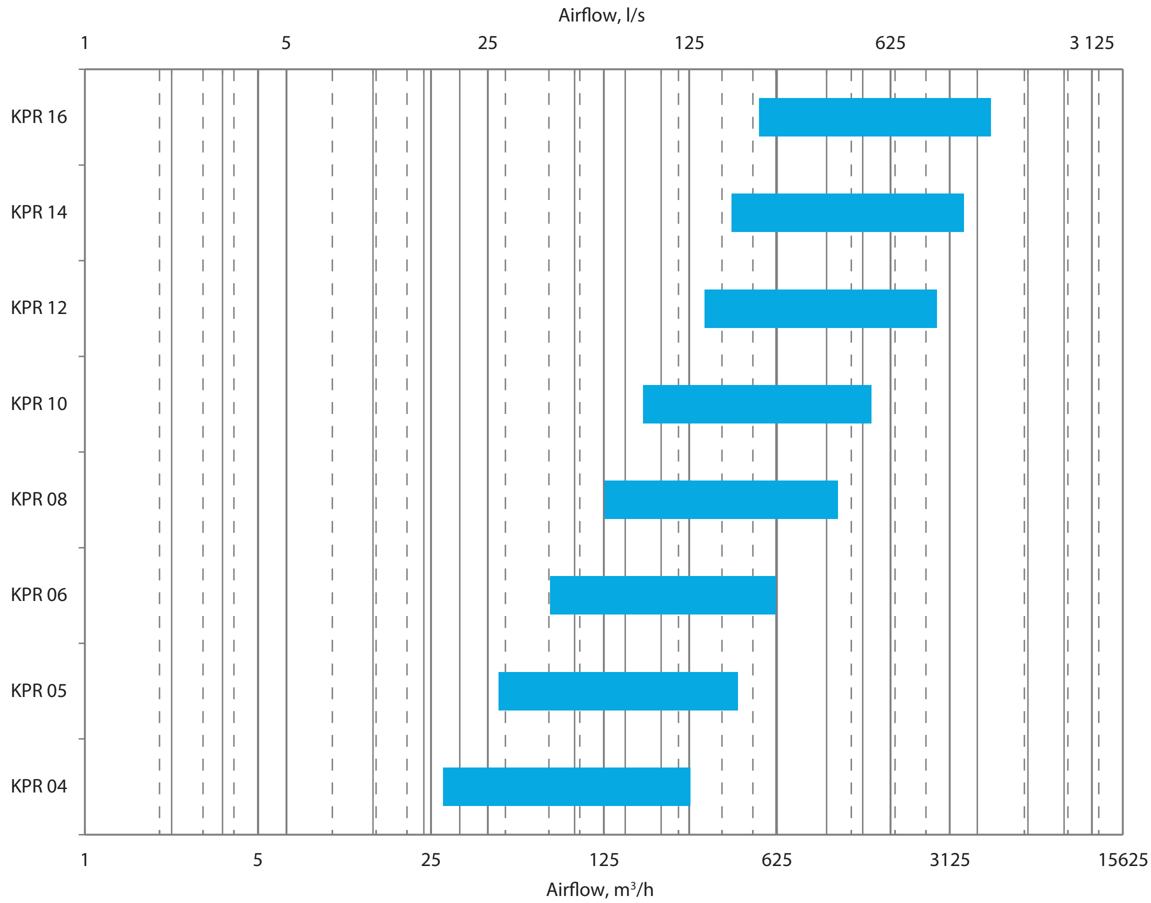
Electric heater elements are integral to the air terminal. Electric reheat coils are factory mounted on the discharge of the air terminal. Heater casings are constructed of galvanized steel. Element is constructed of material with variable resistivity (positive temperature coefficient). Safety control involves air pressure switch de-energizing magnetic contactors primary automatic reset high temperature limit, backup manual reset high temperature limit. Integral transformer allows easy connection directly to the network 120 V or 230 V current. Heater is shipped factory mounted and wired.
Heating capacities:

Size of air terminal	Heating capacity, kWt
04	0.25
05	0,3
06	0,5
08	0,9
10	1,3
12	1,8
14	2.5
16	3.3

Volume flow ranges and effective pressure

Nominal size	Airflow		ΔPef	Δ Airflow
	l/s	m³/h	Pa	%
04	8	28	2	17
	35	126	40	9
	63	227	125	6
	78	280	198	3
05	13	47	2	17
	30	180	30	9
	80	295	80	5
	121	435	175	3
06	21	76	2	17
	108	389	55	8
	145	522	90	5
	172	620	125	3
08	35	126	2	17
	194	700	60	9
	280	1010	125	2
	307	1105	150	3
10	50	180	2	17
	251	904	45	9
	359	1293	90	6
	419	1508	125	2
12	89	320	2	17
	562	2023	80	8
	703	2530	125	2
	770	2772	150	3
14	114	411	2	17
	676	2434	70	7
	904	3255	125	2
	990	3564	150	4
16	147	530	2	17
	656	2360	40	8
	984	3543	90	5
	1271	4576	150	3

Quick selection diagram



Discharge sound power level depending on airflow and static pressure Legend:

Ps – differential static pressure of the VAV terminal unit. Refference for damper position (nearly closed/nearly open/open/fully open etc.)
Lwa–A-weighted sound power level at discharge
Lswa - A-weighted sound power level of the unit with integrated sound attenuator at discharge (KPR CP20)

	Qv, m³/h	Ps, Pa	L^s_{wa} dB(A)	L_{wa} dB(A)	Non-weighted sound power level, dB/Oct							
					63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
KPR 04 I20	126	100	43	47	58	60	48	40	36	30	23	21
		250	50	54	60	61	56	51	48	40	32	30
		500	52	56	61	63	58	53	50	42	34	31
		750	52	56	62	63	58	53	50	42	34	32
		1000	53	57	63	65	60	53	52	44	36	33
	227	100	44	48	60	61	50	40	35	31	27	26
		250	51	55	61	62	57	53	48	41	35	29
		500	53	57	62	64	59	55	50	43	37	31
		750	53	57	62	64	59	55	50	43	37	32
		1000	54	58	63	66	61	55	52	45	39	33
	280	100	45	49	61	62	52	43	38	33	28	25
		250	50	56	62	63	58	54	49	43	37	30
		500	52	58	63	65	60	56	51	45	39	34
		750	52	58	64	65	60	56	51	45	39	35
		1000	53	59	65	67	62	56	53	47	41	37

	Qv, m³/h	Ps, Pa	L^s_{wa} dB(A)	L_{wa} dB(A)	Non-weighted sound power level, dB/Oct							
					63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
KPR 05 I20	180	100	44	48	59	61	49	41	37	31	24	22
		250	51	55	61	62	57	52	49	41	33	31
		500	53	57	62	64	59	54	51	43	35	32
		750	53	57	63	64	59	54	51	43	35	33
		1000	54	58	64	66	61	54	53	45	37	34
	295	100	45	49	61	62	51	41	36	32	28	27
		250	52	56	62	63	58	54	49	42	36	30
		500	54	58	63	65	60	56	51	44	38	32
		750	54	58	63	65	60	56	51	44	38	33
		1000	55	59	64	67	62	56	53	46	40	34
	435	100	46	50	62	63	53	44	39	34	29	26
		250	51	57	63	64	59	55	50	44	38	31
		500	53	59	64	66	61	57	52	46	40	35
		750	53	59	65	66	61	57	52	46	40	36
		1000	54	60	66	68	63	57	54	48	42	38
KPR 06 I20	389	100	47	51	60	63	53	46	41	35	29	23
		250	52	56	61	64	59	54	50	45	38	28
		500	54	58	62	66	61	56	52	47	40	30
		750	54	58	62	66	61	56	52	47	40	30
		1000	56	60	64	68	63	56	54	49	42	35
	522	100	50	54	62	65	57	52	46	39	35	30
		250	55	59	63	65	62	58	51	47	44	36
		500	57	61	64	67	64	60	53	49	46	38
		750	57	61	65	67	64	60	53	49	46	39
		1000	59	63	66	69	66	62	55	51	48	40
	620	100	54	58	63	66	61	56	50	43	41	33
		250	54	60	64	66	63	59	52	48	48	38
		500	56	62	65	68	65	61	54	50	50	39
		750	56	62	66	68	65	61	54	50	50	40
		1000	59	65	67	70	68	63	56	52	52	45
KPR 08 I20	700	100	50	54	63	65	58	49	44	39	34	26
		250	58	62	65	69	65	59	54	50	46	30
		500	57	61	64	69	65	57	54	50	49	33
		750	59	63	65	70	66	58	56	52	51	40
		1000	60	64	68	71	67	59	58	54	53	44
	1010	100	56	60	67	70	64	55	52	44	40	30
		250	62	66	69	74	70	62	59	54	49	36
		500	61	65	68	74	69	60	57	54	53	40
		750	63	67	70	75	70	61	59	56	55	46
		1000	64	68	72	76	71	62	61	58	57	49
	1105	100	58	62	69	72	66	57	55	46	41	28
		250	61	67	71	75	71	64	61	55	51	36
		500	62	68	72	76	72	63	59	56	54	43
		750	63	69	73	77	73	64	61	58	56	46
		1000	64	70	74	78	74	65	63	60	58	50

	Qv, m³/h	Ps, Pa	L^s_{wa} dB(A)	L_{wa} dB(A)	Non-weighted sound power level, dB/Oct							
					63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
KPR 10 I20	904	100	51	55	60	63	60	51	47	39	37	29
		250	58	62	63	68	66	59	55	50	47	33
		500	60	64	64	69	67	62	58	53	50	36
		750	60	64	65	69	67	62	58	53	50	37
		1000	63	67	67	71	69	64	60	56	54	41
	1293	100	54	58	61	66	63	54	50	42	40	28
		250	60	64	64	70	69	61	57	52	49	33
		500	62	66	67	71	69	64	59	55	52	41
		750	62	66	68	71	69	64	59	55	52	43
		1000	64	68	69	73	71	66	62	58	54	46
	1508	100	56	60	63	69	64	56	53	42	41	30
		250	60	66	66	72	69	63	59	56	53	36
		500	61	67	68	73	70	65	60	56	53	38
		750	61	67	69	73	70	65	60	56	53	39
		1000	63	69	70	75	72	67	62	58	55	42
KPR 12 I20	2023	100	52	56	57	58	56	53	51	47	41	33
		250	56	60	61	63	60	55	54	52	49	37
		500	55	59	62	64	59	53	54	51	50	42
		750	56	60	62	65	60	54	55	52	51	42
		1000	58	62	63	67	62	56	57	54	53	46
	2530	100	56	60	60	62	60	59	55	51	46	32
		250	61	65	61	66	65	61	59	57	54	43
		500	61	65	63	67	65	60	59	57	55	46
		750	62	66	64	68	66	61	60	58	56	48
		1000	64	68	66	70	68	63	62	60	58	44
	2772	100	57	61	61	63	61	60	56	52	47	40
		250	60	66	63	68	67	63	60	59	56	44
		500	61	67	64	69	68	63	61	60	58	49
		750	62	68	65	70	69	64	62	61	59	52
		1000	64	70	67	72	71	66	64	63	61	54
KPR 14 I20	2434	100	43	47	47	50	44	44	43	38	33	36
		250	56	60	58	61	56	55	56	53	49	49
		500	63	67	63	66	62	61	62	60	57	55
		750	65	69	65	68	64	63	64	62	59	57
		1000	68	72	68	71	67	66	67	65	62	60
	3255	100	45	49	49	52	46	46	45	41	37	30
		250	58	62	58	61	57	56	57	55	52	45
		500	64	68	63	66	62	61	63	62	59	52
		750	66	70	65	68	64	63	65	64	61	54
		1000	69	73	68	71	67	66	68	67	64	57
	3564	100	49	53	51	54	49	50	49	45	42	35
		250	58	64	60	63	58	58	59	58	55	48
		500	63	69	64	67	63	62	64	64	61	54
		750	65	71	66	69	65	64	66	66	63	56
		1000	68	74	69	72	68	67	69	69	66	59

	Qv, m³/h	Ps, Pa	L^s_{wa} dB(A)	L_{wa} dB(A)	Non-weighted sound power level, dB/Oct							
					63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
KPR 16 I20	2360	100	44	48	51	54	49	46	42	37	32	35
		250	56	60	62	65	60	57	54	52	48	47
		500	62	66	67	70	65	62	60	59	56	53
		750	64	68	68	71	66	63	62	61	58	55
		1000	66	70	70	73	68	65	64	63	60	57
	3543	100	52	56	58	61	56	54	51	45	41	34
		250	61	65	66	69	64	62	59	57	53	46
		500	65	69	70	73	68	65	63	63	59	52
		750	67	71	71	74	69	66	65	65	61	54
		1000	69	73	73	76	71	68	67	67	63	56
	4576	100	57	61	62	65	59	59	56	50	45	38
		250	62	68	69	72	67	65	62	60	56	49
		500	65	71	72	75	70	67	65	65	61	54
		750	67	73	73	76	71	68	67	67	63	56
		1000	69	75	75	78	73	70	69	69	65	58

Radiated sound power level

Legend:

L^c_{wa} – a-weighted radiated sound power level, dB(A)
Ps – differential static pressure of the VAV terminal unit. Refference for damper position (nearly closed/nearly open/open/fully open etc.)

	Qv, m³/h	Ps, Pa	L^c_{wa} dB(A)	Non-weighted sound power level, dB/Oct							
				63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
KPR 04 I20	28	100	32	41	44	35	24	23	20	14	10
		250	38	43	49	41	32	29	24	19	15
		500	35	42	47	38	27	26	23	18	13
		750	35	42	47	39	28	26	24	20	14
		1000	38	43	48	41	30	28	28	25	19
	227	100	36	42	47	39	30	27	22	17	12
		250	38	43	49	41	32	29	24	19	15
		500	39	45	50	42	33	30	25	21	16
		750	39	45	50	43	34	30	26	23	18
		1000	41	46	51	45	36	32	30	28	23
	280	100	42	46	52	44	40	33	29	27	22
		250	44	49	54	46	42	35	31	29	24
		500	45	50	55	47	43	36	32	31	26
		750	46	50	55	48	44	36	33	33	28
		1000	48	51	56	50	46	38	37	38	30

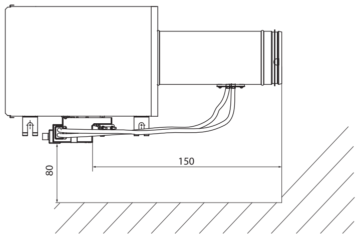
	Qv, m³/h	Ps, Pa	L^c_{wa} dB(A)	Non-weighted sound power level, dB/Oct							
				63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
KPR 05 I20	180	100	33	42	45	36	25	24	21	15	11
		250	39	44	50	42	33	30	25	20	16
		500	36	43	48	39	28	27	24	19	14
		750	36	43	48	40	29	27	25	21	15
		1000	39	44	49	42	31	29	29	26	20
	295	100	37	43	48	40	31	28	23	18	13
		250	39	44	50	42	33	30	25	20	16
		500	40	46	51	43	34	31	26	22	17
		750	40	46	51	44	35	31	27	24	19
		1000	42	47	52	46	37	33	31	29	24
	435	100	43	47	53	45	41	34	30	28	23
		250	45	50	55	47	43	36	32	30	25
		500	46	51	56	48	44	37	33	32	27
		750	47	51	56	49	45	37	34	34	29
		1000	49	52	57	51	47	39	38	39	31
KPR 06 I20	389	100	39	49	50	42	36	30	24	19	14
		250	41	50	52	44	38	32	26	21	16
		500	42	51	53	45	39	33	27	23	18
		750	43	51	53	46	40	33	28	25	19
		1000	45	51	54	48	42	35	32	30	23
	522	100	45	51	54	47	44	36	33	31	26
		250	47	51	56	49	46	38	35	33	27
		500	48	53	57	50	47	39	36	35	30
		750	49	53	57	51	48	39	37	37	31
		1000	52	53	58	53	50	41	41	42	37
	620	100	49	52	56	51	47	42	39	33	32
		250	51	53	58	53	49	44	41	35	33
		500	52	53	59	54	50	45	42	37	35
		750	53	53	59	55	51	45	43	39	37
		1000	55	54	60	57	53	47	47	44	40
KPR 08 I20	700	100	52	59	61	56	48	43	37	33	28
		250	57	59	62	60	55	50	44	42	39
		500	60	64	70	64	55	52	44	40	36
		750	62	68	72	66	57	54	47	43	38
		1000	66	70	74	70	62	59	54	49	46
	1010	100	43	51	55	45	38	34	26	21	16
		250	49	56	60	53	44	39	32	28	22
		500	55	60	63	58	53	45	40	35	31
		750	57	60	64	61	54	48	41	38	34
		1000	59	61	65	62	57	52	45	42	39
	1105	100	45	53	57	47	41	36	28	22	17
		250	50	58	62	54	46	41	34	29	24
		500	55	59	63	58	53	45	40	35	31
		750	57	60	64	61	54	48	41	38	34
		1000	59	60	65	62	57	52	45	42	40

	Qv, m³/h	Ps, Pa	L^{c}_{wa} dB(A)	Non-weighted sound power level, dB/Oct							
				63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
KPR 10 I20	904	100	47	49	52	51	45	39	31	25	24
		250	51	51	56	56	50	42	36	30	29
		500	54	53	59	59	53	45	39	33	32
		750	60	59	64	65	58	51	46	42	40
		1000	64	60	66	69	62	54	49	48	46
	1293	100	51	50	56	56	49	43	35	29	28
		250	54	56	61	59	51	44	38	32	29
		500	58	59	64	63	55	48	42	36	34
		750	62	65	71	67	59	53	48	45	41
		1000	66	66	72	71	64	57	51	50	46
	1508	100	54	53	58	58	54	45	39	33	32
		250	58	59	64	62	56	49	43	37	35
		500	62	60	67	66	60	55	47	41	39
		750	64	66	73	68	61	56	51	49	45
		1000	68	66	74	73	65	59	54	52	47
KPR 12 I20	2023	100	51	52	56	52	51	43	38	37	34
		250	54	54	60	55	53	45	42	40	37
		500	57	60	63	59	57	48	45	43	39
		750	61	61	65	63	61	52	48	48	44
		1000	66	62	67	67	66	57	51	50	48
	2530	100	52	52	57	53	52	44	40	38	35
		250	55	55	62	56	54	46	43	41	38
		500	59	59	65	60	58	50	46	45	40
		750	61	61	67	63	61	53	49	48	43
		1000	66	63	69	68	66	57	52	51	46
	2772	100	53	52	58	54	53	45	41	39	37
		250	57	57	63	59	57	49	45	44	40
		500	61	60	66	62	60	52	49	47	43
		750	64	62	68	66	64	56	52	50	46
		1000	68	63	70	69	68	61	53	52	47
KPR 14 I20	2434	100	52	53	60	53	52	42	36	31	28
		250	54	55	62	57	54	45	39	34	29
		500	53	55	61	54	53	42	37	32	29
		750	53	56	61	54	53	43	37	32	29
		1000	54	57	62	55	54	44	38	33	30
	3255	100	52	54	60	55	52	43	37	32	30
		250	54	57	62	57	54	45	39	34	31
		500	56	57	63	58	56	46	41	35	32
		750	55	58	63	58	55	46	41	35	33
		1000	56	59	64	59	56	47	41	36	33
	3564	100	55	59	63	57	55	44	41	37	33
		250	57	60	65	59	57	46	43	39	34
		500	58	60	66	60	58	47	44	40	36
		750	58	60	66	60	58	47	44	40	36
		1000	59	61	67	61	59	48	45	41	37

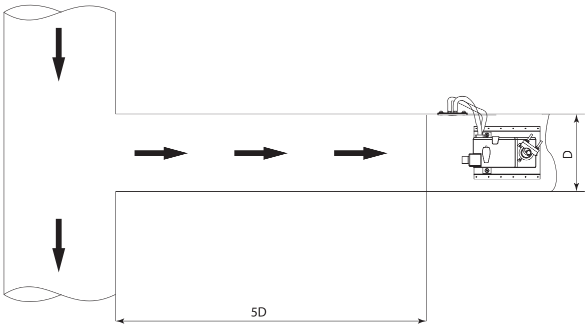
	Qv, m³/h	Ps, Pa	L^{c}_{wa} dB(A)	Non-weighted sound power level, dB/Oct							
				63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
KPR 16 I20	2360	100	48	53	59	52	42	36	32	27	21
		250	51	53	60	56	47	41	37	31	26
		500	54	54	61	58	52	46	42	37	29
		750	58	55	62	60	56	51	46	43	35
		1000	60	58	64	62	58	54	50	48	37
	3543	100	50	53	61	54	45	41	38	34	30
		250	53	54	61	58	50	44	41	36	32
		500	58	57	64	62	56	50	47	43	40
		750	63	59	66	66	61	55	52	49	43
		1000	67	61	69	68	65	61	59	57	50
	4576	100	52	55	62	55	48	43	40	36	32
		250	55	57	63	59	52	46	43	38	35
		500	59	59	65	63	57	51	48	45	40
		750	64	61	68	67	62	57	54	51	46
		1000	70	63	70	70	66	63	62	60	51

Mounting

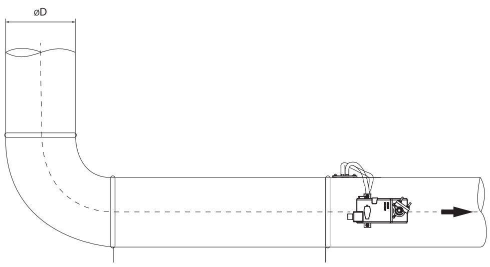
Connect to ducting according to airflow direction sticker. While installing sufficient space should be ensured to enable access to the unit.



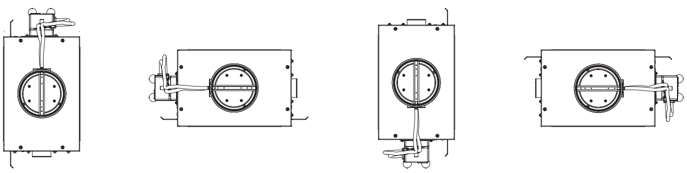
Note that it is mandatory to install the unit at a certain removal from bend, junctions etc. to avoid airflow miscalculating.
Mounting position of STP terminal units by default is calibrated at factory to be vertical according to VFP sensor position. Other position should be mentioned upon order.



Recommended mounting positions



Front view of VAV/CAV terminal units



STP operation mode commissioning

If overpressure in a premise is maintained, "+" tube should be drawn from sensor to the premise, and "-" tube to referent area (hallway, ceiling etc.)

If underpressure in a premise is maintained, "-" tube should be drawn from sensor to the premise, and "+" tube to referent area (hallway, ceiling etc.)

Accessories

Room thermostat:
- On\off or 0-10 V control
- Integrated (NTC) or external Pt1000 sensor
- Detection sensor can be connected
- Three preset operating modes: Stan by, Occupied, Forced ventilation
- Change over function
- Supply: 18-30 V AC 50-60 Hz
- Protection: IP20
- 0-50 C setting range

Regin RC-C3

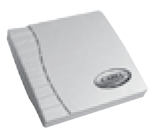
Room controller:
- 3 universal outputs
- On\off or 0-10 V control
- Communication RS485 (ModBus, BACnet, EXOline)
- Supply: 18-30 V AC 50-60 Hz
- Five preset operating modes: Off/Un-occupied/Stan by, Occupied, Forced ventilation
- Integrated (NTC) or external Pt1000 sensor
- Protection: IP20
- CO2 sensor can be connected
- Forced ventilation button
- 0-50 C setting range

Regin RC-C3 DOC

Pressure controller:
- Selectable measuring range 0...100, 0...300, 0...500, 0...1000 Pa
- Pressure signal output 0...10 V and 4...20 mA
- Controls output 0...10 V PID algo-rithm
- Long-service ceramic measurement element
- Protection: IP54
- Maximum overload 20 kPa

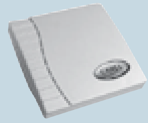
Regin DMD-C

VOC sensor:
- Self-calibrated
- Signal output 0...10 V and 4...20 mA
- Protection: IP30



Carel DPWQ 30600

CO2 sensor:
- Self-calibrated
- Signal output 0...10 V
- Measurement range: 0 ppm to 2000ppm CO2.
- Protection: IP30
- Expected lifetime is at least 36 months.



Carel DPWQ 40200

Humidity sensor:
- Signal output 0...10 V
- Measurement range: 10 to 90 % rH
- Protection: IP30.

Carel DPWC 11200

Fan optimiser:
- 1 to 8 VAV terminals per unit
- 0-10 V frequency converter output. Min. fan speed can be set
- Display with overall / individual actual volumes, damper positions, frequency converter setpoint, etc
- Provides communication and ad-justment for every single connected VAV drive
- Supply voltage AC 24 V, 50/60 Hz / DC 24 V
- Supply: 18-30 V AC 50-60 Hz
- Communication MPbus (RJ12)
- Protection: IP10 (IP20 when commis-sioned)

COU24-A-MP

Gateway MP to BACnet MS/TP:
- 1 to 8 VAV terminals per unit
- Provides communication and ad-justment for every single connected VAV drive
- Supply voltage AC 24 V, 50/60 Hz / DC 24 V
- Communication MPbus (RJ12) to BACnet (RS485)
- Parameterization via BACnet client

UK24BAC

Gateway MP to KNX:
- 1 to 8 VAV terminals per unit
- Provides communication and ad-justment for every single connected VAV drive
- Supply voltage AC 24 V, 50/60 Hz / DC 24 V
- Communication MPbus (RJ12) to KNX (twisted pair)
- Parameterization via ETS 2 or higher

UK24EIB

Gateway MP to LON:
- 1 to 8 VAV terminals per unit
- Provides communication and ad-justment for every single connected VAV drive
- Supply voltage AC 24 V, 50/60 Hz / DC 24 V
- Communication MPbus (RJ12) to KNX (3 Pin Weidmüller plug)
- Parameterization via LNS engineer-ing Tool

UK24LON

Gateway MP to MODbus:
- 1 to 8 VAV terminals per unit
- Provides communication and ad-justment for every single connected VAV drive
- Supply voltage AC 24 V, 50/60 Hz / DC 24 V
- Communication MPbus (RJ12) to KNX (RS485)
- Parameterization via DIP switches

UK24MOD

Adjustment tool:
- USB 2.0 interface
- ZK6 GEN cable optional

ZTH EU

Connecting cable:
- Used to communicate with the actuators via ZTH EU or ZIP-USB-MP

ZK1 GEN

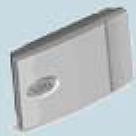
Connecting cable:
- Used to communicate with VRP-M, UK24LON/UK24EIB via ZTH EU or ZIP-USB-MP

ZK4 GEN

Connecting cable:
- Used to communicate with COU24A-MP, UK24MOD/UK24BAC via ZTH EU or ZIP-USB-MP

ZK6 GEN

Humidity sensor:
- Signal output 0...10 V
- Measurement range: 10 to 90 % rH
- Protection: IP30.



Carel DPWC 11200

Adjustment tool:
- Tool used to program actuators, controllers and BUS masters via PC using PC tool

ZIP-USB-MP

KPR - XXX - XXX - XXX - XXX - XXX - XXX - XXX - XXX

KPR – variable air volume terminal

Size: 04, 05, 06, 08, 10, 12, 14, 16

Type of insulation:
_ – as default w/o insulation;
I – insulated externally
SR – acoustic design (integral attenuator)

Thickness of insulation:
_ – as default w/o insulation;
20 – 20 mm
50 – 50 mm

Design:
_ – universal or supply design (as default);
EA – exhaust air design

Reheat:
_ – w/o reheat (as default);
E – electric coil;
W – water coil

Mode of operation:
_ – VAV/CAV (as default);
STP-100 – static pressure control 0-100 Pa;
STP-300 – static pressure control 0-300 Pa;
STP-600 – static pressure control 0-600 Pa;.

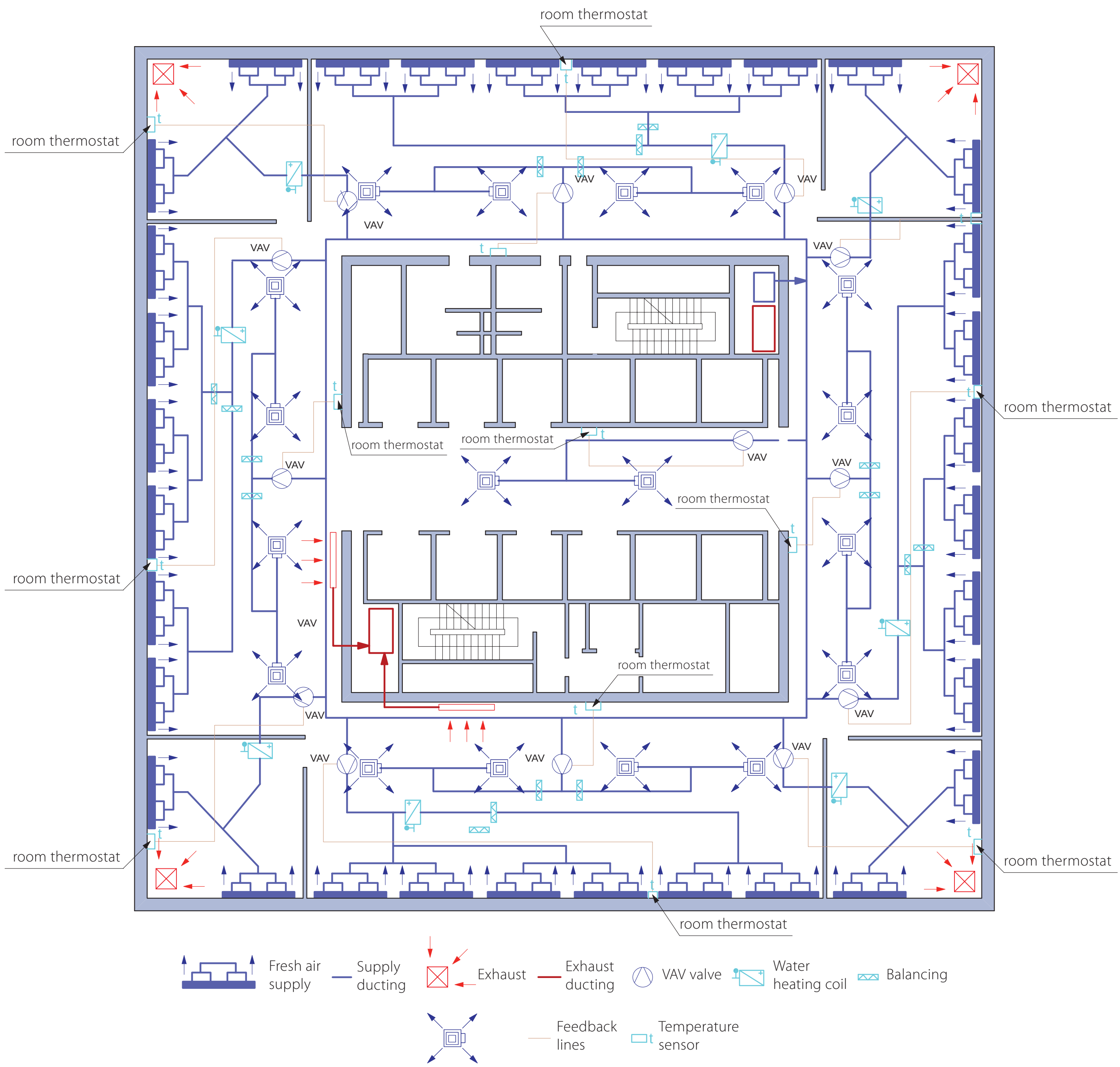
Communication (BMS):
MP – Mpbus
MOD – ModBus
BAC – BACnet
LON – LONworks
KNX – KNX

Transformer:
_ – as default w/o transformer;
230/24 – 230/24 V transformer
120/24 – 120/24 V transformer

COMMON SOLUTIONS WITH VAV VENTILATION SYSTEMS

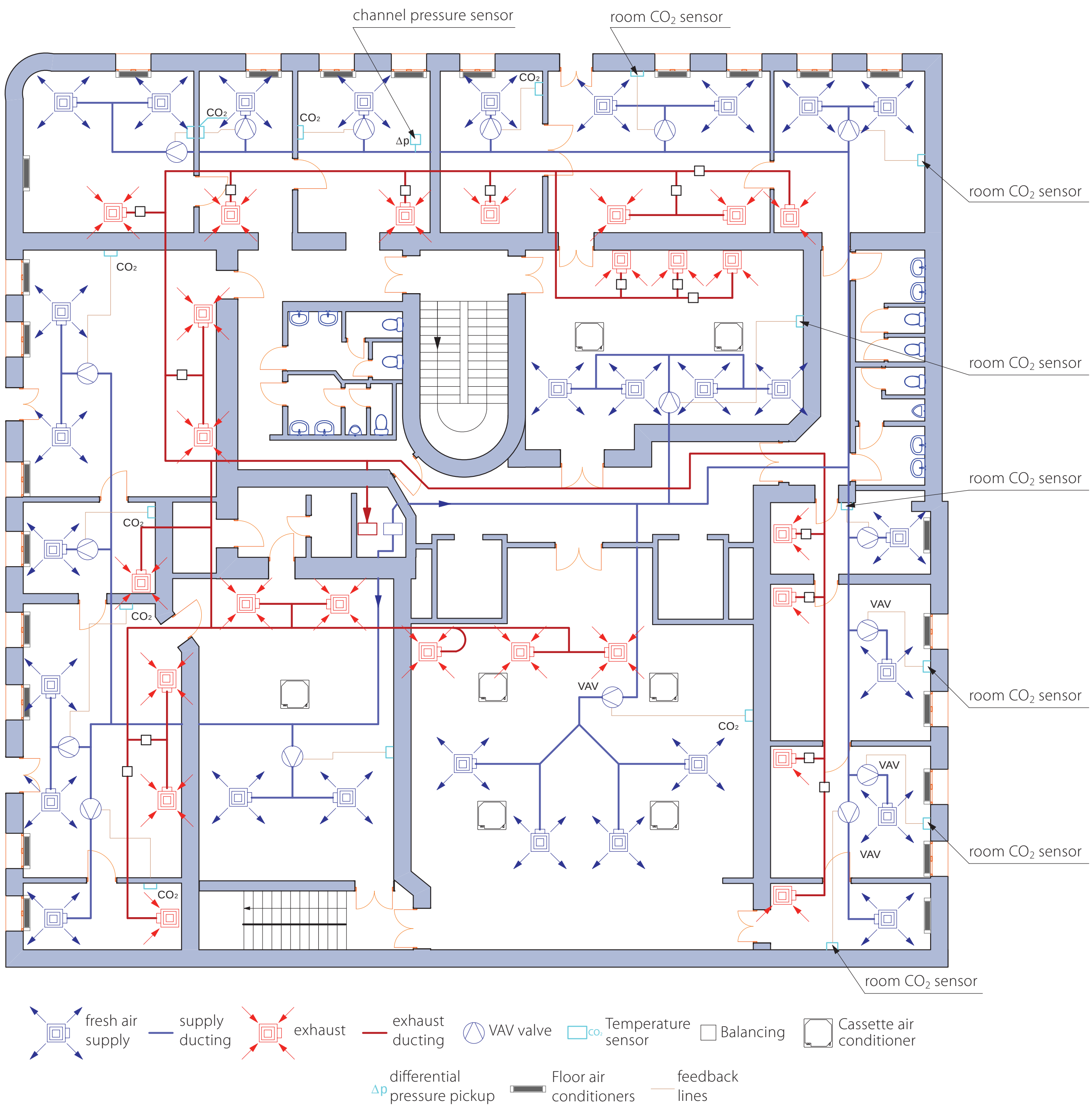
Open space workplace

One of the simplest solution is employed. Ducting is made as circular system. Fresh conditioned air from AHU is supllied into the premise with temperature of 15 C which is divided into an inner and outer zones. Each zone is separated by VAV valve. Outer zone is comprised of premises which have at least one wall in contact with the environment. Exhaust is organized via mid-ceiling space and regulated by dampers situated nearby mutual exhaust collector. Airflow ranges for every zone are calculated separately considering local heat losses and incomes, purpose of a premise and occupancy by people. For instance, corridors, archives, service rooms can be ventilated with minimum airflows. Heat losses during winter period are covered by reheaters, installed in every VAV valve. As setpoint reference signal room thermostats and CO_2 sensors are employed. Swirl and slots diffusers are used as air distribution devices.



Hotel building

Every premise in hotel is separated into enclosed space divided by fireproof of apllication of VAV ventilation system in such kind of buldings consists in using fire-retarding valves in every single zone. Fresh conditioned air from AHU is supllied into the premise with temperature of 15 C or 37 depending on operation mode: cooling or heating. The volume of fresh air to be supplied depends on the occupancy of the room and set parameters. In the event of room unoccupancy minimum permissible airvolume will be ensured. If room is occupant, airflow will depend on the number of people and set parameters. Worth mentioning that room thermostats are synchronized with hot-water radiators, so, excessive heating is escluded. Exhaust is organized via mid-ceiling space and regulated by dampers situated nearby mutual exhaust collector. Airflow ranges for every zone are calculated separately considering local heat losses and incomes, purpose of a premise and occupancy by people. For instance , corridors, service rooms can be ventilated with minimum airflows. Heat losses during winter period are covered by hot-water radiators, installed in every premise. As setpoint reference signal room thermostats are employed. Swirl and slots diffusers are used as air distribution devices. The complete range of products used in installation is provided by VENTS!



Educational institution

Design of VAV ventilation system for school building exposes to use engineers to complex approach. Preculiarities of such bulding should be overthought:

- main coverage of heat losses are ensured by hot water heating system;
- ventilation system is meant to supply fresh conditioned air;
- building is exploted due to tight schedule;
- noise criterea should be under acceptable level;
- ventilation system should take away excessive heat incoms from people and lightning.

Air quality is the first priority for school so as setpoint reference signal CO_2 sensors are widely used. There are also premises with constant temperature maintaining need like libraries, shower rooms etc. Thus regulation of operation of VAV system should be overthough keeping in mind all that particular details. Exhaust ventilation is conducted via mid-ceiling space so it removes the hottest and most pollute air.