DOĞU
İKLİMLENDİRME | HVAC SYSTEMS

ACB

Variable Air Volume Device

FOUR SEASONS®

Venues Breathe with DOGU HVAC Systems!

DOGU HVAC founded in 1999, and ever since has been manufacturing energy and cost efficient products as Air Handling Units, Air Distribution & Management & Movement Systems [HVAC Components] and constantly enhancing to provide an integrated solution for well-being. DOGU HVAC's core business products which are subsumed under 4 major groups as Air Handling Units, Heat/Energy Recovery Units, Air Distribution & Management Products and Kitchen Ventilation Equipment are all produced under the compliance with EU standarts. Particularly AHU and HRU-ER units are entitled under the "FOUR SEASONS" brand name for domestic and foreign markets. DOGU HVAC's, headquarter in Izmir/Turkey, operates in a large-sized plant spread over 2 factories, in total area of 45.000 sqm in which 25.000 sqm indoor space that enables DOGU HVAC manufactures 180 various type of products. Additionally, DOGU HVAC has a powerful sales network with 4 sales offices located in İstanbul, Ankara, Antalya and Adana in Turkey as well as authorized dealers in many other countries for sales and after sales operations. DOGU HVAC has been exporting to more than 55 countries.

Thanks to our "Customer Satisfaction","Zero-Defect Policy" motto and reinforced by complete certified products, more than 250 employees. DOGU HVAC R&D center developed exclusive products, such as Double Skin Make-Up Kitchen Hood, Recirculated Laminar Airflow Unit, Single Piece Square Ceiling Diffuser and Ecology Units, for the first time have brought to the sector. DOGU HVAC R&D has the ability to make customized production which can meet the requirement of the customers by means of special software such as "ANSYS FLUENT". DOGU HVAC guaranteed its quality of management by having advantages of ISO 9001, ISO 14001, ISO 18001 certifications. Air Handling Units have EUROVENT, TUV Hygiene [in accordance with DIN1946-4, VDI 6022-1, DIN EN 13053 standarts], CE, TSEK, GOST-R certifications; Fire Dampers have EN 1366-2 and EN 13501-3 CE certifications; Smoke Control Dampers have EN 1366-10 and 12101-8 CE certifications; Kitchen Ventilation Products have TSEK, CE and GOST-R quality certifications.

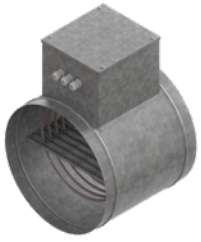
- ACB Variable Air Volume Control Device, contains an averaging airflow measurement probe, airflow controller and actuator. Airflow is controlled based on actual flow measurement by changing the damper blade position.
- It is used in circular ducts to control air flow in projects with special requirements such as comfort and hygiene. With variable air flow VAV systems, it provides energy savings of up to 50% in the energy consumed by the fan motor.
- The airflow set point can be modified between minimum and maximum settings by, e.g., a room controller with an analogue signal (0...10 or 2...10 VDC).
- All VAV devices produced are calibrated in the VAV laboratory according to the flow rates specified in the order and their leakage is tested according to DIN EN 1751. In this laboratory, calibration is completed by testing one-to-one field conditions with 7 measuring stations, each with different diameter and nominal flow.
- The tightness of the control damper in closed position conformed to standard EN1751 class 3 and casing tightness to EN 1751 Class B.
- Duct connection includes airtight rubber gaskets.
- ACB complies with EN 1946/4 and VDI 6022 hygiene standards.
- For supply and exhaust installations
- Maximum differential pressure over the damper of 1000 Pa
- Operating range: ambient temperature of 0 to 50 °C
- Ambient relative humidity < 95%, non-condensing
- Operates at flow rates between 28 m^3/h and 5372 m^3/h
- ACB has a compact structure. It works efficiently with low pressure loss thanks to aerodynamic blade design.

MATERIAL

- Galvanized steel casing and damper blade
- Zinc coated steel shaft
- Plastic bearings
- Neoprene blade gaskets
- EPDM rubber duct gaskets
- Aluminium measurement probe

ACCESORY

- **Acoustic Insulation:** In order to fulfill the acoustic comfort conditions in the selected product, it is insulated with an optional 19 mm thick foamed rubber. Rubber insulation is covered with galvanized sheet.
- **ACQ - Electrical Heater:** When an additional heater power is needed for the supply air, an Electric Heater can be added to the output of the ACB.
- **GSS_K - Circular Silencer:** Duct type silencer option is available to meet comfort conditions.

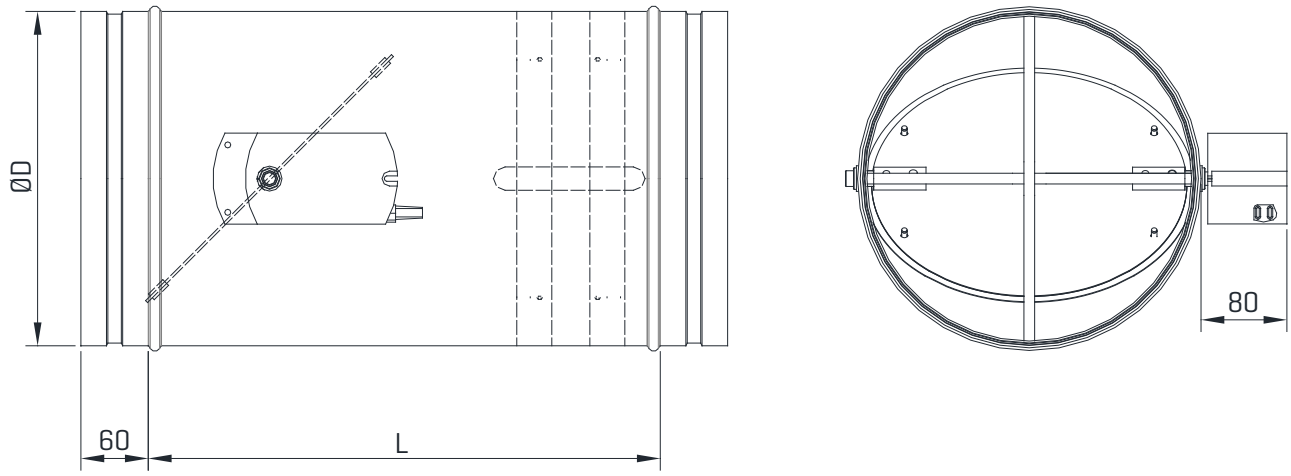


ACQ - Electric Heater

GSS_K - Circular Silencer

STANDARD DIMENSIONS

ACB WITHOUT INSULATION



ACB WITH INSULATION

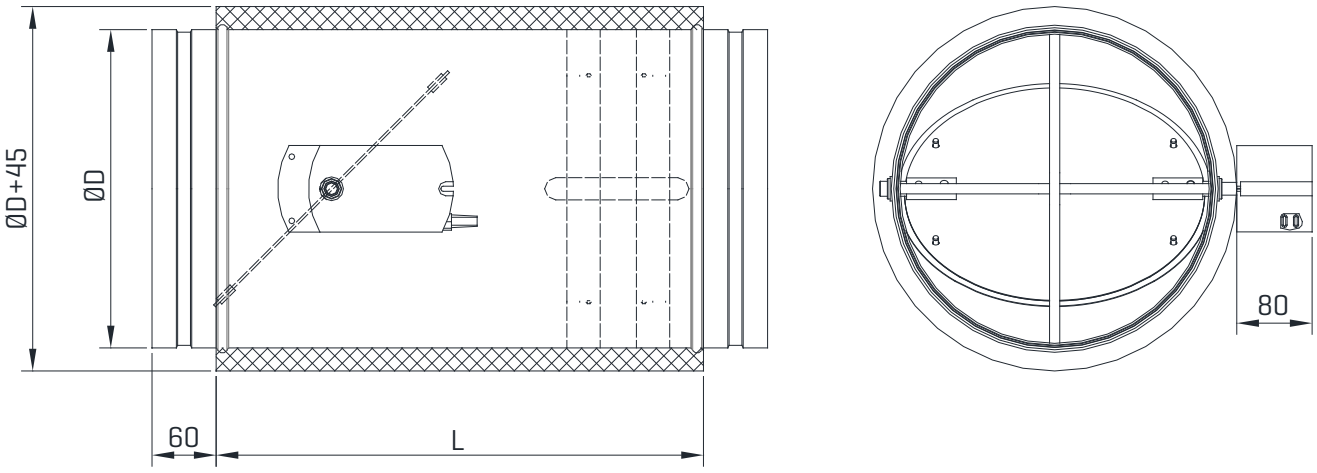


Table 1. Quick Selection

TYPE (By Diameter [mm])	V_{min} [m^3/h]	V_{max} [m^3/h]	L mm
ACB-100	28	266	345
ACB-125	44	428	325
ACB-160	72	705	330
ACB-200	113	1108	370
ACB-250	177	2086	420
ACB-315	281	3322	485
ACB-355	356	4226	525
ACB-400	452	5372	570

Note:

Vmin air speed of 1 m/s, Vnom values of air velocity 10 m/s refers to the nominal flow is to pass through a duct according to product size.

Vmax and Vmin values should be determined in the flow rate selection. The Vmin value can be selected between 0% and 100% of the Vnom value. The Vmax value can be chosen between 40% and 80% of the Vnom value. When Vmin and Vmax values are selected the same, the product will operate in constant flow (CAV) mode.

PERFORMANCE DATA

Table 2. Performance Data

ACB - [W/O Insulation] / ACB - [Insulated]				Air Regenerated Noise Lp_A [dB(A)]				Case Radiated Noise LP_R [dB(A)]							
Nominal	Velocity	Flow Rate	Pressure Drop	ACB - [W/O Insulation] ACB - [Insulated]				ACB - [W/O Insulation]				ACB - [Insulated]			
ØD	[m/s]	[m³/h]	[Pa]	100	200	400	800	100	200	400	800	100	200	400	800
				[Pa]	[Pa]	[Pa]	[Pa]	[Pa]	[Pa]	[Pa]	[Pa]	[Pa]	[Pa]	[Pa]	[Pa]
100	2	53	2	30	38	45	50	<15	20	28	32	<15	<15	<15	18
	4	106	10	34	40	47	52	<15	22	29	34	<15	<15	<15	21
	6	160	23	36	43	49	54	19	24	31	35	<15	<15	19	23
	8	213	41	39	45	51	57	21	27	33	38	<15	<15	22	27
	10	266	65	42	47	54	59	25	29	36	41	<15	18	24	30
125	2	86	2	30	38	45	50	<15	20	28	33	<15	<15	<15	20
	4	172	10	35	41	48	53	<15	23	31	36	<15	<15	18	23
	6	258	22	38	43	51	56	20	25	33	38	<15	<15	21	26
	8	344	39	41	46	53	58	24	28	35	41	<15	<15	24	29
	10	428	61	44	49	55	60	26	31	37	43	<15	19	26	31
160	2	141	2	28	40	46	52	<15	24	30	36	<15	<15	<15	20
	4	282	10	33	43	48	55	<15	26	32	38	<15	<15	17	23
	6	423	22	37	47	51	57	20	31	34	41	<15	21	22	28
	8	564	39	40	49	53	60	23	33	36	44	<15	18	24	31
	10	705	61	44	51	55	62	27	35	38	46	<15	20	26	33
200	2	222	2	29	38	44	54	<15	22	29	39	<15	<15	<15	26
	4	444	9	34	42	49	56	17	27	33	41	<15	<15	21	28
	6	666	19	38	45	51	58	22	30	36	43	<15	18	24	31
	8	888	35	41	48	54	61	25	33	38	45	<15	21	26	33
	10	1108	54	45	51	56	63	29	35	40	48	<15	23	29	35
250	2	348	2	28	37	46	52	<15	21	30	39	<15	<15	<15	26
	4	696	9	35	42	49	57	17	27	33	41	<15	<15	21	28
	6	1044	18	38	46	52	59	22	30	36	43	<15	18	24	31
	8	1392	33	41	49	54	61	25	33	38	45	<15	21	26	33
	10	1740	51	45	51	56	63	29	35	40	48	<15	23	29	35
	12	2086	53	48	53	58	64	32	36	42	48	22	28	33	39
315	2	554	2	29	37	46	52	<15	21	31	37	<15	<15	20	27
	4	1108	9	36	44	50	56	19	27	34	40	<15	19	25	31
	6	1662	17	40	47	54	59	24	31	37	43	<15	22	29	34
	8	2216	29	44	50	56	62	28	33	40	45	19	25	31	37
	10	2770	46	48	53	58	64	32	36	42	48	22	28	33	39
	12	3322	54	52	57	59	66	34	39	45	50	24	30	36	43
355	2	704	3	28	37	44	53	<15	23	31	40	<15	<15	20	29
	4	1408	14	36	45	49	56	21	30	35	43	<15	20	24	32
	6	2112	15	39	47	53	60	24	33	39	46	15	22	29	35
	8	2816	26	43	50	56	63	28	36	42	49	18	26	31	38
	10	3520	41	46	53	59	66	32	39	44	52	22	29	34	41
	12	4226	54	52	56	60	68	34	41	45	54	24	30	36	43
400	2	895	2	29	36	46	55	<15	22	34	41	<15	<15	22	31
	4	1790	10	37	44	50	57	22	30	36	43	<15	21	26	34
	6	2685	14	40	47	54	60	26	33	39	46	17	23	30	37
	8	3580	25	45	50	56	63	30	36	41	49	21	27	32	39
	10	4475	38	48	54	59	67	33	39	45	53	24	30	36	43
	12	5372	54	52	56	60	68	34	41	45	54	24	30	36	43

FLOW AREA

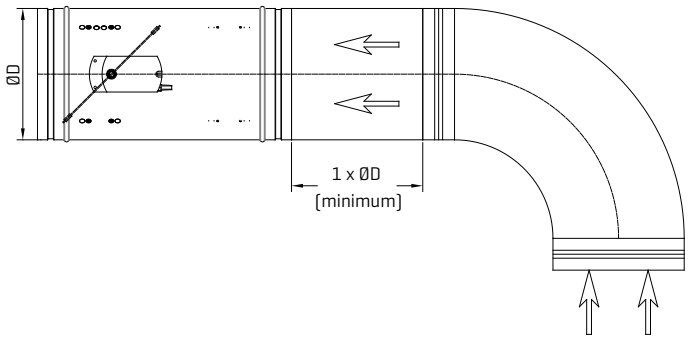
Table 3. Flow Area By Dimensions

Flow Area Table	TYPE (By Diameter [mm])							
	ACB- 100	ACB- 125	ACB- 160	ACB- 200	ACB- 250	ACB- 315	ACB- 355	ACB- 400
Flow Area [m²]	0,008	0,012	0,020	0,031	0,049	0,078	0,099	0,126

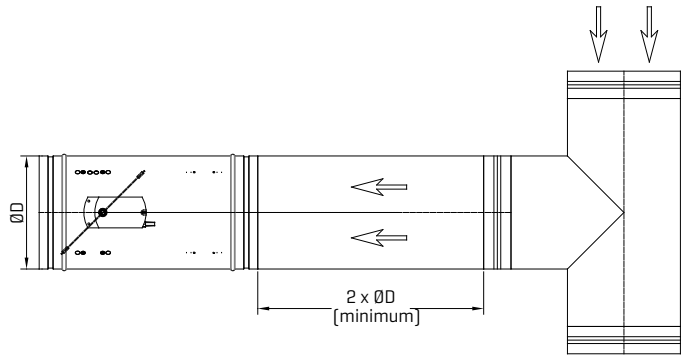
INSTALLATION

It is installed by considering the air flow direction arrow on the ACB. For the differential pressure sensors to function correctly, the following distance rules must be observed. For duct connections such as elbows, branches, tee connections and reductions must conform to EN 13180 design.

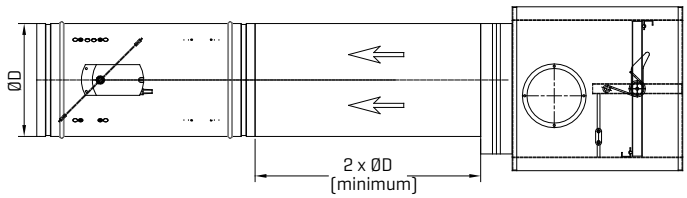
A. AFTER BENDS



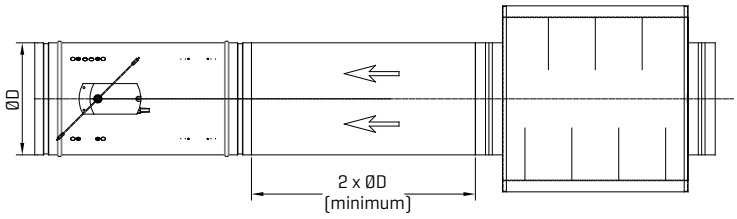
B. AFTER BRANCHES



C. AFTER FIRE DAMPERS



D. AFTER SILENCERS



Tablo 4. Minimum Duct Length Table

Connection	Minimum Duct Length
Elbow	1x**ØD**
Other duct equipment (T connection, reduction etc. duct equipment)	2x**ØD**
Fire Damper	2x**ØD**
Silencer	2x**ØD**

VAV COMPACT CONTROLLERS

VAV controllers are equipped as standard with actuators with analog setpoint and feedback signals in DC 2 V... 10 V or DC 0 V... 10 V mode.

MP-BUS, MODBUS and BACnet communication options are available in the control devices.

Control devices are calibrated and adjusted at the factory to the desired flow rate and Vmin Vmax value with ZTH-EU and Belimo PC Tool.

Table 5. VAV Controller Information Table

Order Code	Belimo Motor Code	Flow Volume Adjustment Analog input	Flow Volume Adjustment via BUS Com.	Controller Parameters Setup [3]	Hard Wired Override	Feedback Signal Type	Feedback Values [2]	BUS Communicated Variables	Power Supply	Operating Temperature [°C]
S71 S70	LMV-D3-MP (5 Nm) NMV-D3-MP (10 Nm)	DC 0...10 V, DC 2...10 V	MP-BUS	ZTH-EU, PC TOOL, NFC (Android), MP-BUS	Open [1] Close Vmin, Vmax	DC 0...10 V, DC 2...10 V, MP-BUS	Actual Volume, Damper Angle, Actual Pressure	**Read/Write:** Setpoint, Vmin, Vmax, Open, Close **Read:** Actual Volume, Damper Angle, Actual Pressure, Serial Number, Fault, Alarm Messages	AC 24 V, DC 24 V	0...+50 °C
S72	LMV-D3-MF (5 Nm)		—	ZTH-EU, PC TOOL		DC 0...10 V, DC 2...10 V		—		
S71 S86	LMV-D3-MOD (5 Nm) NMV-D3-MOD (10 Nm)		MODBUS, BACnet, MP-BUS	ZTH-EU, PC TOOL, MODBUS, MP-BUS		DC 0...10 V, DC 2...10 V, MODBUS, MP-BUS		**Read/Write:** Setpoint, Vmin, Vmax, Open, Close **Read:** Actual Volume, Damper Angle, Actual Pressure, Serial Number, Fault, Alarm Messages		

Note:

1) Available on AC 24 supply only.

2) Output is analog. Therefore, only one feedback value can be selected.

3) Control units are not provided as accessories.

VAV COMPACT CONTROL DEVICE ELECTRIC CONNECTION

S72: LMV-D3-MF (STANDARD PRODUCTION)

No.	Designation	Wire Colour	Function
1	⊥-	Black	AC/DC 24 V Supply
2	~+	Red	
3	◂Y	White	Referance Signal VAV / CAV
5	▸U	Orange	-Actual Value Signal -Tool Communication

S71: LMV-D3-MP & S70: NMV-D3-MP

No.	Designation	Wire Colour	Function
1	⊥-	Black	AC/DC 24 V Supply
2	~+	Red	
3	◂Y	White	Referance Signal VAV / CAV
5	▸U	Orange	-Actual Value Signal -MP-Bus Connection

S73: LMV-D3-MOD & S86: NMV-D3-MOD

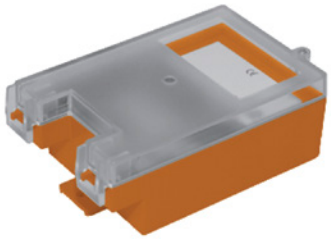
No.	Designation	Wire Colour	Function
1	⊥-	Black	AC/DC 24 V Supply
2	~+	Red	
3			
5	▸MFT	Orange	MP Connection
6	D-	Pink	BACnet / Modbus (RS485)
7	D+	Gray	

OPTIONAL ADAPTIVE VAV CONTROL SYSTEM

If desired, a product option is available with a fast response VAV servomotor, static pressure sensor and control platform. It provides the adaptive control of the ambient air flow by providing an on-off speed control independent of the duct pressure in 2.5 seconds.

Table 6. VRP-M Regulator Information Table

VRP-M Controller	
Nominal Voltage	24 V AC, 50/60 Hz 24 V DC
Power Supply	1,1 W (Without Servomotor, with VFP 300)
Reference Signal w (terminal 3) Range: Vmin...Vmax	Input Impedance > 200 kΩ - DC 0...10 / 2...10 V or - 0...20 / 4...20 mA (with 500 Ω resistance)
Actual Value	0...10 / 2...10 DC, maximum 5 mA
Degree of Protection	IP 42
Operating Temperature	0...+50°C
EMC	CE 2004/108/EC
Ambient Humidity	5...95% r.h



VRP-M

Table 7. VFP-300 Static Differential Pressure Transducer Information Table

VFP-300 Static Differential Pressure Sensor	
Supply Connection	15 V DC (Suitable with VRP-M)
Measuring Ranges	0...300 Pa
Output Signal	0...10 V DC
Connection for Pressure Losses	Internal Diameter Ø4...6 mm
Protection Class	III Safety Extra-Low Voltage
Degree of Protection	IP42
Operating Temperature	0...+50°C
EMC	CE 2004/108/EC

VRP-300

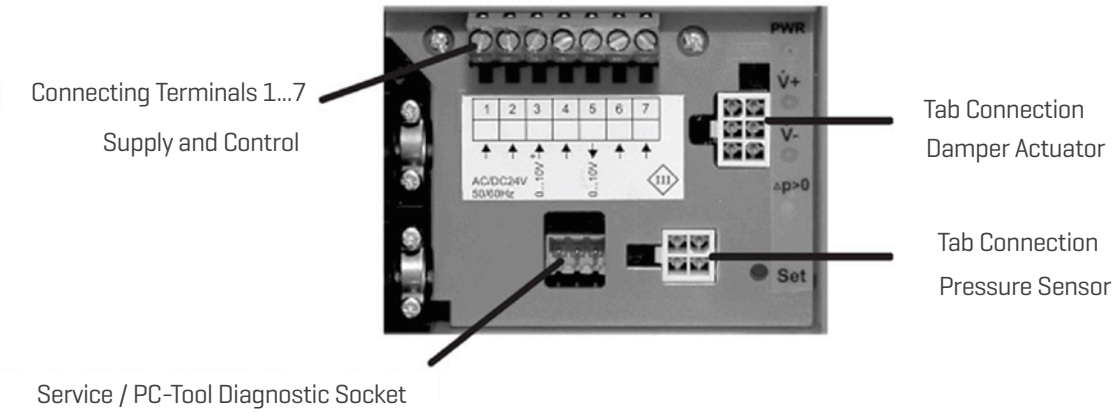
Table 8. LMQ24A-SRV-ST & LMQ24A-SRV-ST Servomotor Information Table

LMQ24A-SRV-ST Servomotor	
Supply with VRP-M	24 V AC, 50/60 Hz 24 V DC
Power Operating Consumption	13 W
Protection Class	III (Safety Extra-Low Voltage)
Torque	4 Nm
Speed	2,5 s / 90°
Degree of Protection	IP54
Operating Temperature	0...+50°C
EMC	CE 89/336/EEC
Ambient Humidity	5...95% r.h.
Maintenance	Maintenance Free

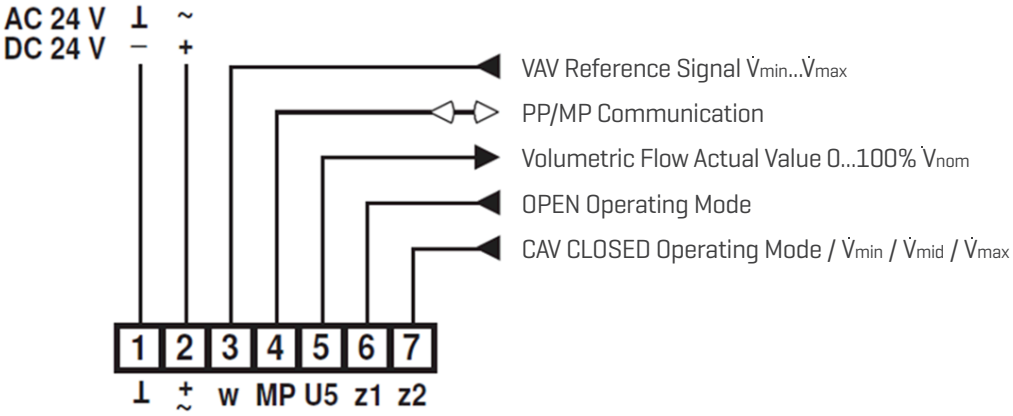
LMQ24A-SRV-ST
NMQ24A-SRV-ST

ADAPTIVE VAV CONTROL SYSTEM ELECTRIC CONNECTION

FRONT PANEL



FRONT PANEL CONNECTION TERMINALS FUNCTIONS



PRODUCT SELECTION

The maximum air flow rate of the space is known as Vmax. Vmax volume flow rate can be selected between maximum 80% and 40% of the nominal volume flow rate of the damper. Vmin flow rate can be selected as 30% of the nominal air flow rate of the damper. In 2-10V controller selection, the damper operates at a flow rate of Vmin at 2V and below. Between 0-10V, the damper has the feature of completely closing. If Vmax and Vmin are selected at the same value, the damper will operate in CAV (constant flow rate setting) mode.

Example: The total air flow of a zone is determined as 15000 m^3 / h. 5 VAV devices for the room will be installed in the supply duct. Select your product.

The maximum supply flow rate for each VAV to be used is calculated as 15000/5 = 3000 m^3 / h. Since Vmax = 80% Vnom and Vmax = 3000 m^3 / h, it is calculated as Vnom = 3750 m^3/h from the formula. Vmin can be 30% of the Vnom value and can be selected Vmin = 1125 m^3/h. According to the values of Vmin and Vmax, the appropriate size is selected from the Table 2. Quick Selection table as Vnom = 4226 m^3/h and duct dimension is Ø355 mm.

For maximum calibrated flowrate of VAV is 3000 m^3/h and diameter Ø355 mm, the performance data can be obtained from Table 2. Performance Data. According to the table, values can be interpolated. Example results shown below.

Pressure drop = 30 Pa

Air Regenerated Noise: 44 dB(A) (100 Pa), 64 dB[A] (800 Pa)

Case Radiated Noise Without Insulation: 29 dB(A) (100 Pa), 50 dB[A] (800 Pa)

Case Radiated Noise With Insulation: 19 dB(A) (100 Pa), 39 dB[A] (800 Pa)

Actuator Selection

According to the building automation system, the desired motor is selected from Table 5. VAV Controller Information Table. If the system is desired to be fast reacting under special conditions, adaptive vav control system is preferred. For electric connection information, see the section "Adaptive Vav Control System Electric Connection".

ORDER CODE

ACB.< A > . < B > . < C > . < D > . < E > . < F > . < G >

A	**Material Type**	
	GAL	Galvanized
	PAS	Stainless Steel
B	**Flow Type**	
	E	Exhaust
	U	Supply
C	**Mechanism**	
	S70	NMV-D3-MP
	S71	LMV-D3-MP
	S72	LMV-D3-MF
	S73	LMV-D3-MOD
	S74	LMV-D3-LON
	S86	NMV-D3-MOD
	S97	Adaptive VAV Control System
D	**Installation**	
	KG	Duct Type
E	**Insulation**	
	00	Without Insulation
	04	With Insulation
G	**Dimension [ØD]**	
125 mm - 160 mm - 200 mm - 250 mm - 315 mm - 355 mm - 400 mm		

Example; ACB.GAL.E.S72.KG.00.0200

NOTES


PLEASE HANDLE WITH CARE. DO NOT THROW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