LIMODOR

The Austrian
MONO-DUCT VENTILATION SYSTEM

According to ÖNORM H 6036

Contents

IMPRINT

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LIMODOR
Mono-Duct Ventilation System

Special Characteristics Of LIMODOR-Ventilation Devices

ÖVE-Certificate
The ÖVE certificate guarantees that the devices comply with the electric safety regulations and cause no radio interference.

Splashproof And/Or Jet-Proof
IPX4, IPX5 – ÖVE-certified (see installation instructions)

Installation Within The Protected Area Of Shower And Bathtub
Without certified splashproof and/or jet-proof connection within the protected area is not permitted.

CE Certificate
CE certificate of all LIMODOR fans according to EU declarations of conformity. With these safety certificates the manufacturer guarantees that the device complies with all relevant standards and directives.

Fire Protection F90
Optional fan housing with fire protection casing, fire protection casing and metal exhaust connector with integrated intumescent fire protection material (FLI90) and/or incl. metal closing element (FLI-VE90), which closes at 72°C.

Maintenance-Free Fire Protection Flaps
From Ø80mm to Ø160mm (to Ø200mm with special agreement from the respective building authorities) with intumescent fire protection material (FLI_{90}) and/or incl. metal closing elements ($FLI\text{-}VE_{90}$), which close at 72°C.

Protection From Unpleasant Odors And/Or Cold Smoke Protection
Exchangeable, tight sealing non-return flaps according to ÖNORM H 6036, type-certified by TÜV-Wien. Tightness at 50Pa counter-pressure below 0,01$m^3 \cdot h^{-1}$. Due to its extreme tightness this non-return flap serves the LIMODOR mono-duct ventilation system as cold smoke protection, which prevents smoke transmission in case of fire.

Sound Insulation In Structural Engineering
Complied with according to DIN 4109 by LIMODOR ventilation devices. The permitted sound pressure levels (DIN 4109 Tab.4) in protected rooms of third party apartments are for LIMODOR individual ventilation devices not above permitted maximum values of 30dB(A) or 35dB(A) respectively for continuous sound without noticeable individual sounds.
With respect to telephony sound at the Frauenhofer Institute for Building Physics in Stuttgart a well level differential test with the result was carried out that noise transmission from one ventilation device to a ventilation device above mainly takes place via the well formation and not via the ventilation system and therefore via the mono-duct ventilation system no telephony sound transmission takes place.

Residual Noise Of LIMODOR Fans
Die Residual noise of all LIMODOR fans is verified by MA39-WIEN according to ÖNORM S 5031 and complies with ÖNORM M7645 and ÖNORM B 8115 - Part 2.

Warping In Main Duct
Deflections, horizontal warping and similar are possible with the LIMODOR mono-duct ventilation system. However, this necessitates detailed calculation of duct dimension according to technical rules and case-wise evaluation of the system with regard to fire protection. You can request a respective computer program free of charge at LIMOT.

Duct Dimensioning
Different brands require different duct dimensions. There is no uniform duct dimensioning. The duct dimension depends on the respective individual fan brand (rated volume flow and pressure differential) and a new calculation of the duct dimensions must be carried out when changing an individual fan type.

Easily Exchangeable Dust Filter
The double-walled special cover allows exchanging the dust filter without tools.

Thermal Protection Switch
The thermo switch in the motor protects against overload. All motors in LIMODOR individual fans are 100% suitable for continuous operation.

Particularly Long Life Cycle
of the meticulously designed long-term motor through insulated and lacquered windings.

Delivery Volume Stability

Even at 40*Pa* wind load (according to ÖNORM H 6036) and at different operating modes, due to a changing number of connected LIMODOR fans in operation, the delivery volume of every individual LIMODOR ventilation device stays stable. Due to the optimal designed volume flow characteristics even at simultaneous operation of all system fans the required minimum air volumes according to ÖNORM H 6036 are met.

Installation

All LIMODOR ventilation devices can be installed in any installation position (ceiling, wall, right, left, top, bottom) without effecting performance or life span.

ÖNORM-Conform Design

LIMODOR individual ventilation devices comply with the ÖNORM H 6036 regulations (Ventilation systems – Demand-depending ventilation of apartments or individual living spaces) and M 7645 (Noise reduction). LIMODOR individual ventilation devices are type-certified by MA39-Wien.

5-Year Warranty

A thorough final inspection is performed on every product and we grant a 5-year warranty on all LIMODOR individual ventilators according to our warranty conditions.

Austrian Quality Product

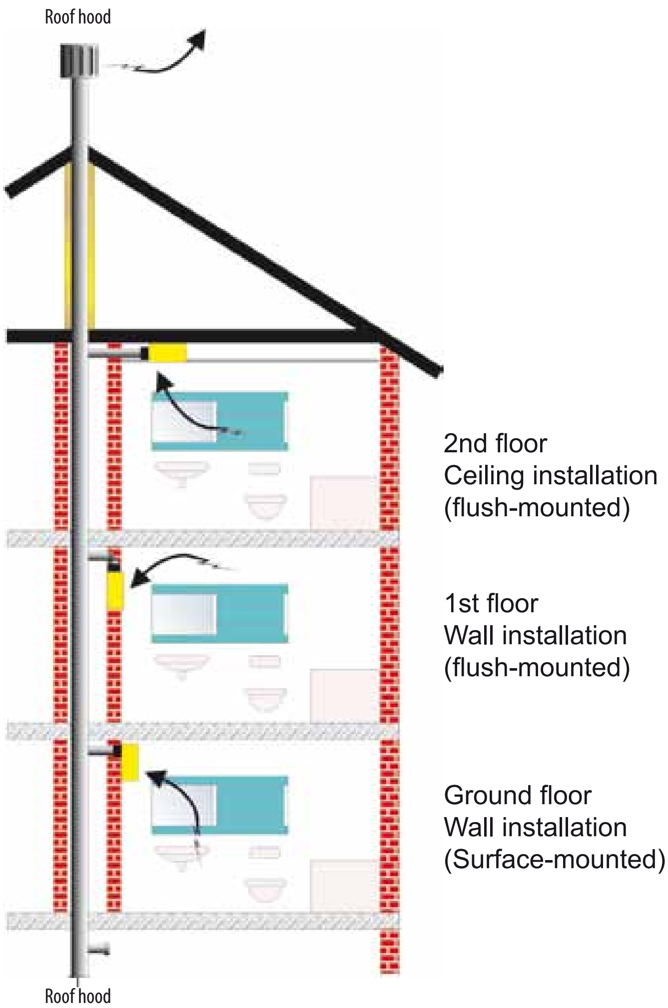
All LIMODOR appliances are Austrian developments and tested Austrian quality products.

LIMODOR is the quality product, which has revolutionized ventilation of internal sanitary rooms and kitchens, setting new benchmarks in living space ventilation. LIMODOR individual ventilation devices have been tried and tested millions of times and are used all across Europe. The products are continuously developed further and adjusted to the requirements of users and construction professionals.

Today the brand LIMODOR stands for best quality and highest customer satisfaction, for powerful ventilation at lowest power consumption and minimum noise emission.

All these factors characterize the Austrian LIMODOR individual ventilation device and guarantee best quality and best energy efficiency.

LIMODOR mono-duct ventilation system



It Is Very Easy To Install The LIMODOR Mono-Duct Ventilation System:

Space-saving: It only needs one main duct through all floors per riser.

Trouble-free: During planning no calculations are necessary, except determination of the minimum duct width of the riser.

Fail-safe: 100% testing of LIMODOR fans during manufacture. The 5-year warranty speaks for itself.

Economical: Exceptionally low operating costs of LIMODOR individual fans due to operation on demand.

Energy Consumption Of Ventilation Systems

It is generally known that for exhaust air conveyed to the outside the same amount of incoming air must flow in via the exterior elements (windows, doors, etc.). During the cold season this inflowing air must be heated to room temperature. Therefore the required heating energy can be set in relation to the exhaust air volume. In table 2 the energy consumption of the different ventilation systems is shown.
Considering that the front door of every housing unit is opened several times per day and every time fresh air flows from the outside into the building, it can be assumed that for a single ventilation without base load one intensive airing (opening window) of approx. 300 - 500m^3 is sufficient to achieve the required air volume. However, to create equal conditions for comparison, calculation for daily intensive airing was assessed in such way that for all ventilation systems the same air volume/day was assumed.
The fresh air volumes entering the living space by opening entrance door and windows are not taken into consideration for the required energy calculation, since this energy is additionally needed for all systems.

Specification:
In ÖNORM H 6038 (Controlled mechanical ventilation systems with heat recovery) the minimum volume flow per housing unit is to be determined according to 3 methods, where the greater of such determined outgoing/ incoming air volume is applied.
As example an apartment with 80m^2 usable living space, 2,5m ceiling height, 1 bathroom, 1 WC, 1 storeroom, 1 kitchen and other living rooms was calculated. 3 persons occupy the apartment.

1. Calculation of minimum volume flow according to occupancy
Calculation of minimum volume flow according to occupancy 36$m^3 \cdot h^{-1}$. This results in (3 x 36 x 24) a daily required volume flow of 2592m^3.

2. Calculation of minimum volume flow according to air change rate
According to ÖNORM H 6038 up to 150m^3 living space a minimum air change rate of 0.5 times the living space volume, and from 150m2 living space 0.3 times the living space volume is to be applied.
This results in our example (80 x 2.5 x 0.5 x 24) in a daily required volume flow of 2400m^3.

3. Calculation of minimum volume flow according to type of space
According to ÖNORM H 6038 the following values for minimum volume are to be applied for the different spaces.

Room type	*Minimum exhaust air volume flow in $m^3 \cdot h^{-1}$*
Bathroom	40
WC	20
Storeroom	10
Kitchen (basic ventilation)	40

Table 1

This results in our example ({40+20+10+40} x 24) in a daily required volume flow of 2640m^3.

For the ventilation system design in this example therefore a daily exhaust air and/or incoming air volume flow of 2640m^3 is to be applied. The heating costs were calculated for an oil heating system, where for 1400$m^3 \cdot h^{-1}$ exhaust air on average 1l fuel oil is consumed. As heat recovery gradient on average 70% were assumed, since manufacturer data only relate to lab values and always new, clean and technically flawless equipment. However, in practice it can be assumed that these values cannot be maintained in the long run. For the versions with heat exchanger, auxiliary heating with 400W heating output is included to prevent icing of the heat exchanger during the cold season (approx. 35 days/year below 0°C according to statistics). It is assumed that the auxiliary heater operates 300 hours per year.

Annual Operating Costs In Comparison (Without Maintenance Costs)

A = INDIVIDUAL VENTILATION with Limodor ventilation device
Only switched on on demand and therefore minimizing the air exchange to the required ventilation time.
With regard to a 3-person household on average 3 hours daily operating time with 60$m^3 \cdot h^{-1}$ can be assumed.
To achieve the required air volume according to ÖNORM H 6038 it was assumed in the example that the shortfall is achieved by intensive aeration via the window (vertical transverse ventilation).

B = INDIVIDUAL VENTILATION (as pos. A) **with BASE LOAD** without heat recovery:
The ventilation devices (3 units) run constantly in base load mode (30$m^3 \cdot h^{-1} \Rightarrow$ 56h per day) and are switched to full load mode (60$m^3 \cdot h^{-1} \Rightarrow$ 16h per day), if necessary.

C = AirClean-VENTILATION SYSTEM with Heat recovery:
LIMODOR AirClean-ventilation system with 3 LIMODOR exhaust air ventilators and one EC incoming air box with AirClean heat exchanger. The exhaust air devices run constantly in base load mode (30$m^3 \cdot h^{-1} \Rightarrow$ 56h per day) and are switched to full load mode (60$m^3 \cdot h^{-1} \Rightarrow$ 16h per day), if necessary.

D = CENTRAL VENTILATION with heat recovery:
Central ventilation device with integrated heat exchanger. The device runs 5,33h per day in full load mode (180$m^3 \cdot h^{-1}$) and the remaining time (18,67h per day) in partial load mode (90$m^3 \cdot h^{-1}$).

Ventilation version	*A*	*B*	*C*	*D*
Exhaust air in m^3/day	2640 m^3	2640 m^3	2640 m^3	2640 m^3
approx. liter fuel oil/day	1,89 Liter	1,89 Liter	0,57 Liter	0,57 Liter
approx. liter fuel oil/year (5 Month)	287,44 Liter	287,44 Liter	86,04 Liter	86,04 Liter
Operating costs for fuel oil at € 0.82/l	235,70 €	235,70 €-	70,55 €	70,55 €
Power/day	0,033 kWh	0,568 kWh	1,27 kWh	3,609 kWh
Power/year incl. heating for WT	12,045 kWh	207,32 kWh	463,55 kWh	1317,285 kWh
Operating costs for power at € 0,18/kWh	2,17 €-	37,32 €-	83,44 €	237,11 €-
Total operating costs	**237,87 €**	**273,02 €-**	**153,99 €**	**307,66 €**

Table 2

Purchase Price In Comparison

The purchasing and installation costs in our example are estimates, which cannot be transferred 100% to other or similar projects. The values reflect the average purchasing and installation costs.

Ventilation version	*A*	*B*	*C*	*D*
Cost ventilation device	550,00 €	630,00 €	2900,00 €	2150,00 €
Cost ducting material and accessories	340,00 €	340,00 €	1350,00 €	2500,00 €
Cost inlet and outlet valves	0,00 €	0,00 €	0,00 €	670,00 €
Cost controllers (time delay, humidity, etc.)*	150,00 €	150,00 €	150,00 €	0,00 €
Installation cost fans and valves	300,00 €	300,00 €	500,00 €	500,00 €
Installation cost ducting	100,00 €	100,00 €	250,00 €	250,00 €
Installation cost electric	100,00 €	100,00 €	250,00 €	150,00 €-
adjustment costs	0,00 €	0,00 €	50,00 €	100,00 €
Start-up costs	0,00 €	0,00 €	50,00 €	200,00 €
Total installation costs	**1.540,00 €**	**1.620,00 €**	**5.500,00 €**	**6.520,00 €**

Table 3

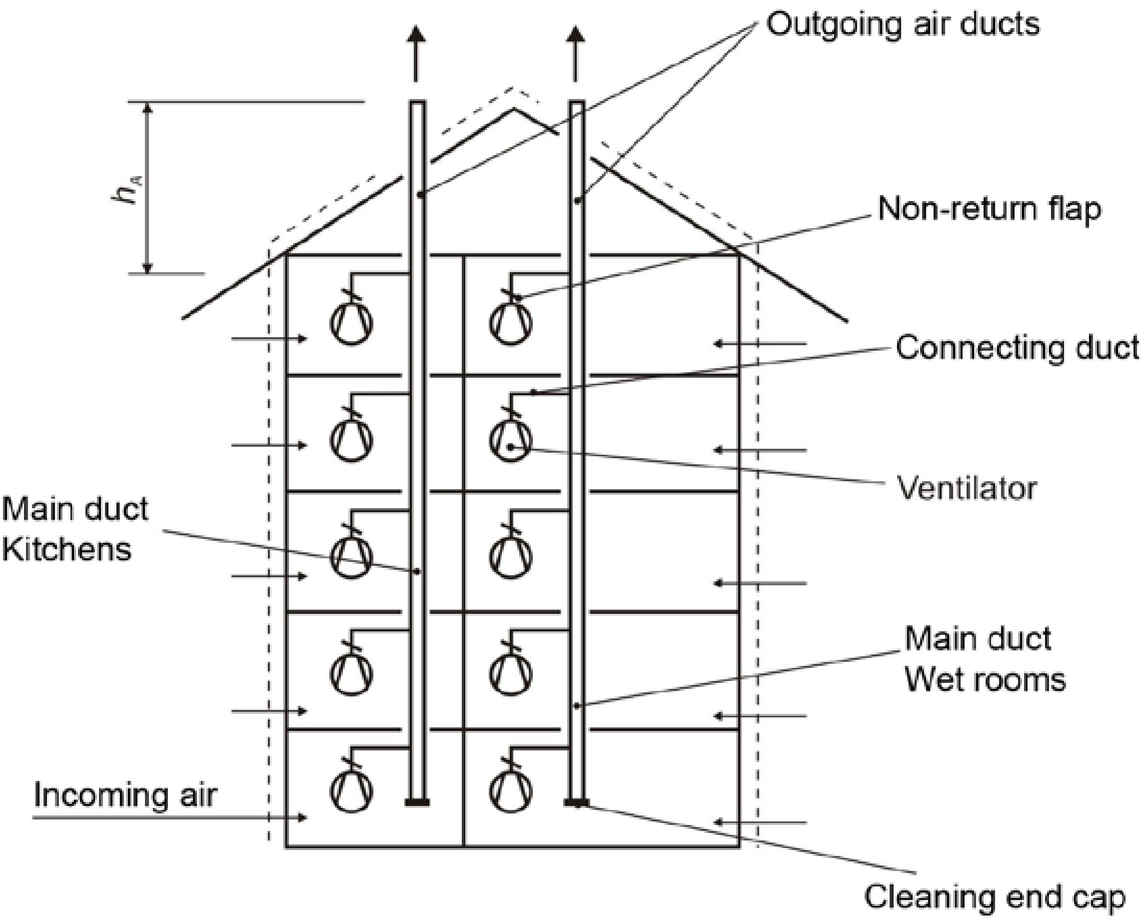
*) Individual control only possible for individual ventilation devices and AirClean.

Mechanical Exhaust Air Systems According To ÖNORM H 6036 (Edition 2007-06-01)

Mechanical exhaust air systems are used to ventilate bathrooms, WCs, storerooms, kitchens and similar living spaces in housing units. ÖNORM H 6036 requires that during operation sufficient air volumes can flow in via sufficiently dimensioned air passages. They should be equipped with air filters and are to be positioned in such way that the incoming airflow is as draft-free as possible. Assuming that already the leakiness of a building of <= 0.6 times the room volume per hour equals the passive house standard, then it can be assumed that for the mono-duct ventilation system always sufficient fresh air for proper operation is available. As example for this statement we take the previous example with 150m^2 living space times 2,5m ceiling height, which equals fresh air supply of 225$m^3 \cdot h^{-1}$ assuming a leakage of 0.6. This amount is by far sufficient to properly operate 3 LIMODOR ventilation devices with 60$m^3 \cdot h^{-1}$ each. Particularly if it assumed that these individual ventilation devices are only turned on/off on demand.

Principle Of A Mechanical Exhaust Air System With Mutual Outgoing Air Duct According To ÖNORM H 6036

In this ventilation system several apartments are ventilated via a mutual common outgoing air duct.



Exhaust Air Volume Flow Design According To ÖNORM H 6036

For air volume flow design according to ÖNORM H 6036 the values from table 4 are to be used.

Room type	operating volume flow $m^3 \cdot h^{-1}$	Basic volume flow $m^3 \cdot h^{-1}$
Bathroom (also with WC)	60	20
WC	40	10
Kitchen in common are	100	20
Kitchen in cooking area (extractor hoods)	200	-

Table 4

The basic volume flow relates to mechanical exhaust air systems with central exhaust air devices (central systems with continuous operation).

Odor Transmission For Mechanical Exhaust Air Systems With Mutual Exhaust Air Duct

To prevent odor transmission for decentralized exhaust air systems with mutual outgoing air duct, ÖNORM H 6036 requires installation of tight-closing non-return flaps. These non-return flaps must be accessible for maintenance and must be closed at a pressure differential of less than 10*Pa*. The air leakage volume flow with regard to a duct diameter of 100cm^2 at a pressure differential of 50*Pa* is to be maximum 0,01$m^3 \cdot h^{-1}$ Theses tightness requirements are to be verified by type testing (official testing institute).

Exhaust Air Duct Design

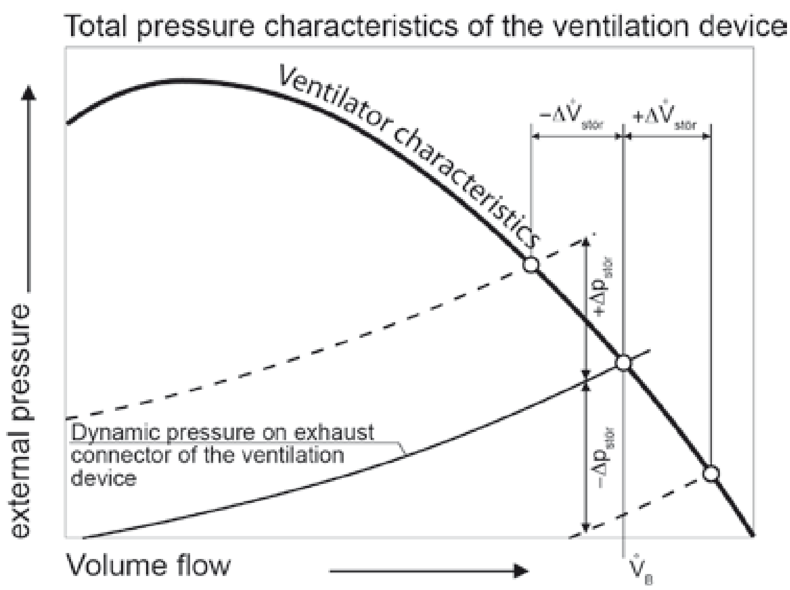
Exhaust air duct design has to follow criteria below to guarantee for all system ventilation devices uniform and efficient performance.

Fan Characteristics Evaluation

Evidence is to be provided that that scheduled outgoing air volume flows due to wind loads only change within the permitted limits. This can be verified by means of the characteristics of the device unit and the system characteristics. The volume flows are not to change with respect to designed outgoing air volume flows due to wind loads (e.g. wind, thermal lift) more than ±10%. As parameter of the wind load for perpendicular exhaustion 40Pa are to be assumed, horizontal exhaustion is to be avoided.

Legend:

- $\Delta p_{Stör}$ Pressure differential due to wind loads (40*Pa*)
- $\Delta \mathring{V}_{Stör}$ Outgoing air volume flow change due to wind loads (40*Pa*)
- $\mathring{V}_B$ Outgoing air volume flow I on operating point, in $m^3 \cdot s^{-1}$

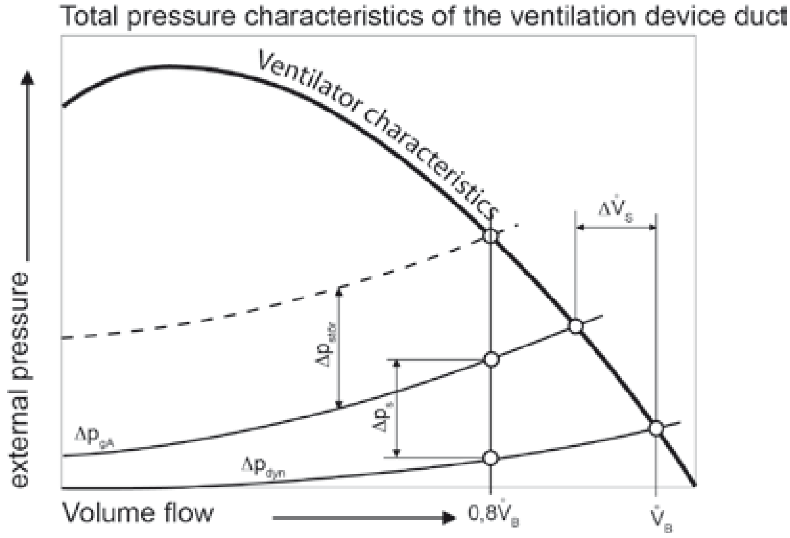


The Simultaneity Factor For Exhaust Air Systems With Mutual Exhaust Air Duct

For exhaust air systems with mutual exhaust air duct generally the simultaneity is to be taken into consideration. In this case deviations up to ±20% are permitted.

Legend:

$\mathring{V}_B$	Outgoing air volume flow in operation point
Δp_s	Static pressure loss in main duct, with refe rence to the most adverse device unit with all device units operational
$\Delta\mathring{V}_S$	Outgoing air volume flow reduction in most adverse device unit during simultaneous operation of all device units
$0{,}8{*}\mathring{V}_B$	Minimum calculation outgoing air volume flow at most adverse device unit during simulta neous operation of all device units and greatest possible wind load (40*Pa*)
Δp_{dyn}	Dynamic pressure in exhaust duct of the device unit
Δp_{gA}	Total system pressure at inlet of the most ad verse device unit during simultaneous operation of all device units
$\Delta p_{Stör}$	Pressure differential due to wind loads (40*Pa*)



Calculation Method For Individual Ventilation Devices With Mutual Exhaust Air Duct

Evidence is to be provided that that scheduled outgoing air volume flows due to wind loads and reciprocal interference of the ventilation devices only change within the permitted limits. Static pressure loss .ps in the main duct most distant device unit from the connection of the outgoing air outlet is estimated. The value 0.77 is an average value for the drag coefficient of the inlets.

$$\Delta P_S = R_A \cdot h_S \cdot \left(\frac{(n+1)\cdot(2n+1)}{6n} + \frac{h_A}{h_S} - 1\right) + 0{,}77 \cdot P_{dA}$$

Legend:

R_A	Drop in pressure per m in exhaust duct at total outgoing air volume flow, in *Pa*
n	Number of floors with connected device units
h_s	Length of outgoing air collecting main duct sections between two device connections, in *m*
h_A	Length of exhaust duct (according to Figure 3), in *m*
p_{dA}	Dynamic pressure in the exhaust duct at total outgoing air volume flow, in *Pa*
Δp_s	Static pressure loss in the outgoing air collecting main duct for the most distant device unit, in *Pa*

Requirement for the correctness of the formula is the condition that the outgoing air duct between the lowest an uppermost connecting duct is straight and has a uniform diameter and that the volume flows are identical. Accurate calculation is necessary to prove that the volume flow continuity is maintained if the system does not comply with this simple form.

The total outgoing air volume flow $V_{m,gesamt}$ during simultaneous operation of all devices is estimated according to the following formula. The value 0,93 ×V_B is the average value for the volume flow of all system device units.

$$\mathring{V}_{m,gesamt} = n \cdot 0{,}93 \cdot \mathring{V}_B$$

Legend:

n	Number of floors with connected device units
$\mathring{V}_B$	Outgoing air volume flow of a freely exhausting device unit, in $m^3 \cdot s^{-1}$
$\mathring{V}_{m,gesamt}$	Total outgoing air volume flow of a freely exhausting device unit, in $m^3 \cdot s^{-1}$

Riser Dimensioning

according to ÖNORM H 6036

Per floor 1 LIMODOR individual fan

Condition for the correctness of below duct dimensions is:

1. The riser is designed vertical without any transverse cupping.
2. The riser is designed from the lowest LIMODOR individual fan up to over roof with the same duct dimension.
3. On every floor is one LIMODOR individual fan of the same type each connected to the riser.

Floor heights:

①	Floor heights	h_s = 2,75*m*
	Exhaust duct	h_A = 1,50*m*
②	Floor heights	h_s = 3,00*m*
	Exhaust duct	h_A = 2,00*m*
③	Floor heights	h_s = 3,30*m*
	Exhaust duct	h_A = 3,00*m*

Rated duct width in mm

Type	Rated volume V calculated Vm a.t. ÖNORM	Connection diameter	Floor height	ø 100	ø 125	ø 150	ø 160	ø 180	ø 200	ø 224	ø 250	ø 280	ø 300	ø 315
LIMODOR-B-UP	60 $m^3 \cdot h^{-1}$	ø 50	①	4	6	9	10	12	15	18	20			
			②	4	6	8	9	12	14	18	20			
	55,8 $m^3 \cdot h^{-1}$		③	3	5	8	9	11	14	17	20			
LIMODOR-B-AP	60 $m^3 \cdot h^{-1}$	ø 64	①	3	5	8	9	11	13	17	20			
			②	3	5	7	9	11	13	16	20			
	55,8 $m^3 \cdot h^{-1}$		③	3	5	7	8	10	13	16	19	20		
LIMODOR-C/E	45 $m^3 \cdot h^{-1}$	ø 40	①	6	9	12	14	18	20					
			②	5	9	12	14	17	20					
	41,8 $m^3 \cdot h^{-1}$		③	5	8	12	13	16	20					
LIMODOR-F/M	60 $m^3 \cdot h^{-1}$	ø 80	①	5	8	11	12	15	18	20				
			②	5	7	10	12	14	17	20				
	55,8 $m^3 \cdot h^{-1}$		③	5	7	10	11	14	17	20				
LIMODOR-F/M	100 $m^3 \cdot h^{-1}$	ø 80	①	2	4	5	6	7	9	11	13	17	19	20
			②	2	3	5	6	7	9	11	13	16	18	20
	93 $m^3 \cdot h^{-1}$		③	2	3	5	-	7	8	10	13	16	18	20
LIMODOR-F/E	167 $m^3 \cdot h^{-1}$	ø 80	①	2	-	4	-	5	6	8	10	12	14	15
			②	1	2	4	-	5	6	8	10	12	14	15
	155,31 $m^3 \cdot h^{-1}$		③	1	2	3	4	5	6	8	9	12	13	15
LIMODOR-W/A	300 $m^3 \cdot h^{-1}$	ø 100	①	1	-	2	-	3	4	5	6	8	9	10
			②	1	-	2	-	3	4	5	6	8	9	10
	279 $m^3 \cdot h^{-1}$		③	1	-	2	-	3	4	5	6	8	9	10

Table 5

Number of floors (1 device per floor)

Search example:

Specifications: 8 floors: 1 LIMODOR F/M with 60$m^3 \cdot h^{-1}$ per floor each; floor height h_s=3*m*; length exhaust duct from last device to over roof h_A=2*m*.

Search path: LIMODOR-F/M ⇒ 60$m^3 \cdot h^{-1}$ ⇒ ② (h_s=3, h_A=2) ⇒ number of floors = 8

Since the number of floors 8 is not included in the table LIMODOR-F/M - 60$m^3 \cdot h^{-1}$ - ② it must be rounded up to the next higher number of floors. This results for number of floors 10 a riser with a rated diameter of **Ø150 mm**.

Riser Dimensioning

according to ÖNORM H 6036

Per floor 2 LIMODOR individual fans

Condition for the correctness of below duct dimensions is:

1. The riser is designed vertical without any transverse cupping.
2. The riser is designed from the lowest LIMODOR individual fan up to over roof with the same duct dimension.
3. On every floor are two LIMODOR individual fans of the same type each connected to the riser.

Floor heights:

① Floor heights h_s = 2,75*m*
Exhaust duct h_A = 1,50*m*

② Floor heights h_s = 3,00*m*
Exhaust duct h_A = 2,00*m*

③ Floor heights h_s = 3,30m
Exhaust duct h_A = 3,00*m*

Rated duct width in mm

Type	Rated volume V calculated Vm a.t. ÖNORM	Connection diameter	Floor height	ø 100	ø 125	ø 150	ø 160	ø 180	ø 200	ø 224	ø 250	ø 280	ø 300	ø 315
LIMODOR-B-UP	60 $m^3 \cdot h^{-1}$	ø 50	①	2	3	5	-	7	8	11	13	16	18	20
			②	2	3	5	-	7	8	10	13	16	18	20
	55,8 $m^3 \cdot h^{-1}$		③	2	3	4	5	6	8	10	12	15	17	19
LIMODOR-B-AP	60 $m^3 \cdot h^{-1}$	ø 64	①	2	3	4	5	6	8	10	12	15	17	18
			②	2	3	4	5	6	7	9	12	14	16	18
	55,8 $m^3 \cdot h^{-1}$		③	1	3	4	-	6	7	9	11	14	16	17
LIMODOR-C/E	45 $m^3 \cdot h^{-1}$	ø 40	①	3	5	7	8	10	13	16	19	20		
			②	3	5	7	8	10	12	15	19	20		
	41,8 $m^3 \cdot h^{-1}$		③	3	4	7	8	10	12	15	18	20		
LIMODOR-F/M	60 $m^3 \cdot h^{-1}$	ø 80	①	3	4	6	-	8	10	12	15	18	20	
			②	3	4	6	-	8	10	12	15	18	20	
	55,8 $m^3 \cdot h^{-1}$		③	2	4	5	6	8	9	12	14	18	20	
LIMODOR-F/M	100 $m^3 \cdot h^{-1}$	ø 80	①	1	2	3	-	4	5	6	7	9	10	11
			②	1	2	-	3	4	5	6	7	9	10	11
	93 $m^3 \cdot h^{-1}$		③	1	2	-	3	4	-	5	7	9	10	11
LIMODOR-F/E	167 $m^3 \cdot h^{-1}$	ø 80	①	1	-	2	-	3	-	4	5	7	8	-
			②	1	-	2	-	3	-	4	5	6	8	-
	155,31 $m^3 \cdot h^{-1}$		③	-	1	2	-	-	3	4	5	6	7	8
LIMODOR-W/A	300 $m^3 \cdot h^{-1}$	ø 100	①	-	-	1	-	-	2	3	-	4	5	-
			②	-	-	1	-	-	2	-	3	4	5	-
	279 $m^3 \cdot h^{-1}$		③	-	-	1	-	-	2	-	3	4	5	-

Table 6

Number of floors (2 devices per floor)

Search example:

Specifications: 5 floors: 2 LIMODOR F/M with 60$m^3 \cdot h^{-1}$ per floor each; floor height h_s=3*m*; length exhaust duct from last device to over roof h_A=2*m*.

Search path: LIMODOR-F/M ⇒ 60$m^3 \cdot h^{-1}$ ⇒ ② (h_s=3, h_A=2) ⇒ number of floors = 5

Since the number of floors 5 is not included in the table LIMODOR-F/M - 60$m^3 \cdot h^{-1}$ - ② it must be rounded up to the next higher number of floors. This results for number of floors 6 a riser with a rated diameter of **Ø150 mm**.

Fire Protection According To ÖNORM H 6027

Particularly for ventilation systems with a mutual exhaust air duct over several floors it must be observed that in case of fire no smoke or fire transmission from the area of fire to other rooms or floors occurs, which are connected to the ventilation system. Until May 2010 in Austria the German test version according to DIN 18017 was permitted, which related to pure air wells, described as homogenous wells. Since this installation method in Austria is rather not used, in April 2006 OIB Principle governing the use of fire shutters in air ducts based on intumescent materials with/without mechanical closing element. Based on this OIB principle governing the use ÖNORM H 6027 Edition: 2008-08-01 Ventilation and air conditioning plants - Fire doors and shutters for air distribution systems on the basis of intumescent materials with or without mechanical closing element was created.
This ÖNORM H 6027 determines the requirements for application and installation for fire shutters for air distribution systems for the penetration of fire zone-forming components on the basis of intumescent materials with (FLI-VE) or without (FLI) mechanical closing element.
Intumescent fire protection closing elements can prevent the spreading of fire and smoke, if using a cold smoke protection in ventilation systems, where air ducts penetrate a fire zone.
The use of such fire protection closing elements is regulated by specifications of the responsible authority (building inspection department, fire authority, etc.), relevant technical directives and a fire protection concept.
Such fire protection closing elements (FLI, FLI-VE) are only to be used in ventilation systems of several living spaces, kitchens and rooms with similar utilization or wet rooms lying on top of each other.
Use is restricted to air ducts with maximum rated diameter of 160*mm*. Greater dimensions need special authorization.

Fire Resistance Classes

Fire resistance class	*Fire resistance duration t in min*	*Fire protection technical denomination*	*Installation*
$FLI_{(ho)}$ 60	60 min $\leq t <$ 90 min	highly fire retardant	horizontal
$FLI_{(ho)}$ 90	$t \geq$ 90 min	fire resistant	horizontal
$FLI\text{-}VE_{(ho+ve)}$ 60	60 min $\leq t <$ 90 min	highly fire retardant	horizontal and vertical
$FLI\text{-}VE_{(ho+ve)}$ 90	$t \geq$ 90 min	fire resistant	horizontal and vertical

Table 7

Installation

These fire protection closing elements are to be installed in such way that their position is unchanged over the fire resistance duration. The components are to be installed in such way that they are easily accessible. Fire protection closing elements must consist of elastic connection elements made of flammable materials, which guarantee in case of fire a complete separation of the fire protection closing element and subsequent air duct.

Key Data Fire Protection Closing Elements On The Basis Of Intumescent Materials

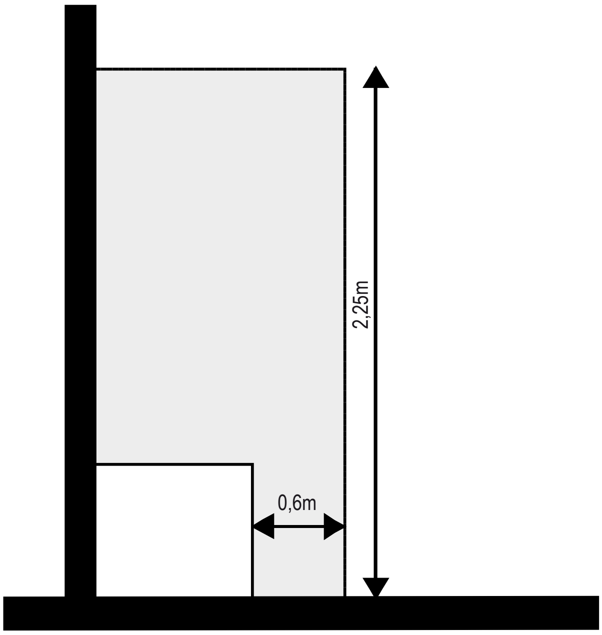
	with mechanical closing element	*without mechanical closing element*
Trigger	Closing element thermal at 70°C to 75°C intumescent material at approx. 150°C to 170°C	intumescent material at approx. 150°C to 170°C
Classification	FLI-VE (ho + ve) 60 FLI-VE (HO + VE) 90	FLI (ho) 60 FLI (ho) 90
Rules and regulations	Application principle OIB-095.4-001/06-005	Application principle OIB-095.4-002/06-009
Installation	horizontal or vertical	horizontal
Maintenance	generally maintenance-free	generally maintenance-free
Control test	no test, only installation certificate	no test, only installation certificate
Certificate	ÜA certification obligation (OIB)	ÜA certification obligation (OIB)

Table 8

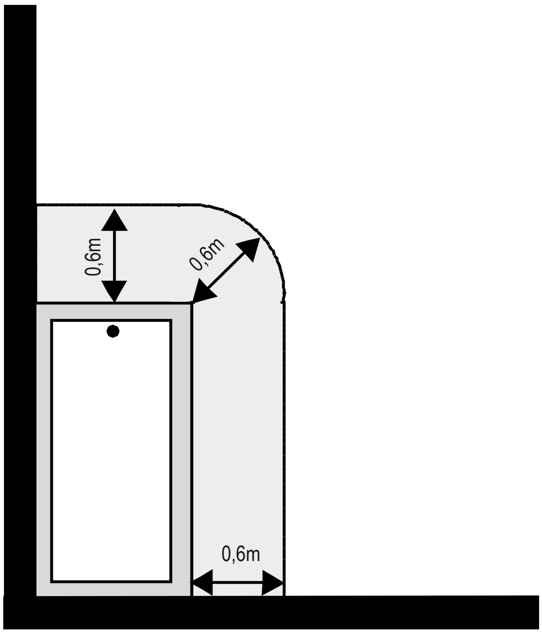
Protection Zones Of Showers And Bathtubs

Excerpt According To 1, Part 4

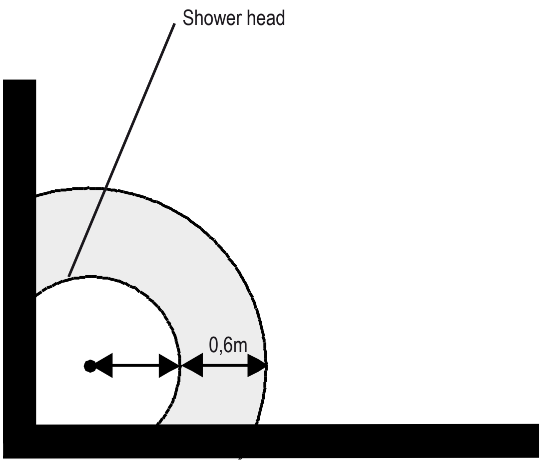
Electric equipment must at least be drip-proof (protection class IPX 1), but if splashing water can be expected, splashproof (IPX 4) is necessary. It must be designed in such way that no condensate can collect. Within the protected area no cables are permitted surface-mounted, in the plaster or behind wall coverings. Excluded is wiring for the supply of fixed consumers above upper tub level and wall outlets behind separating transformers (shaver outlets) if they are placed perpendicularly above the consumer and inserted to it from the rear. Electric consumers within the protected area must be at least splashproof (IPX 4), except water heaters and electric ignitions for gas and oil water heaters.



Protection area from floor level to 2.25m height



Protection zone for bathtub and/or shower with shower basin



Protection zone for shower without shower basin, shower head fixed

Possible causes of malfunction

Malfunctions can be avoided if the ventilation system is carefully planned and the installation instructions are followed. However, if malfunctions should occur, see table 5 for possible causes and find solutions.

Possible malfunction	Cause of malfunction	Solution
Insufficient performance of individual fan.	Riser too small.	New riser calculation and enlargement to correct dimensions.
	Ducting between individual fan and riser too small and/or to many bends.	Enlargement of connecting duct, straight, reduction of number of bends, if possible. Adapt existing airflow control on ventilation device.
	Non-return flap does not or not sufficiently open.	Remove non-return flap, clean flap and exhaust duct and replace flap again.
	Filter too dirty.	Remove cover, clean or replace filter.
	Ducting obstructed by building rubble.	Clean ducting.
	Not sufficient incoming air.	Shorten door leaf or ensure incoming air via other incoming air opening.
WC bowl connection does not or not sufficiently discharge.	Ducting from WC to individual fan is obstructed.	Clean ducting.
	Ducting from WC to individual fan is too small.	Enlarge ducting to Ø40mm or Ø50mm and only reduce before WC bowl connection to Ø30mm. If this is no longer possible reduce exhaustion area of the individual fan with paper or film respectively (always below filter).
Loud drumming noise after ceiling or well installation.	Air space resonance within the suspended ceiling or well.	Connect housing to raw ceiling and/or exterior brickwork of the well. Insert or foam in insulation material between exterior brickwork and rear wall of the fan.
Air flap valve rattles in strong wind.	Roof attachment is not aligned with the wind direction.	Align roof attachment with main wind direction.
	Negative pressure in riser to great due to wind.	Change valve return spring on air flap valve according to instruction manual.
Bad odors through other ventilation devices.	Air flap valve not properly attached.	Attach air flap valve properly according to instruction manual.
	Air return flap dirty.	Remove and clean air flap valve. Lubricate sealing area with some oil, if necessary. Replace flap according to instruction manual.
	Air flap valve does not close completely due to low spring pressure.	Change valve return spring on air flap valve step by step according to instruction manual until it closes completely.
Ventilation runs with high rotation speed and is very noisy.	Exhaust air duct is obstructed.	Check exhaust air duct for narrow part and clean, if necessary.
	Filter is dirty.	Clean and replace filter, if necessary.

Table 9

Maintenance

LIMODOR Mono-duct ventilation devices and accessories are nearly maintenance-free and only need to be cleaned externally with a damp cloth; the exhaust air filter needs to be regularly checked.
Filter contamination depends on the air pollution and the daily operating hours of the ventilation device. Checking the exhaust air filter should be carried out in intervals of approx. 2 months.
For cleaning or replacement the internal fleece filter must be removed from the housing cover. The filters can be cleaned with water and dishwashing liquid and must be air-dried. Regular cleaning of the filters guarantees a long life cycle of the ventilation device and accessories as well as a uniform ventilation quality.
All other components of the LIMODOR ventilation device, except specially integrated control elements such as humidity or CO2 sensors, are maintenance-free.

Planning Aid

LIMOT offers for the calculation for complex mono-duct ventilation systems extensive planning and calculation of duct dimensions incl. Material bill of quantities and complete tender of necessary components for the entire ventilation system as a free service. A LIMOT employee is always at your service if you provide the construction plans.
LIMOT not only offers high-quality ventilation devices, but also best advice during the planning stage of the ventilation system. This ensures that the ventilation system works as it should work, to replace bad odors, humidity and fumes as quickly as possible with fresh air.

Warranty

LIMOT guarantees even components for LIMODOR ventilation devices older than 25 years, to be able to still operate these ventilation devices. All accessories, such as controllers, covers, filter inserts and blower units are available. This ensures that your device is in good working condition until the next renovation of the sanitary wet room.
LIMOT offers for all ventilation devices a 5-year warranty from the purchase date. This warranty includes the complete ventilation device, except electronic auxiliary controls such as time delay relay, humidity control, motion detector, etc. The warranty for LIMODOR controls is 2 years from the purchase date.
The warranty requires regular maintenance of the filters in the LIMODOR ventilation device and its proper operation.
In case of a defective fan insert after the LIMOT warranty has expired you can make use of the proven LIMOT exchange procedure, where you send the defective fan insert to LIMOT and receive an exchanged blower at a special reduced price.

Warranty Conditions:

Condition for all warranty adjustments is making the defective devices and/or components available, proof of purchase (invoice or delivery note). Within the warranty period the exchange of the defective device is free of charge, after it was returned to us at no charge. Further costs for repairs at the customer, especially compensation claims, are excluded.

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