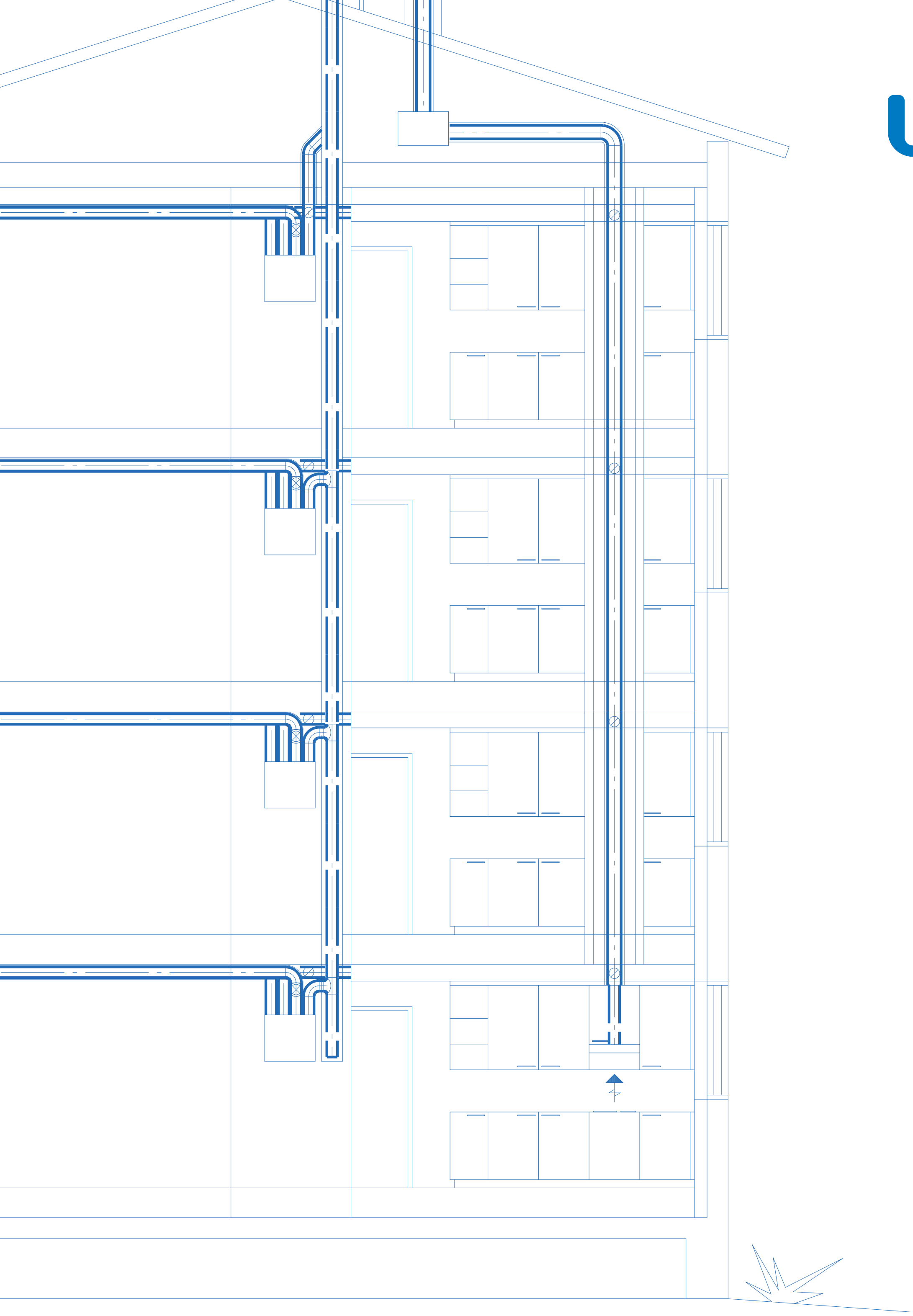


Design and installation guide Apartment-specific supply and exhaust air ventilation system for apartment buildings

New buildings and renovation

Contents

Introduction

Uponor Suomi Oy manufactures ducts, components, and products designed for apartment-specific ventilation. The ducts and components are manufactured from polypropylene plastic. The tightness class is D. Because of the manufacturing technique and the material, the interior surfaces are clean, oil-free, and smooth. Dust and other impurities do not adhere well to the smooth interior surface, and any required cleaning is easy.

The ducts are delivered from the factory with the ends covered by protective caps and the components packed in an airtight plastic bag, keeping them clean.

The plastic Uponor ventilation system ducts and components have a VTT product certificate, code VTTC-6220-10. Plastic Uponor system ventilation ducts have been used in the implementation of ventilation systems for detached houses from the autumn of 2000.

This manual is a compilation of installation examples of ventilation implementation, describing in text and illustrative drawings how the apartment-specific ventilation of apartment buildings is implemented with plastic Uponor ventilation ducts.

In the installation examples of ventilation for apartment buildings, the kitchen hood exhaust duct is always made from zinc-coated sheet metal. The use of plastic ducts is forbidden.

Uponor and environmental issues

Uponor Suomi Oy is part of the international Uponor Group. We deliver solutions that create better living environments in co-operation with professionals. Uponor's solutions are technologically advanced, cost-efficient in life-cycle terms, environmentally friendly, and ethically sound. It is the company's policy to take account of stakeholder expectations and corporate social responsibility.

Our operation system has been established to meet the requirements set by SFS-EN ISO 9001 and SFS-EN ISO 14001. In order to ensure expertise and consistent corporate policy throughout the organisation, the company provides all staff with training. In all of our operations, the aim is continuous improvement and minimum environmental hazards. We develop our environmentally friendly product systems in co-operation with the stakeholders.

Our main goal in relation to environmental issues is the continuous development of production processes, development of environment-friendly products, minimisation of the waste generated, and utilisation of recyclable plastics.

The functionality of our operations system is regularly evaluated both internally and by an outside auditor. These evaluations ensure the functionality of the system and continuous development in accordance with our environmental aims and the goals set.

Uponor ventilation systems

The instructions in this manual are designed for the implementation of apartment-specific ventilation systems for P1 category apartment buildings.

Uponor has complemented the selection of its ventilation products and introduced pre-insulated ventilation ducts and components.

With insulated ducting, supply air can be cooled in a safer manner and the energy is not dissipated into the structures. On the other hand, the pre-insulated ducts located in the insulation space above the ceiling are denoted as 'safe', avoiding the risks related to condensation and installation errors.

- The ducting and components are clean and protected, all the way from production to installation.
- The product selection includes pre-insulated ducts and components.
- The system does not collect dust or dirt: the antistatic PP material is resistant to all impurities
- Installation is fast and simple
- The material is easy to work with
- Ducting can be installed without separate sealing and locking
- The structure is of sound technical construction for air flow
- The system presents no corrosion problems
- Odour problems also are prevented
- The system guarantees clean indoor air throughout the home
- Patented structure and joint solutions
  Finland: FI115664 Sweden, Denmark and Estonia: EP1222418
  Norway: application NO20021856

Technical specifications of the duct material

Raw material:	polypropylene; odourless and non-toxic
Colour:	black
Density:	≈ 900 kg/m^3
Tensile strength:	30 MPa
Heat expansion:	0,06 mm/m °C

Technical characteristics of the ducting

The inner surface of the ducts and components is smooth and seamless.

Fire performance:
- VTT certificate no.
  VTT-C-6220-10
  Date 1 Dec 2010
- Compliance with the fire safety regulations has been demonstrated in accordance with Section E1:1.3.2 of the National Building Code of Finland.
  VTT research reports
  No. VTT-R-05113-10
  Date 1 Oct 2010
  No. VTT-S-12299-06
  Date 29 Dec 2006
  No. VTT-S-03927-07
  Date14 May 2007
  No. VTT-M-03934-07
  Date 14 May 2007.

Impact resistance:
Meets the requirements set in SFS-EN 1411.

Corrosion-resistance:
Chemical-resistance as described in the standard ISO/TR 10358.

Antistatic properties:
Antistatic product. The antistatic properties of the inner duct surface and components are measured in production in accordance with the test procedure IEC 61340-4-10.

Heat-resistance:
Continuous –50 °C...+85 °C,
momentary +100 °C.

Resistance to cold:
Lowest recommended installation temperature of -15 °C, with resistance to cold verified by continuous quality control in accordance with the test method SFS/EN 1411.

Cleanliness class:
Cleanliness class M1. Developed in cooperation with the Allergy and Asthma Federation.

Technical specifications of duct insulation

Raw material:	foamed polyethylene,
Colour:	grey
Density:	30 kg/m^3, insulation thickness 15 mm

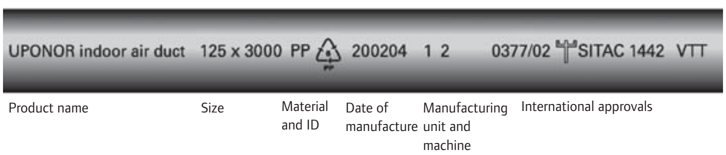
Fire performance: Not fire classified.

VTT research reports
- Industrially insulated ventilation ducting of a detached house Laboratory measurements of surface temperature
  Date 6.11.2006
  Computational assessment of the insulation thickness required to prevent condensation in ventilation ducting and to restrict heat losses for product development and laboratory test purposes
  Date 10.5.2006.

YHTEISTYÖSSÄ ALLERGIA- JA ASTMALIITON KANSSA

ILMANVAIHTOTUOTTEEN PUHTAUSLUOKKA M1

SISÄILMAYHDISTYS KANNATTAJAJÄSEN



Silencers

The silencers are made of PE plastic.
The silencers were tested by VTT, for Certificate VTT-S-03839-07 Date 24.4.2007

- square suppressors have round duct outlets
- lightweight and easy to handle
- excellent in the noise suppression characteristics
- impact- and corrosion-resistant
- black in colour
- interior suppression material of suppressors is Dacron
- no loose fibres or moisture absorption
- no skin or respiratory irritation
- no odour or mould problems

Quality

The plastic Uponor ventilation system ducts and components have been granted a VTT product certificate no. VTT-C-6220-10.

Sizes and tolerances

The duct sizes are ø 100 (+0.5) mm, ø 125 (+0,5) mm, ø 160 (+0,6) mm and ø 200 (+0.7) mm. The tolerances are in compliance with duct standard SFS 3282. The tolerances of injection-moulded components are more precise than the standard requires.

Uponor ventilation ducts and components are compatible with duct components manufactured in accordance with the standard SFS 3282.

Tightness of ducting

Air-tightness classification of the ducting: D. Duct connections must be made in accordance with the instructions in this manual. Connections may not be glued together, because solvents do not take effect on polypropylene.

Packing

The ducts are delivered with both ends plugged to keep them clean. Duct components are delivered packed in plastic bags and cardboard boxes.

Storage

Withstands outdoor storage for one year in Central European climate conditions. The ducts are UV-protected. A maximum of two superimposed layers. Stored protected as much as possible from contamination.

Cleaning

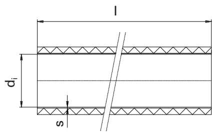
The ducting is swept clean at least every 10 years. The ducting should also be checked and cleaned before commissioning, as necessary.

Insulated and uninsulated ventilation ducts and components

Clean ventilation ducting

Duct material: polypropylene. Colour: black
Insulation material: foamed polyethylene. Colour: grey
Insulation thickness: 15 mm

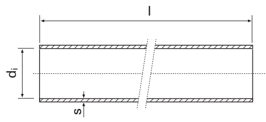
Round pre-insulated duct



Delivered in three-metre poles.

d_i x l	Uponor no.	HVAC no.
100 x 3000	1068041	8273054
125 x 3000	1068042	8273055
160 x 3000	1068043	8273056
200 x 3000	1068044	8273058

Round duct



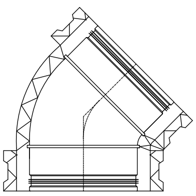
Delivered in three-metre poles.

d_i x l	Uponor no.	HVAC no.	s
100 x 3000	1068037	8273024	2,1
125 x 3000	1068038	8273025	2,1
160 x 3000	1068039	8273026	2,5
200 x 3000	1068040	8273027	3,0

Clean duct components

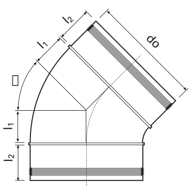
Duct material: polypropylene. Colour: black.
Condensation insulation material: foamed polyethylene. Colour: grey
Insulation thickness: 15 mm
The required number of fasteners are delivered with the insulated components.

Bend 45°, pre-insulated



do x α	Uponor no.	HVAC no.
100 x 45°	1068082	8273071
125 x 45°	1068083	8273072
160 x 45°	1068084	8273073
200 x 45°	1068081	8273070

Bend 45°

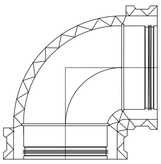


do x α	Uponor no.	HVAC no.	l_1	l_2
100 x 45°	1068057	8273029	46	40
125 x 45°	1068058	8273030	36	50
160 x 45°	1068059	8273031	45	50
200 x 45°	1068056	8273032	54	50

Clean duct components

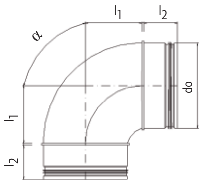
Duct material: polypropylene. Colour: black.
Condensation insulation material: foamed polyethylene. Colour: grey.
Insulation thickness: 15 mm

Bend 90°, pre-insulated



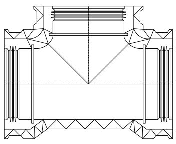
do x α	Uponor no.	HVAC no.
100 x 90°	1068078	8273067
125 x 90°	1068079	8273068
160 x 90°	1068080	8273069
200 x 90°	1068077	8273066

Bend 90°



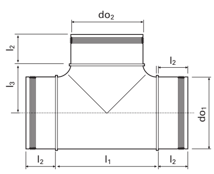
do x α	Uponor no.	HVAC no.	l_1	l_2
100 x 90°	1068053	8273033	81	40
125 x 90°	1068054	8273034	110	50
160 x 90°	1068055	8273035	160	50
200 x 90°	1068052	8273036	130	50

Branch, pre-insulated



do_1/do_2	Uponor no.	HVAC no.
100/100	1068085	8273074
125/100	1068089	8273078
125/125	1068086	8273075
160/100	1068090	8273079
160/125	1068087	8273076
160/160	1068088	8273077
200/160	1068091	8273080

Branch

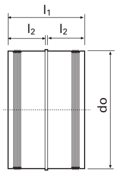


do_1/do_2	Uponor no.	HVAC no.	l_1	l_2	l_3
100/100	1068060	8273037	142	40	71
125/100	1068064	8273038	144	50	81
125/125	1068061	8273039	168	50	81
160/100	1068065	8273040	144	50	98
160/125	1068062	8273041	168	50	101
160/160	1068063	8273042	196	50	100
200/160	1068066	8273043	202	50	118

Clean duct components

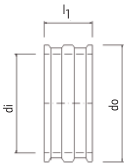
Duct material: polypropylene. Colour: black.
Insulation thickness: foamed polyethylene. Colour: grey.
Insulation thickness: 15 mm

Connector



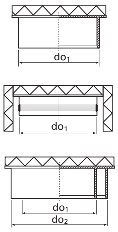
do	Uponor no.	HVAC no.	l_1	l_2
100	1068049	8273047	83	40
125	1068050	8273048	103	50
160	1068051	8273049	103	50
200	1068048	8273050	103	50

Connector, pre-insulated



do	Uponor no.	HVAC no.	di	do	l_1
100	1068074	8273063	134	164	
125	1068075	8273064	159	189	
160	1068076	8273065	195	225	
200	1068073	8273062	235	265	

Plug, pre-insulated



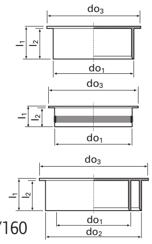
do_1/do_2	Uponor no.	HVAC no.	do_3	l_1	l_2
100	1068092	8273081	120	43	40
125	1068093	8273082	145	33	30
125/160	1068094	8273083	180	53	50

Plug

100

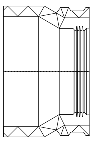
125

125/160



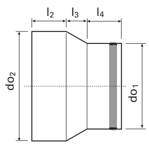
do_1/do_2	Uponor no.	HVAC no.	do_3	l_1	l_2
100	1068067	8273051	120	43	40
125	1068068	8273052	145	33	30
125/160	1068069	8273053	180	53	50

Reducer, pre-insulated



do_1/do_2	Uponor no.	HVAC no.
100/125	1068095	8273084
125/160	1068096	8273085
160/200	1068097	8273086

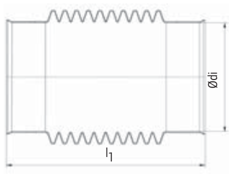
Reducer



do_1/do_2	Uponor no.	HVAC no.	l_2	l_3	l_4
100/125	1068070	8273044	50	20	40
125/160	1068071	8273045	51	30	50
160/200	1068072	8273046			

Clean duct components

Flexible bends



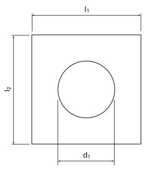
di x α	Uponor no.	HVAC no.	l_1
125 x 0-45°	1061401	8273020	261
125 x 0-90°	1061402	8273021	419
160 x 0-45°	1061403	8273022	333
160 x 0-90°	1061404	8273023	563

Fastener

Please note: Fasteners are delivered, in the required number, with pre-insulated ventilation joints for securing of the joints.

Product	Uponor no.	HVAC no.
Fastener (10 pcs/bag)	1054916	8273920

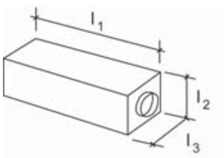
Vapour barrier inlet



Self-adhesive; PE plastic

Size d_1	Uponor no.	HVAC no.	l_1	l_2	thickness
100	1046252	8273822	240	240	10
125	1046251	8273824	240	240	10
160	1047036	8273825	320	320	10
200	1047037	8273826	320	320	10

Silencers



Joint size and model	Uponor no.	HVAC no.	l_1	l_2	l_3
USI - 125 - 300	1046253	8273930	300	190	270
USI - 125 - 650	1046254	8273931	650	190	270
USI - 125 - 1000	1046255	8273932	1000	190	270
USI - 160 - 650	1046256	8273933	650	225	300
USI - 160 - 1000	1046257	8273934	1000	225	300
USI - 200 - 1000	1057895	8273935	1000	250	360

Supply and exhaust air valves

Approved valves must be used in mechanical supply and exhaust air ventilation, and the maximum allowed room-specific air flow through the throttle is 42 dm^3/s with a 100 Pa pressure difference.

Fire restriction valve, supply

The maximum allowed room-specific air flow through the fire restriction valve is 42 l/s with a 100 Pa pressure difference. Can be used for apartment-specific supply and exhaust ventilation in apartment buildings. Colour: white.

UTK-P-100

UTS-P-100

UTK-P-125

UTS-P-125

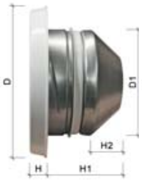
Joint size and model	Uponor no.	HVAC no.	D_1	D	H	H_1
UTK-P-100	1060733	8273683	139	99	18	44
UTS-P-100 **	1060737	8273687	175	99	65	40
UTK-P-S-100 *	1060739	8273689	139	99	18	44
UTK-P-125	1060734	8273684	175	123	19	52
UTS-P-125 **	1060738	8273688	175	123	65	40
UTK-P-S-125 *	1060740	8273690	175	123	19	52

* Withstands temperatures up to ~ 200 °C.
The mounting frame supplied with the valve must always be used with sauna valves.
** Wall-mounted valve

Fire restriction valve, exhaust

UPK-P-100

UPK-P-S-100



UPK-P-125

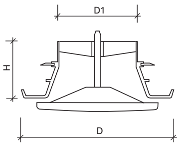
UPK-P-S-125

The maximum allowed room-specific air flow through the fire restriction valve is 42 l/s with a 100 Pa pressure difference. Can be used for apartment-specific supply and exhaust ventilation in apartment buildings. Colour: white.

Joint size and model	Uponor no.	HVAC no.	D_1	D	H	H_1	H_2
UPK-P-100	1060735	8273685	138	99	6	44	
UPK-P-S-100 *	1060741	8273691	138	99	6	44	
UPK-P-125	1060736	8273686	175	123	19	85	33
UPK-P-S-125 *	1060742	8273692	175	123	19	85	33

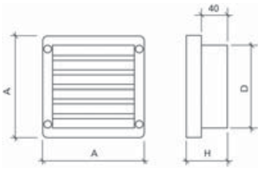
* Withstands temperatures up to ~ 200 °C. The mounting frame supplied with the valve must always be used with sauna valves.

Disc valves (gravitational ventilation)



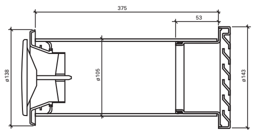
Joint size and model	Uponor no.	HVAC no.	D	D1	H
ULV-100	1046236	8273782	138	72	58
ULV-125	1046237	8273792	168	90	66

Outdoor grilles



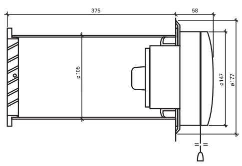
Joint size and model	Uponor no.	HVAC no.	A	D	H
USS-100 with a door screen	1046238	8273851	143	123	57
USS-125 with a door screen	1046239	8273856	143	123	57
USS-160 with a removable framed screen	1046240	8273861	235	160	74
USS-200 with a removable framed screen	1046241	8273866	235	200	74
160/200 framed screen for outdoor grille	1046242	8273874			

Clean air valve



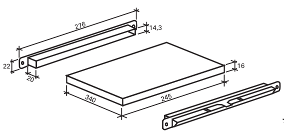
Joint size and model	Uponor no.	HVAC no.
URS-100	1046243	8273882

Fresh air valves



Joint size and model	Uponor no.	HVAC no.
UKS-100, for wall	1046244	8273892
UKTL-100, for vent hole	1046245	8273902

Slit valve



Joint size and model	Uponor no.	HVAC no.
URV-18, 18 x 245 x 340	1046246	8273922

* Withstands temperatures up to ~ 200 C. The mounting frame supplied with the valve must always be used with sauna valves.

Design of apartment-specific supply and exhaust air ventilation

These design instructions apply to apartment-specific supply and exhaust ventilation equipped with heat recovery equipment for P1-class apartment buildings.

Definitions

- **An outdoor air duct** supplies fresh outdoor air to the ventilation unit.

- **Supply air ducts** distribute the fresh air from the unit to rooms.

- **Exhaust air ducts** conduct indoor air to the ventilation unit, which uses the thermal capacity to warm the incoming fresh outdoor air as necessary.

- **An waste air duct** conducts the exhaust air by conveying it from the ventilation unit to the exhaust duct on the roof.

The recommended starting point for ventilation system design and duct sizing is to use a relatively low air velocity in ducts – i.e., less than 3 m/s.

Uponor ventilation duct applications

Uponor ventilation ducts are used as apartment-specific ventilation ducts in accordance with the regulations and instructions of the National Building Code of Finland.

The design must take into consideration which of the apartment-specific ventilation ducts are implemented with steel sheet ducts and which with Uponor plastic ducts. Steel sheet ducting is always used for the kitchen hood's local exhaust duct. The ventilation of the kitchen hood is implemented either with a dedicated exhaust air ducting reaching all the way to the roof or by connecting the hood's exhaust air duct to the apartment-specific ventilation unit. The waste air duct from the ventilation unit to the roof must then be apartment-specific and the duct material must be stainless steel or corresponding.

In the section of this manual on system descriptions for ventilation solutions, some examples of the design starting points for designing for sites of different types and the possible applications of plastic Uponor ventilation ducts in different building types are given.

Kitchen hood exhaust duct

The local exhaust ducting for kitchen hoods is made of non-combustible spiral steel sheet ducting with a minimum thickness of 0.5 mm. The duct is fire-insulated with insulation of EI30 fire-resistance in accordance with these design and installation instructions.

Location of ducting

Supply and exhaust air ducts are normally installed
- above a suspended ceiling
- below the ceiling, in a housing
The supply air valves are mainly installed in living rooms and bedrooms for a constant supply of fresh outdoor air.

Because the exhaust air valves are designed for dehumidification and odour removal in addition to air circulation, they are situated in bathrooms, sauna and utility rooms, walkin closets, kitchens, tambours, and toilets. Air flows through door slits (min. 15 mm) from the rooms with supply air valves to those with exhaust air valves. Supply and exhaust air ducts are fitted with silencers (1000 mm) directly behind the ventilation unit in order to prevent equipment noise from entering the rooms. Additionally, 300 mm long silencers can be installed for bedrooms.

Official regulations

In the design of air ducting and its installation, the regulations and instructions set forth in parts D2, E1, E7, and C1 of the National Building Code of Finland must be followed.

Ducting lining and housing

Ventilation ducting must be protected by means of a suspended ceiling or housing structures from the side of inhabited spaces in accordance with section E1 of the National Building Code of Finland, using at least class A2-s1, d0 materials.

Duct insulation

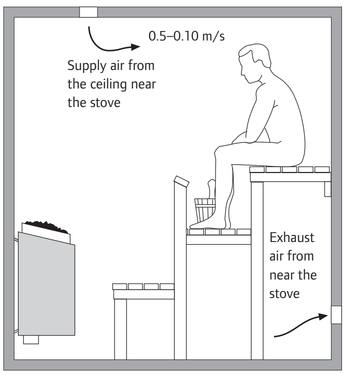
The thermal, condensation-and fire-insulation of ducting are specified in the ventilation plan. Insulation is marked in the drawings. **To facilitate on-site insul ation work, using pre-insulated ducts and components with 15 mm expanded PE plastic insulation is recommended.**

Sauna room ventilation

When one is designing sauna ducting, temperature limitations have to be observed. The ducting is either embedded in the sauna room insulation or installed above the insulation layer. In other circumstances, such as when immediately behind panelling, the ducting must be thermally insulated with 50 mm of mineral wool. The ducting and frame of ceiling-mounted valves must be firmly secured to the ceiling structures with screws.

NB: Only use heat-resistant sauna valves designed for the purpose in the upper part of the sauna room.

Sauna valves must always be installed in combination with the mounting frame. The mounting frame must be fastened with screws to the wooden material of the sauna ceiling, after which the valve can be installed in its place. Avoid installing the valve directly above the sauna tove.



Sauna room ventilation

Energy consumption of the different exhaust ventilation solutions for kitchen hoods

The system descriptions of the ventilation solutions in this manual present three alternative solutions for the exhaust ventilation of a kitchen hood.

When comparing **energy-efficiency** between the different kitchen hood exhaust ventilation solutions, one should estimate how many hours the kitchen hood is in augmentation mode each day. Three hours per day could be considered a good baseline for calculations. The general ventilation of the kitchen operates 24 hours a day, whether the hood augmentation mode is on or off.

In comparison of the energy consumption of the various alternatives, the one where the hood exhaust ventilation is implemented as its own system is the most recommendable. This alternative is also the most economical when one considers service and maintenance work. In this solution, the ducting of the apartment-specific ventilation unit's area of effect, usually with the exclusion of the waste air duct from the unit, is implemented with Uponor ventilation ducting. See the examples on the following pages.

The shared duct exhaust ventilation of the hoods will then be implemented traditionally with sheet metal spiral ducts.

In this solution, the hood's augmentation ventilation will not needlessly augment the ventilation of other rooms, which also has a favourable effect on the flat's heating energy consumption.

In examination of the alternatives from the perspective of energy-efficiency, the **costs related to service and maintenance** must also be taken into consideration.

In the first solution, the flat ventilation is implemented as its own system, and the kitchen hood's exhaust ventilation as its own system. The kitchen hood exhaust ventilation will then be implemented on the shared duct principle only with a pressure-controlled exhaust air fan in the service of hood exhaust ventilation.

In the second solution, where the kitchen hood exhaust air is conducted outdoors via the heat recovery of the apartment-specific ventilation unit, it must be estimated how much the heat recovery cells will be dirtied because of this, and whether the hood filter is powerful enough to remove impurities without causing too much pressure loss.

In the third solution, the latter idea can also be implemented via a ventilation unit with which the kitchen exhaust air ventilation is channelled through the apartment-specific ventilation unit, bypassing heat recovery while still using the shared waste air duct to the outdoors.

When comparing the effects of the different ventilation solutions described above for their energy consumption and energy-efficiency, one must investigate very carefully how the ventilation actually works in the various usage situations.

The comparison must also take into consideration all costs related to servicing and maintenance, the annual efficiency of heat recovery, and the effect the fouling of the heat recovery cells has on the annual efficiency.

System descriptions for ventilation solutions

This section presents installation examples for apartment-specific ventilation systems for apartment buildings, where the implementation of the ducting is based on the use of Uponor ducts and components in the extent shown by the model drawings. The kitchen hood exhaust air duct is always manufactured from steel sheet spiral ducting all the way to the roof.

A. Apartment-specific heat recovery unit and kitchen exhaust ventilation

In this system, ventilation is implemented with a apartment-specific heat recovery unit located in the room space or above the flat's door.

The ventilation ducts of the unit are plastic Uponor ducts. The waste air from the apartment-specific heat recovery unit is conducted separately from each unit to the roof. Two alternatives are presented for waste air ducting.

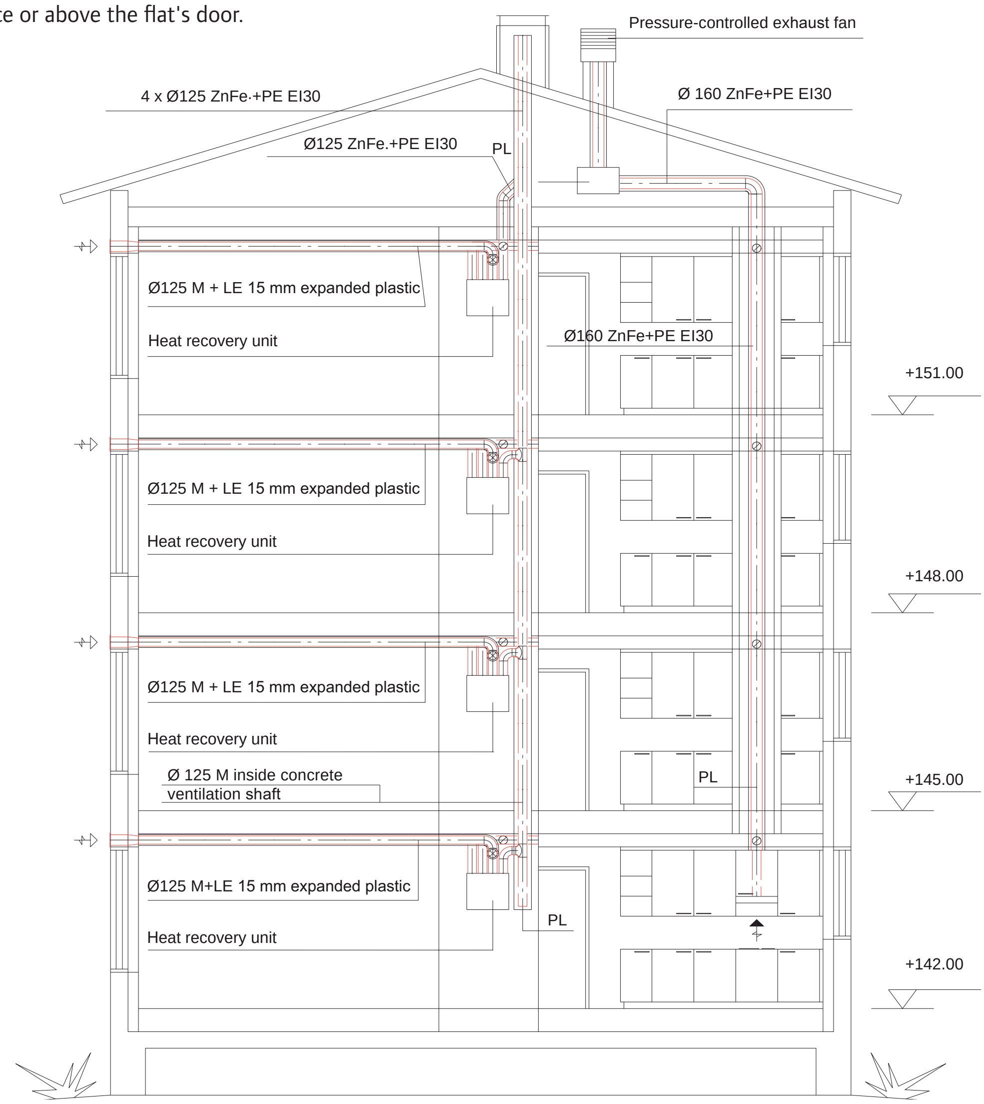
In the first version, the waste air duct is plastic Uponor ducting, installed inside a concrete shaft. The section in the attic area is a fire-insulated steel sheet spiral duct.

In the second version, the waste air duct is a steel sheet spiral duct, fire-insulated from the heat recovery unit all the way to the roof.

The apartment-specific ventilation is presented with two different heat recovery units.

In both versions, the kitchen exhaust ventilation is presented as a dedicated shared duct exhaust from the hood to a pressure-controlled exhaust fan or a shared duct fan. The kitchen exhaust air duct is a steel sheet spiral duct, fire-insulated all the way to the roof. If the kitchen exhaust air duct is located inside a concrete shaft, the duct is a steel sheet spiral duct, and the ducting section in the attic area is fire-insulated.

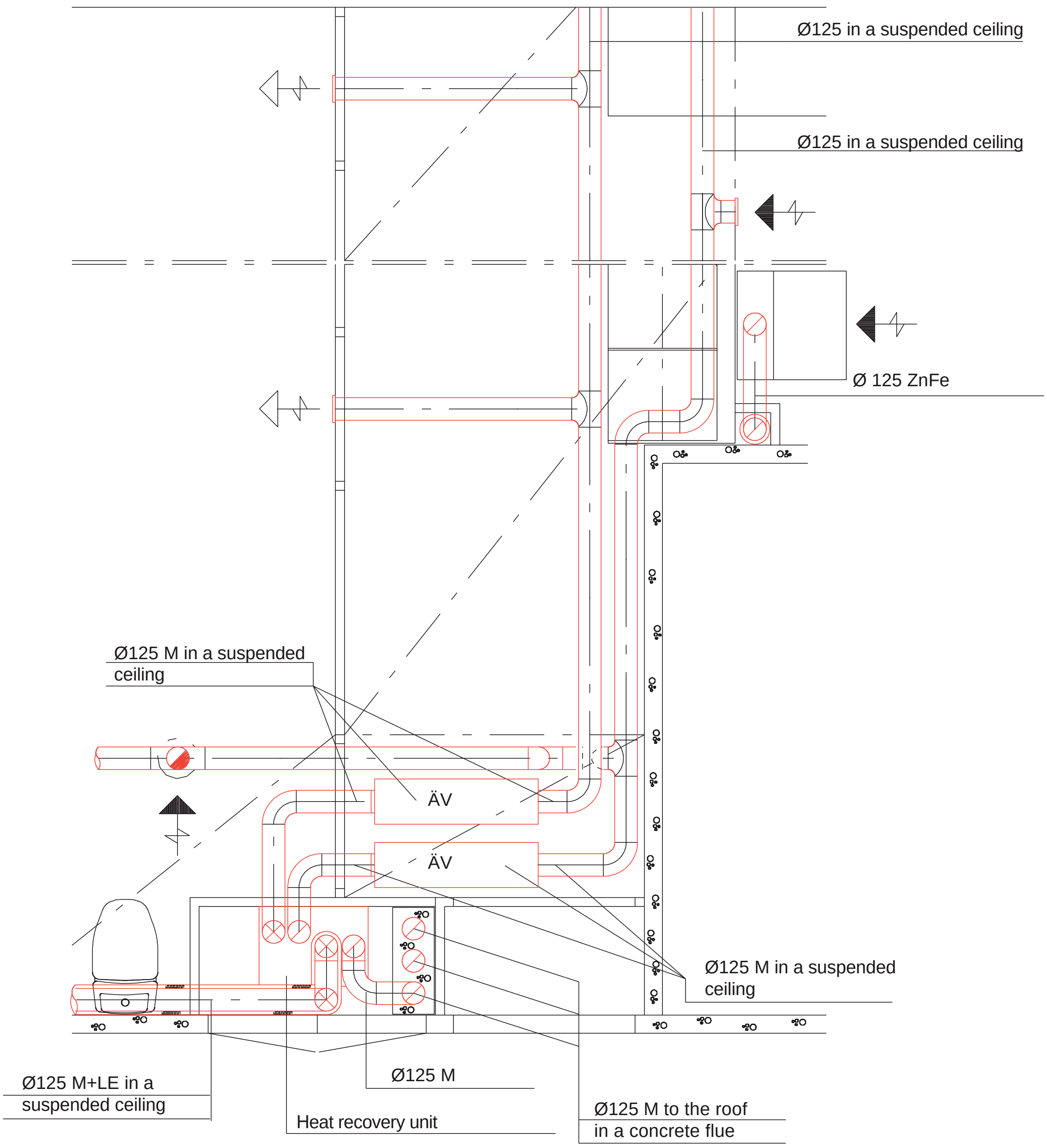
Example 1



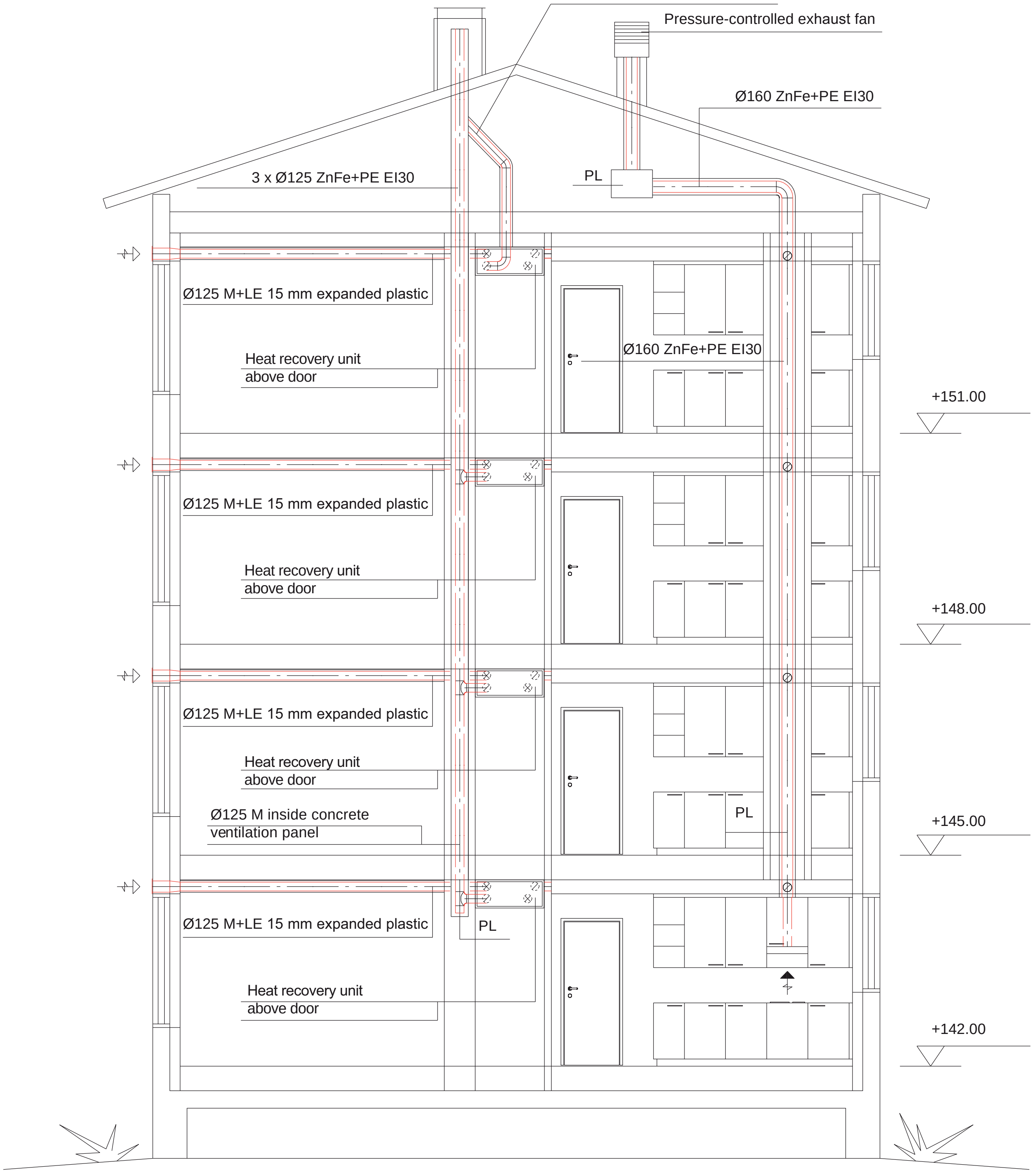
Example 1A

NB!

The exhaust ventilation of kitchen hoods is implemented with the shared duct principle with a dedicated pressure-controlled exhaust fan



Example 2

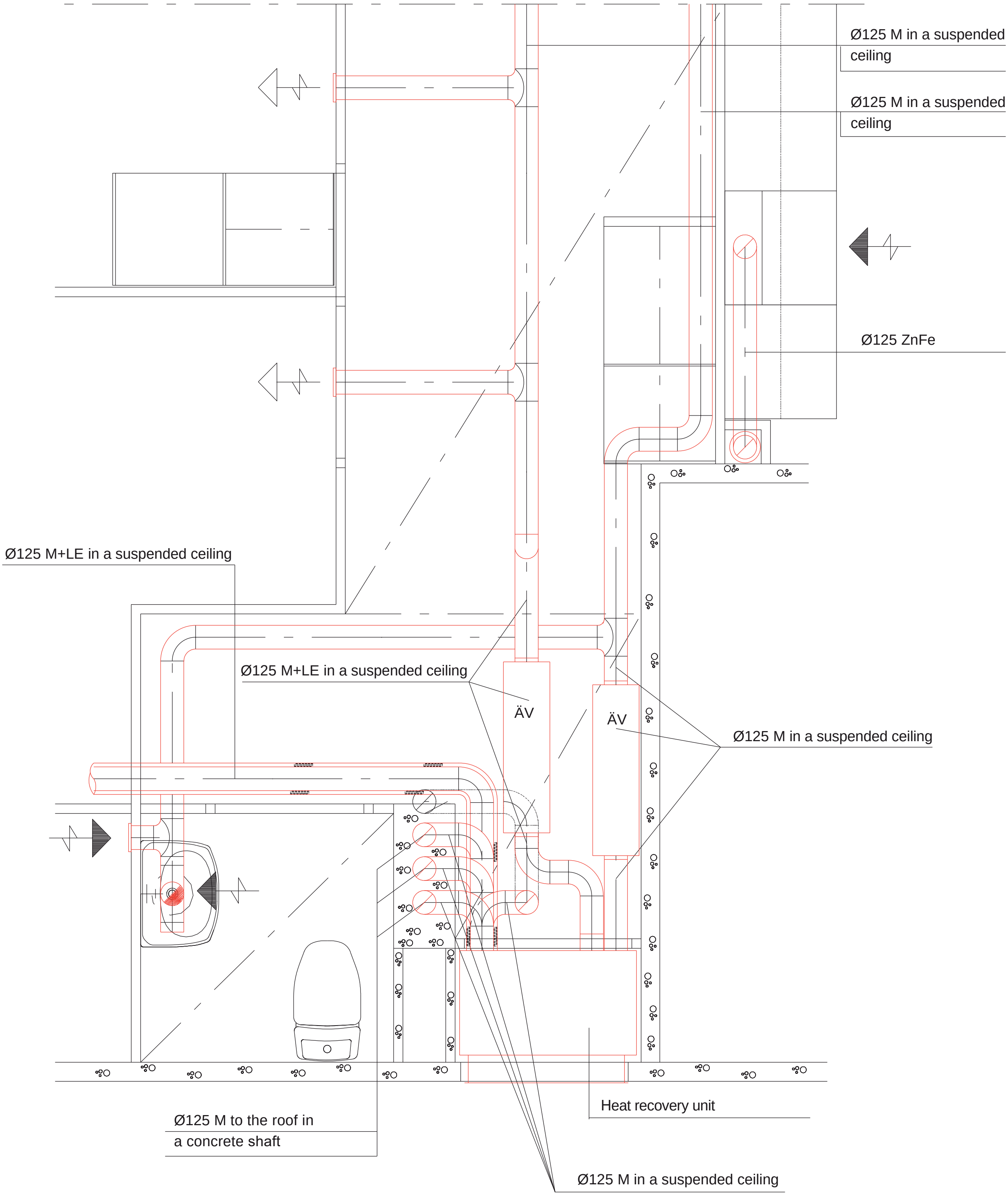


Ø125 ZnFe+PE EI30
Pressure-controlled exhaust fan
Ø160 ZnFe+PE EI30
3 x Ø125 ZnFe+PE EI30
PL
Ø125 M+LE 15 mm expanded plastic
Heat recovery unit
above door
Ø160 ZnFe+PE EI30
+151.00
Ø125 M+LE 15 mm expanded plastic
Heat recovery unit
above door
+148.00
Ø125 M+LE 15 mm expanded plastic
Heat recovery unit
above door
Ø125 M inside concrete
ventilation panel
PL
+145.00
Ø125 M+LE 15 mm expanded plastic
PL
Heat recovery unit
above door
+142.00

Example 2A

NB!

The exhaust ventilation of kitchen hoods is implemented with the shared duct principle with a dedicated pressure-controlled exhaust fan



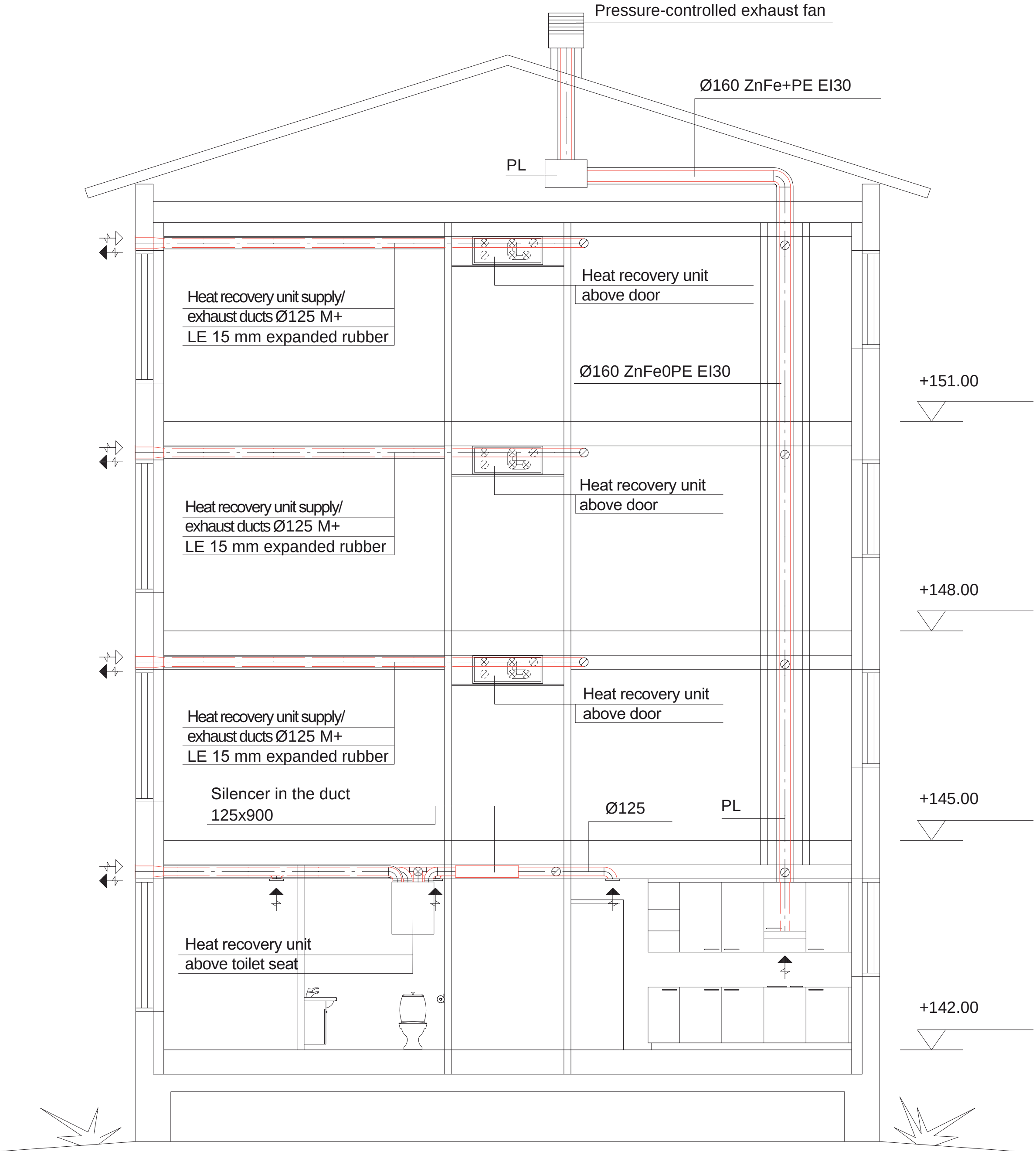
B. Apartment-specific heat recovery unit, waste air from the exterior wall and kitchen exhaust ventilation

In this system, ventilation is implemented with a apartment-specific heat recovery unit located above the toilet seat or above the flat's door.

The ventilation ducts of the unit are plastic Uponor ducts. With the permission of the building inspection authority, in new buildings and on refurbishment sites, the waste air from a apartment-specific heat recovery unit can be conducted outside through the flat's exterior wall via a suitable exterior wall valve manufactured from steel sheeting.

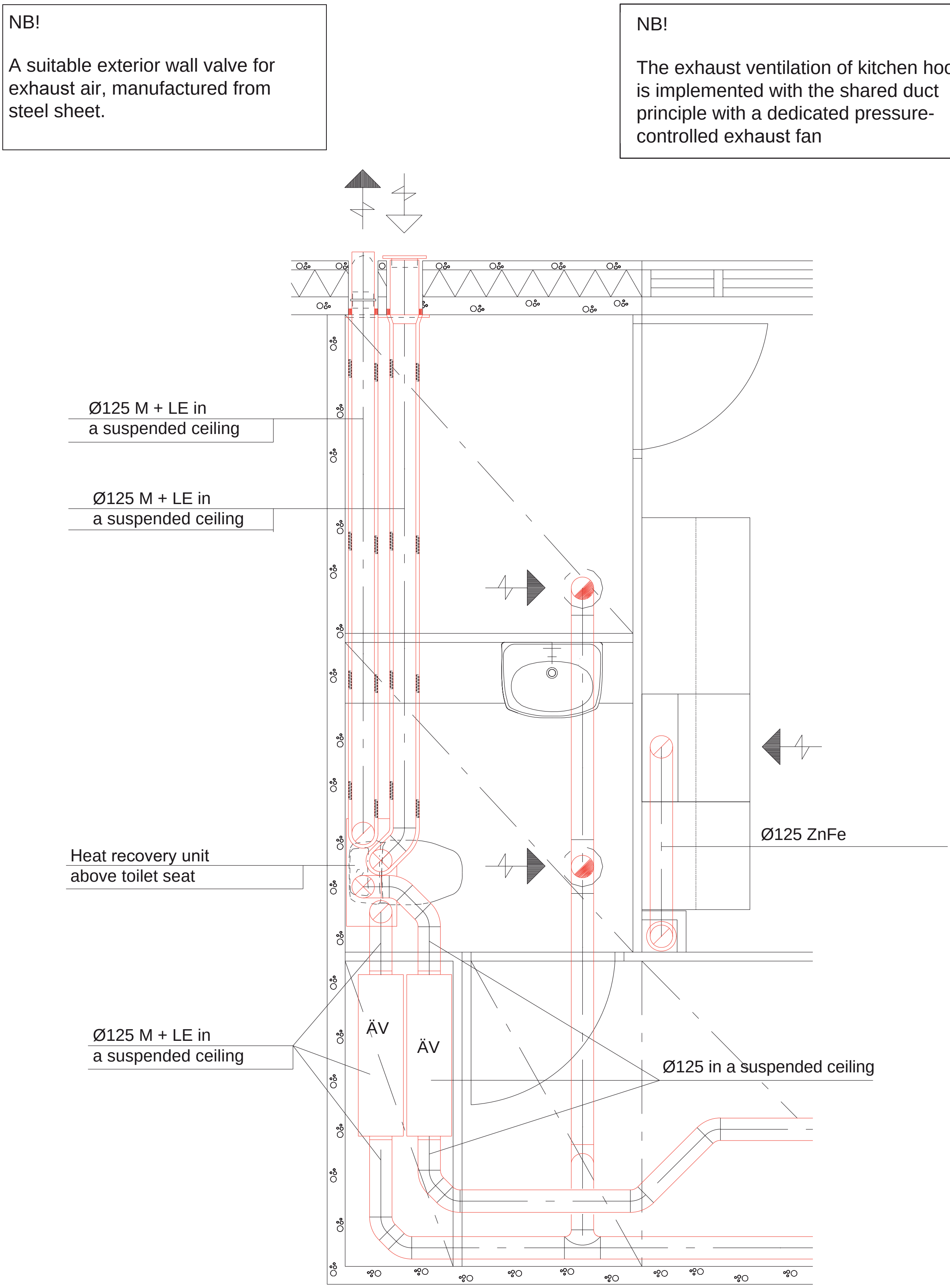
The apartment-specific ventilation is presented with two different heat recovery units. In both versions, the kitchen exhaust ventilation is presented as a dedicated shared duct exhaust from the hood to a pressure-controlled exhaust fan or a shared duct fan. The kitchen exhaust air duct is a steel sheet spiral duct, fire-insulated all the way to the roof. If the kitchen exhaust air duct is located inside a concrete shaft, the duct is a steel sheet spiral duct, and the ducting section in the attic area is fire-insulated.

Example 3



Example 3A

Heat recovery unit above toilet seat

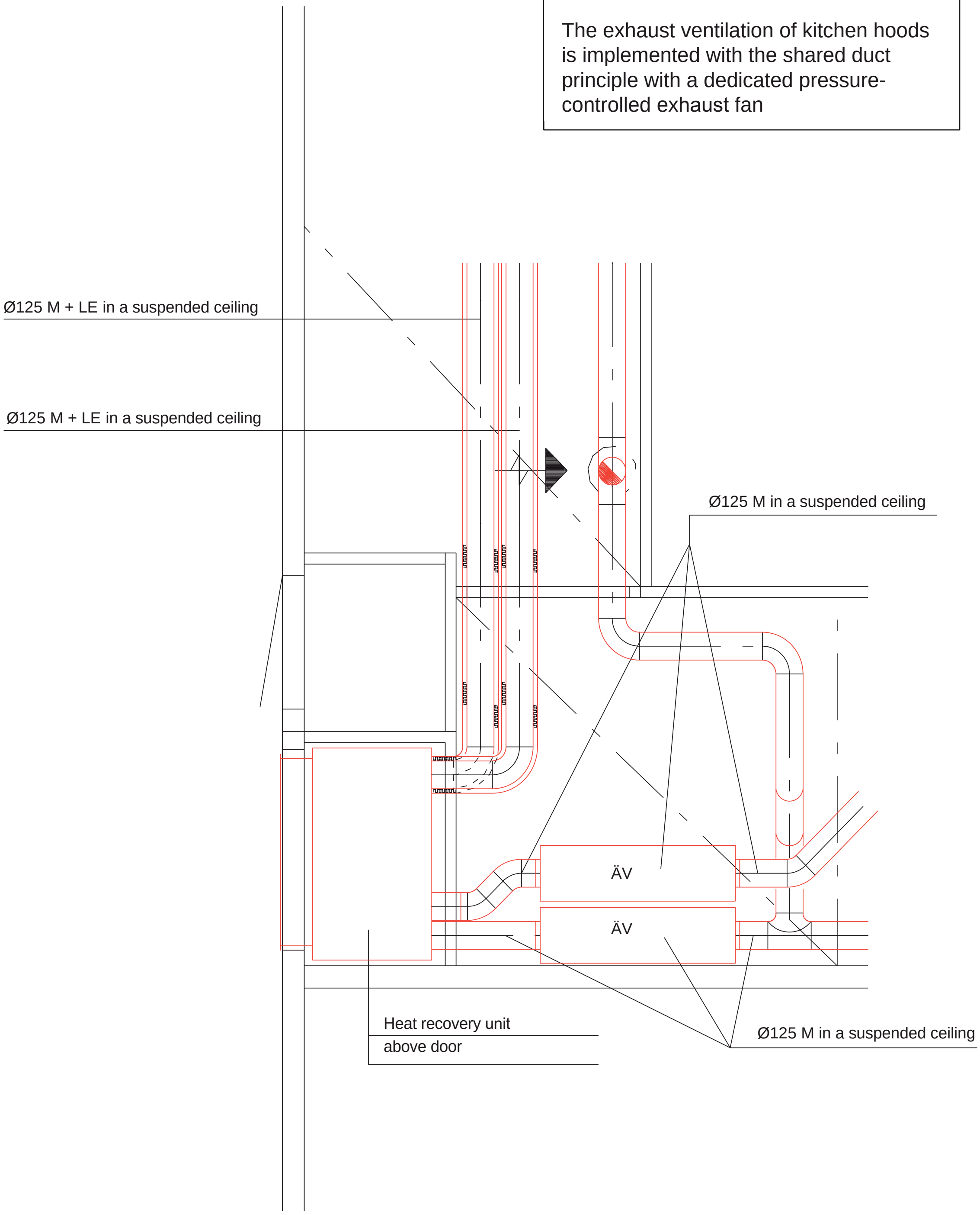


Example 3B

HEAT RECOVERY UNIT ABOVE FLAT DOOR

NB!

The exhaust ventilation of kitchen hoods is implemented with the shared duct principle with a dedicated pressure-controlled exhaust fan

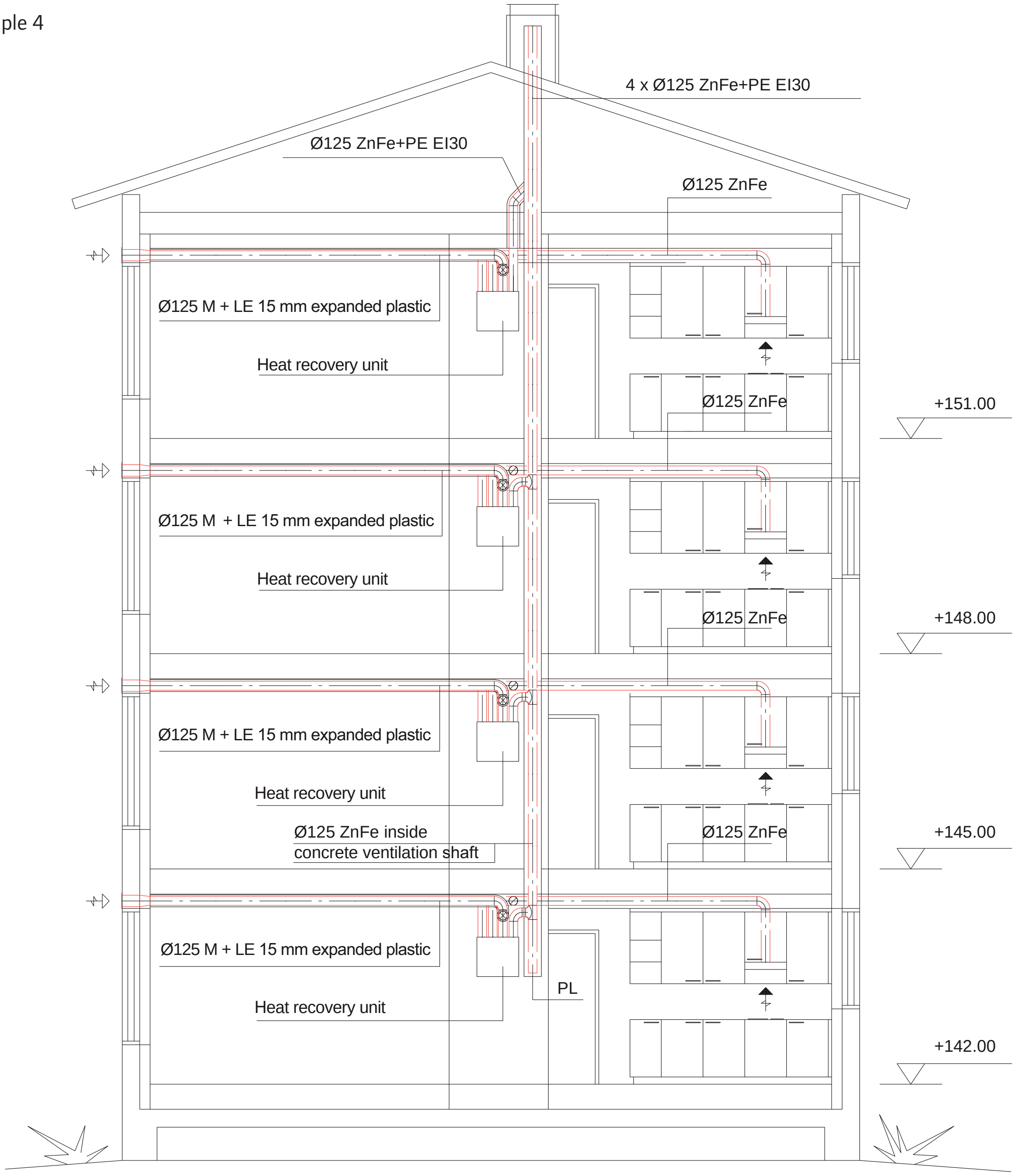


C. The exhaust air from the kitchen hood is conducted via a dedicated duct to the ventilation unit bypassing heat recovery

In this system, ventilation is implemented with a apartment-specific heat recovery unit. The ventilation ducts of the heat recovery unit are plastic Uponor ducts with the exception of the hood and waste air ducts, which are steel sheet spiral ducts. The hood exhaust air is conducted to the heat recovery unit bypassing heat recovery.

The general kitchen exhaust and other plastic exhaust air ducts from the other rooms are combined into one duct close to the heat recovery unit. The waste air from the apartment-specific heat recovery unit is conducted separately from each unit to the roof.

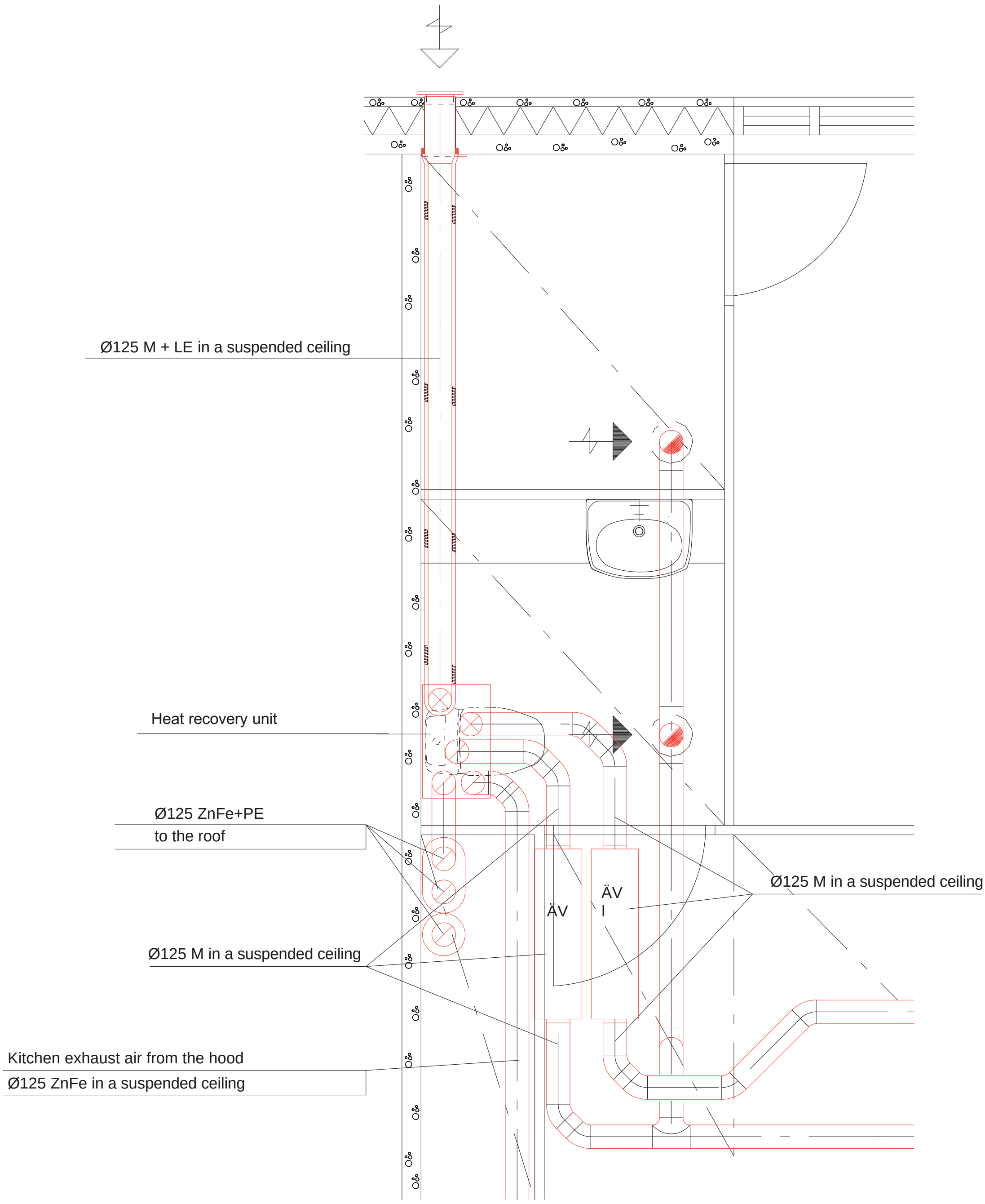
Example 4



NB!

In this system, exhaust air may not be blown outside from the wall.

Example 4A



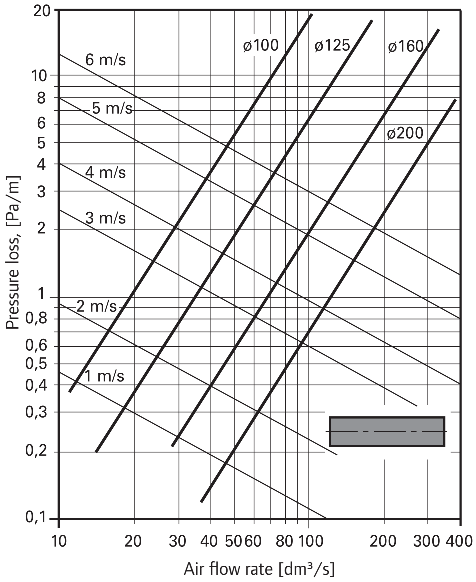
Ø125 M + LE in a suspended ceiling
Heat recovery unit
Ø125 ZnFe+PE
to the roof
Ø125 M in a suspended ceiling
Kitchen exhaust air from the hood
Ø125 ZnFe in a suspended ceiling
ÄV
ÄV
I
Ø125 M in a suspended ceiling

Dimensioning of the ducting and silencers, and the pressure loss graphs

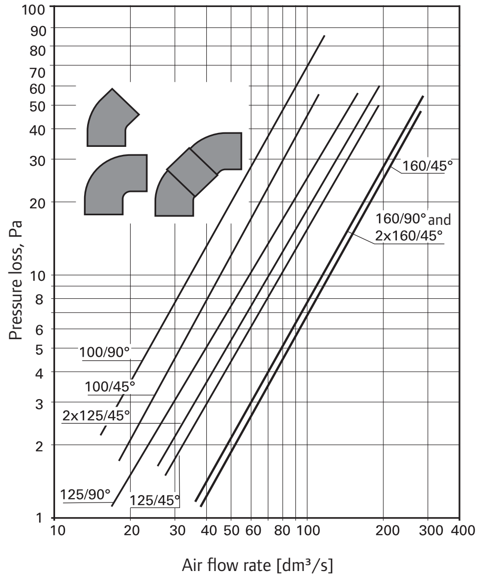
The main supply and exhaust air ducts must be dimensioned loose to the maximum extent possible, which minimises the pressure loss of the ducting.

The supply air valves are connected to the main ducting with Branches.

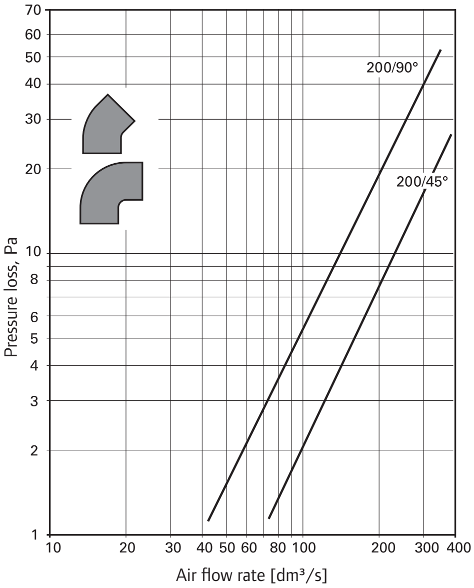
Ducts ø 100, ø 125, ø 160 and ø 200



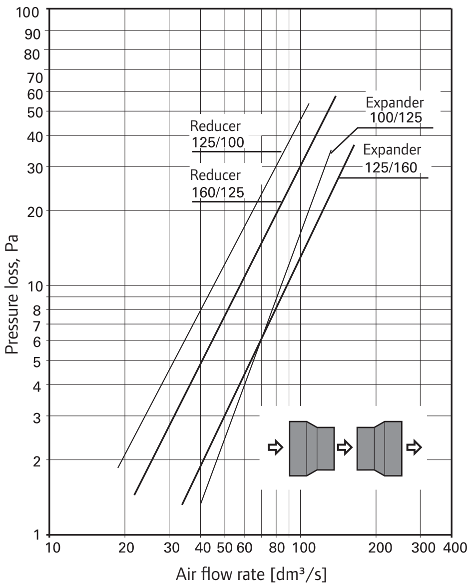
Curves 100/45°, 100/90°, 125/45°, 2x125/45°, 125/90°, 160/45°, 2x160/45° and 160/90°



Curves 200/45° and 200/90°

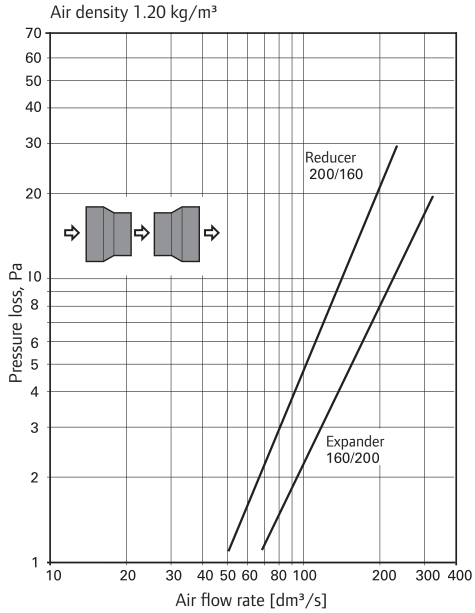


Reducer/expander: Reducers 125/100, 160/125, and expanders 100/125 and 125/160



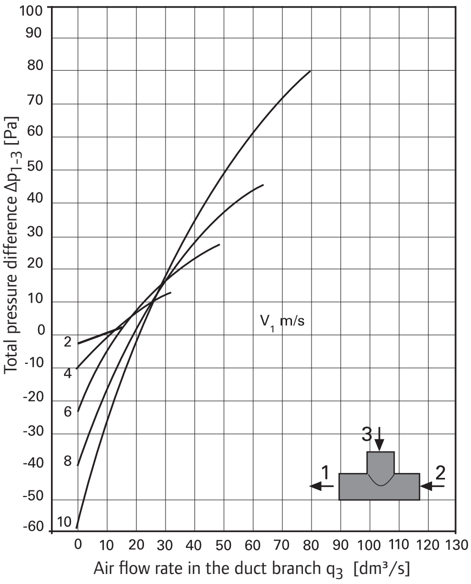
Reducer/expander: Reducer 200/160 and expander 160/200

Air density 1.20 kg/m³



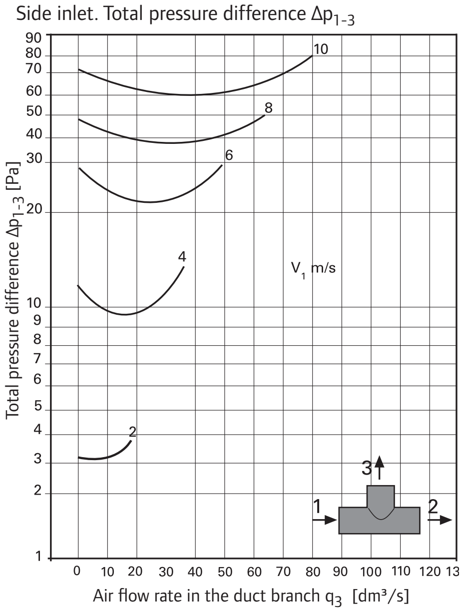
Branch 100/100

Exhaust from the side. Total pressure difference Δp_{1-3}



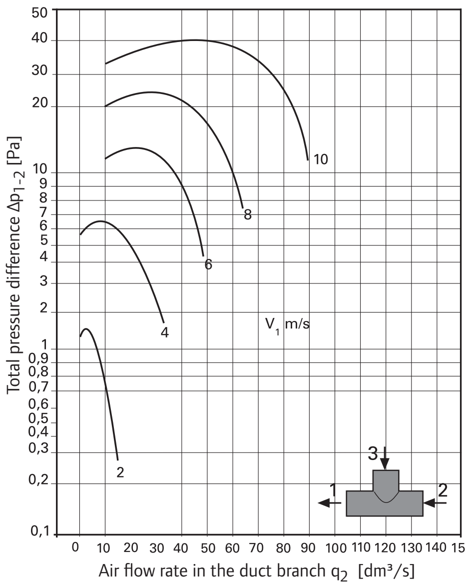
Branch 100/100

Side inlet. Total pressure difference Δp_{1-3}



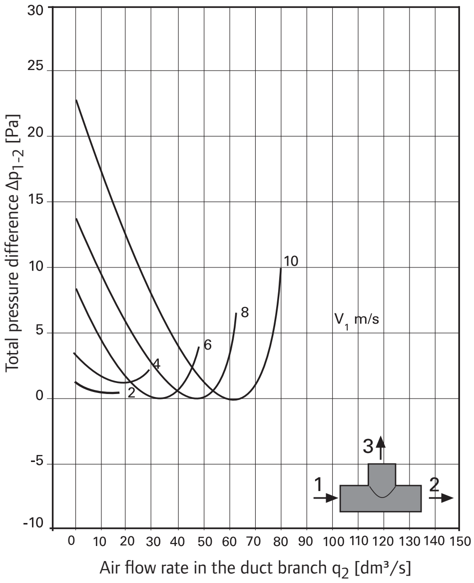
Branch 100/100

Exhaust from the side. Total pressure difference Δp_{1-2}



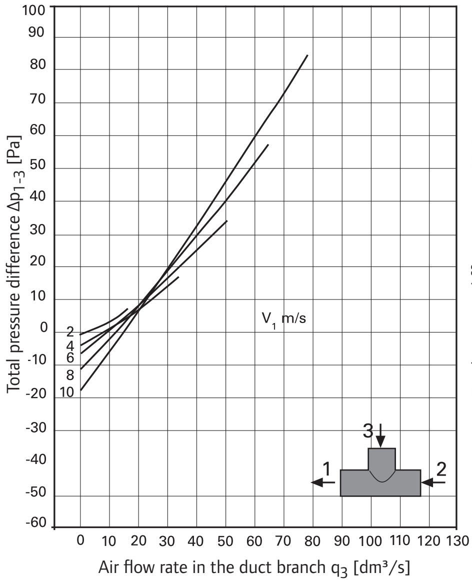
Branch 100/100

Side inlet. Total pressure difference Δp_{1-3}



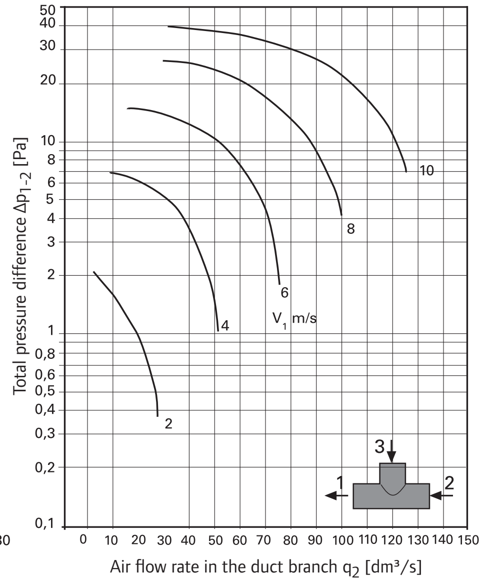
Branch 125/100

Exhaust from the side. Total pressure difference Δp_{1-3}



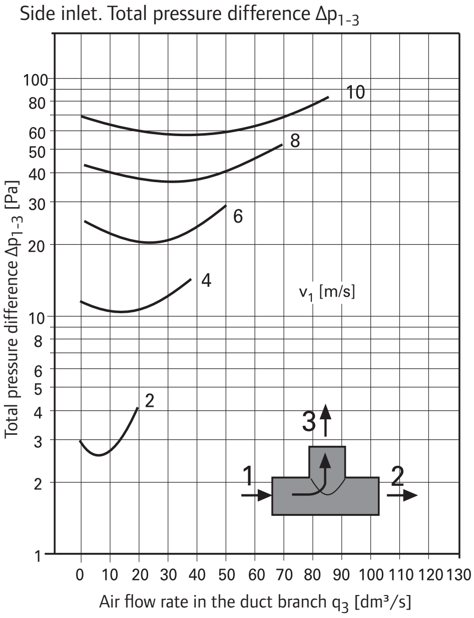
Branch 125/100

Exhaust from the side. Total pressure difference Δp_{1-2}



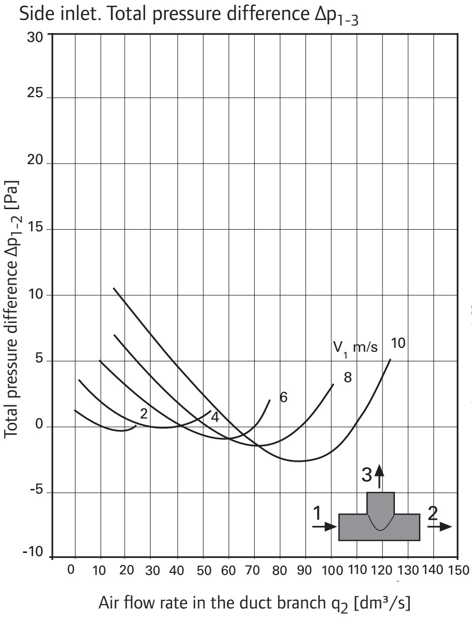
Branch 125/100

Side inlet. Total pressure difference Δp_{1-3}



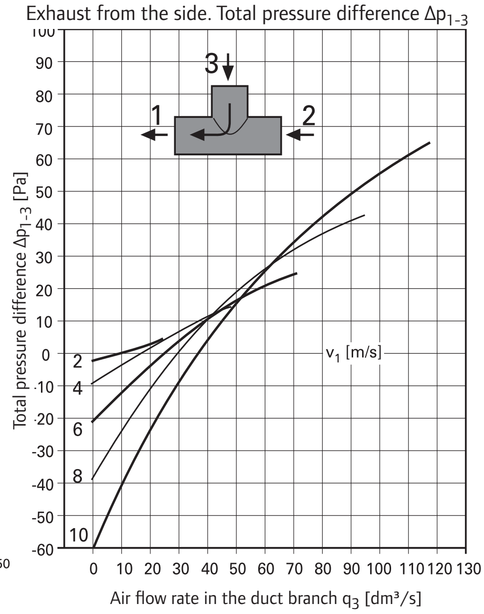
Branch 125/100

Side inlet. Total pressure difference Δp_{1-3}



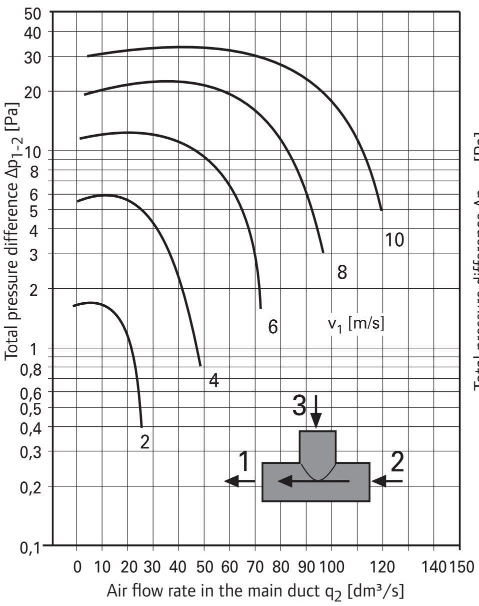
Branch 125/125

Exhaust from the side. Total pressure difference Δp_{1-3}



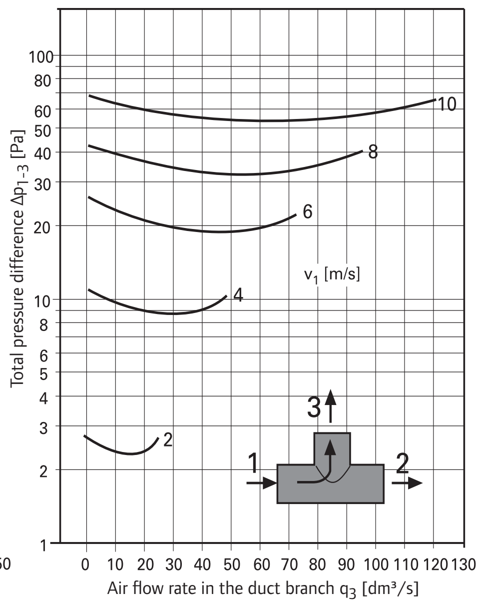
Branch 125/125

Exhaust from the side. Total pressure difference Δp_{1-2}



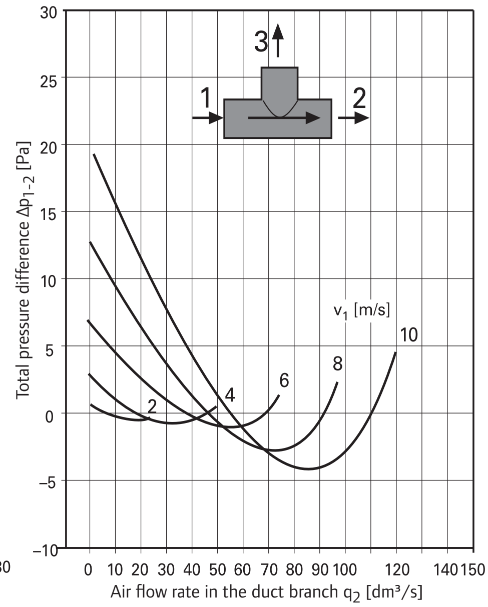
Branch 125/125

Side inlet. Total pressure difference Δp_{1-3}



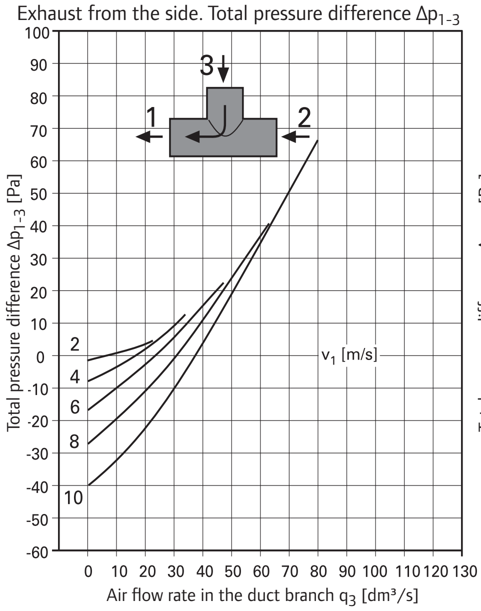
Branch 125/125

Side inlet. Total pressure difference Δp_{1-2}



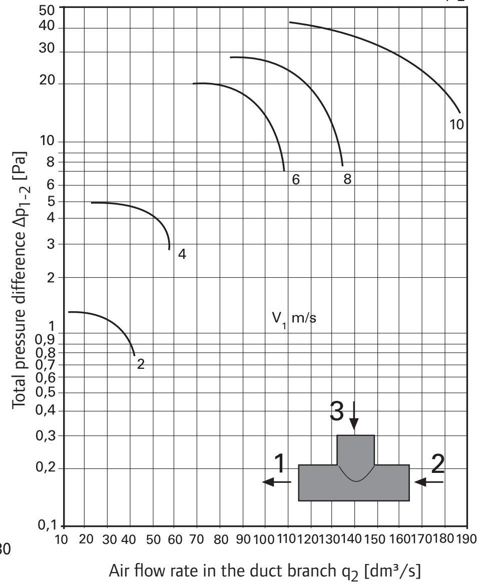
Branch 160/100

Exhaust from the side. Total pressure difference Δp_{1-3}



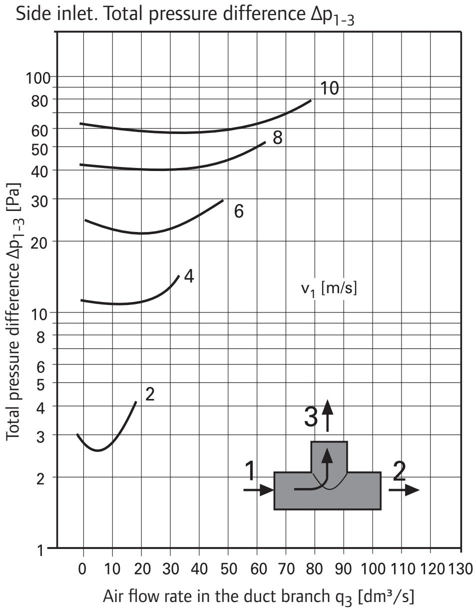
Branch 160/100

Exhaust from the side. Total pressure difference Δp_{1-2}



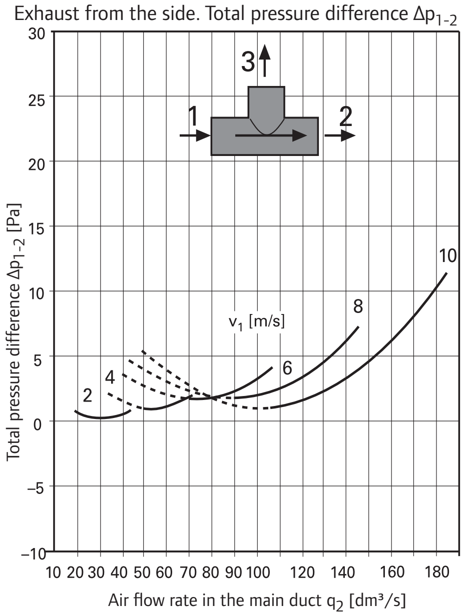
Branch 160/100

Side inlet. Total pressure difference Δp_{1-3}



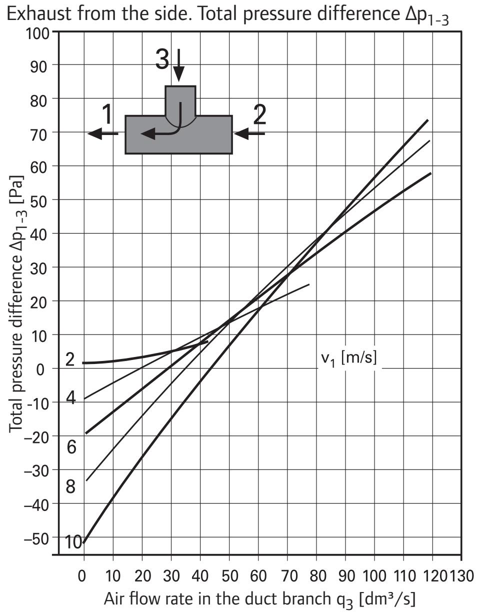
Branch 160/100

Exhaust from the side. Total pressure difference Δp_{1-2}



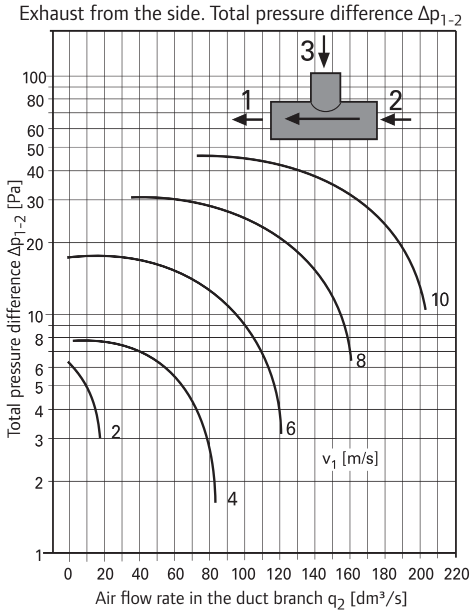
Branch 160/125

Exhaust from the side. Total pressure difference Δp_{1-3}



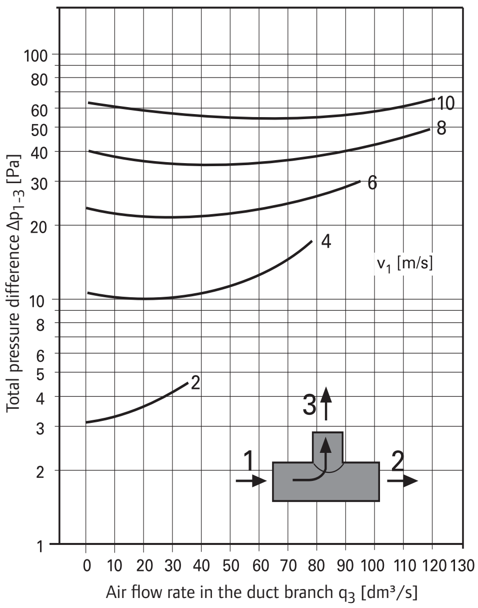
Branch 160/125

Exhaust from the side. Total pressure difference Δp_{1-2}



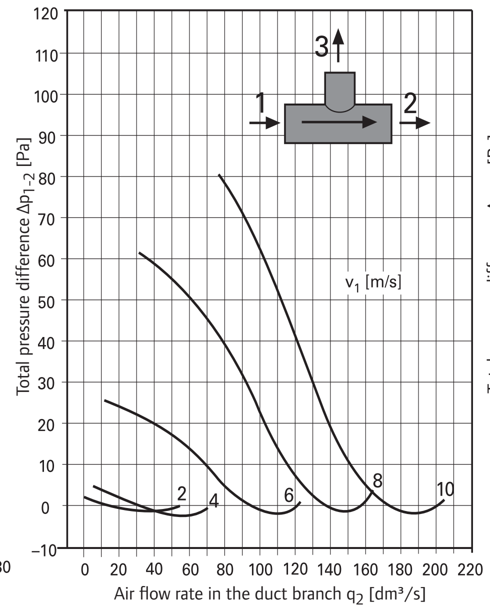
Branch 160/125

Side inlet. Total pressure difference Δp_{1-3}



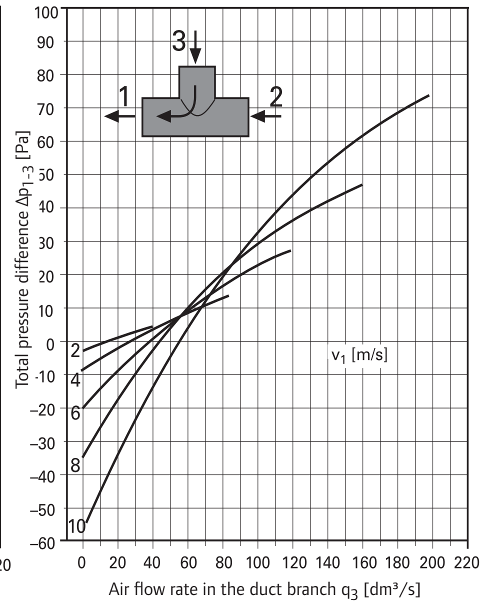
Branch 160/125

Side inlet. Total pressure difference Δp_{1-2}

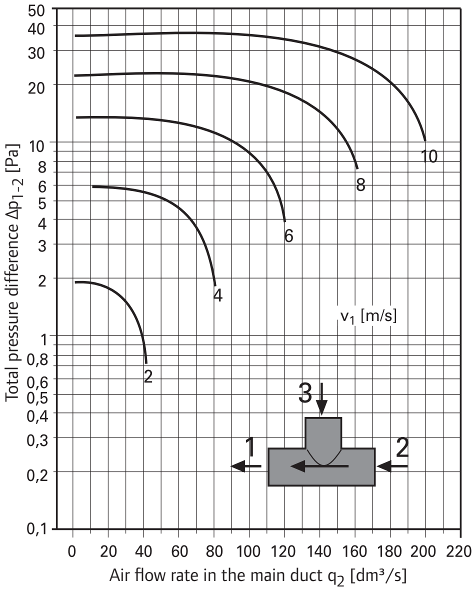


Branch 160/160

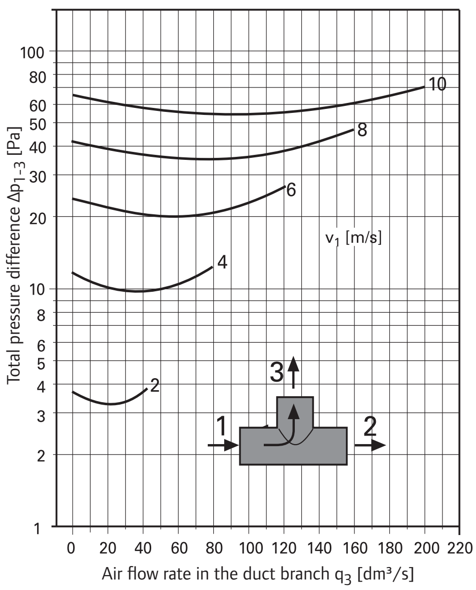
Exhaust from the side. Total pressure difference Δp_{1-3}



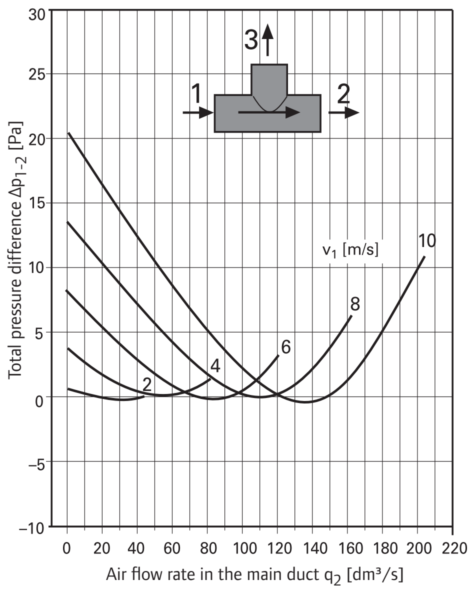
Branch 160/160
Exhaust from the side. Total pressure difference Δp_{1-2}



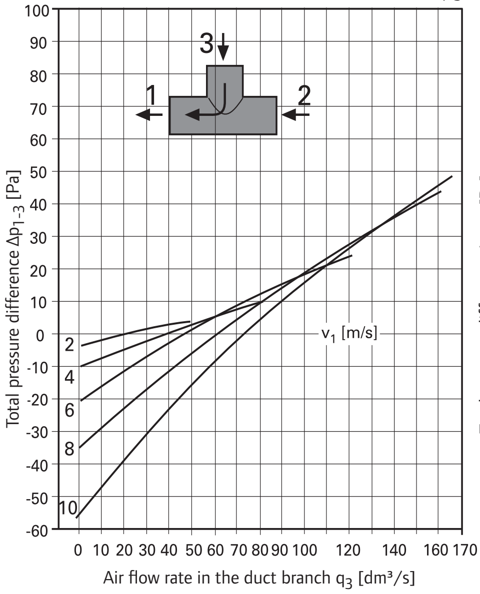
Branch 160/160
Side inlet. Total pressure difference Δp_{1-3}



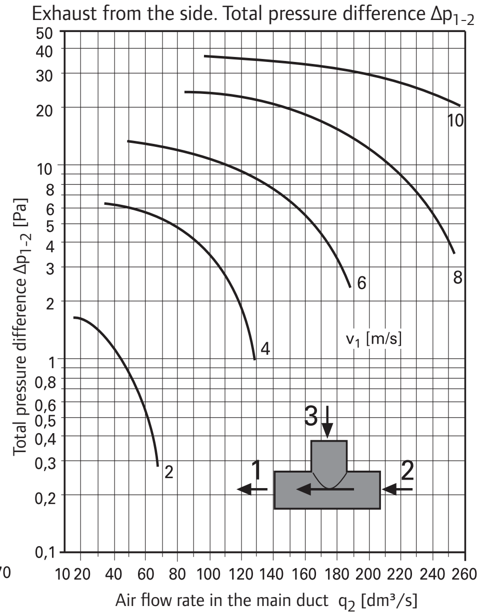
Branch 160/160
Side inlet. Total pressure difference Δp_{1-2}



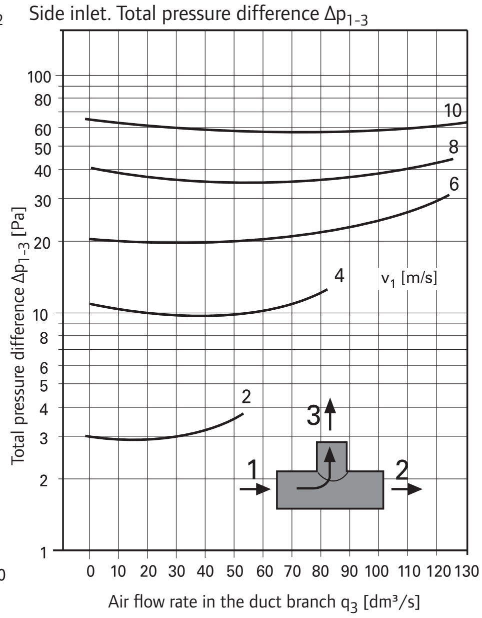
Branch 200/160
Exhaust from the side. Total pressure difference Δp_{1-3}



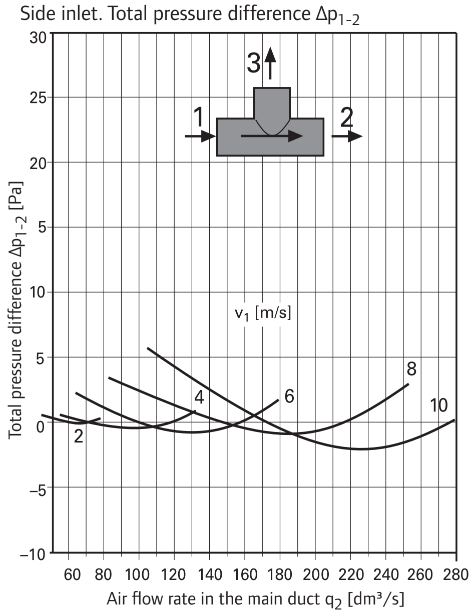
Branch 200/160
Exhaust from the side. Total pressure difference Δp_{1-2}

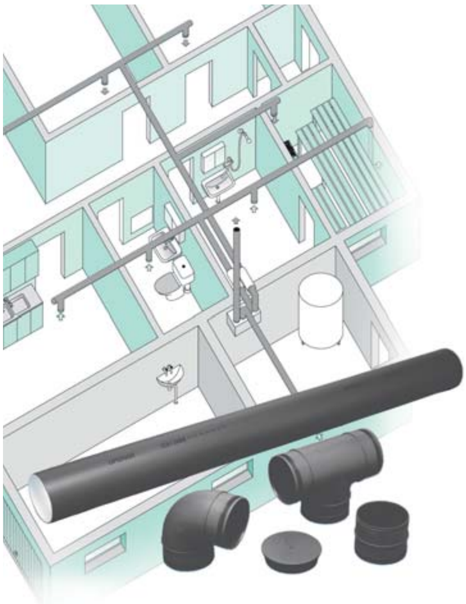


Branch 200/160
Side inlet. Total pressure difference Δp_{1-3}

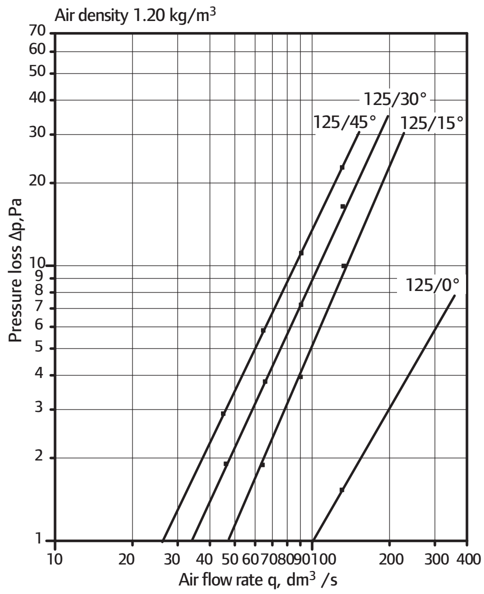


Branch 200/160
Side inlet. Total pressure difference Δp_{1-2}

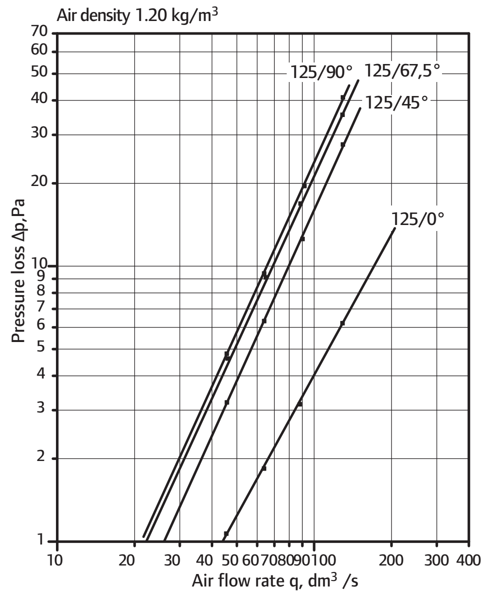




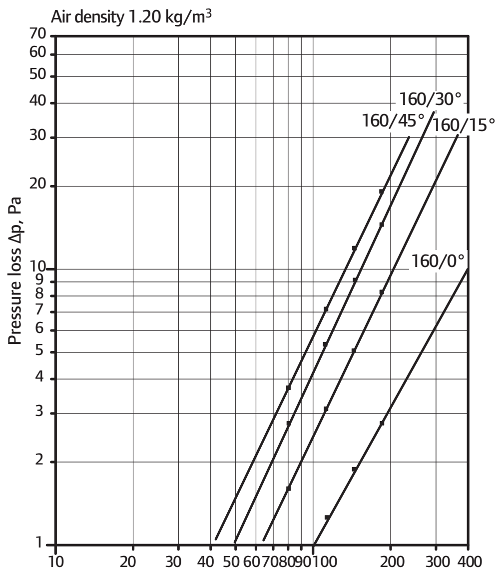
Flexible bend 125x0-45°



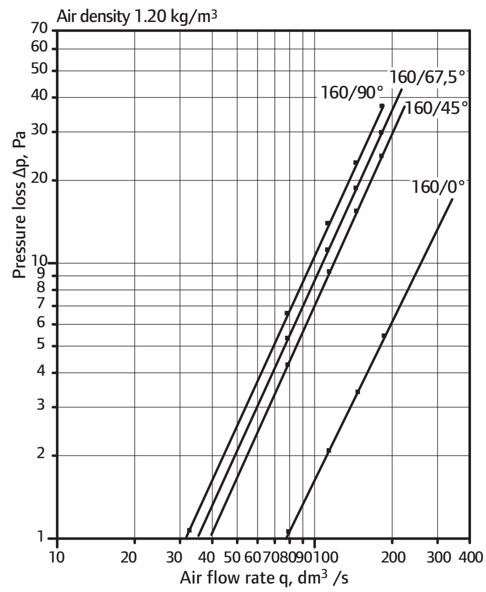
Flexible bend 125x0-90°



Flexible bend 160x0-45°

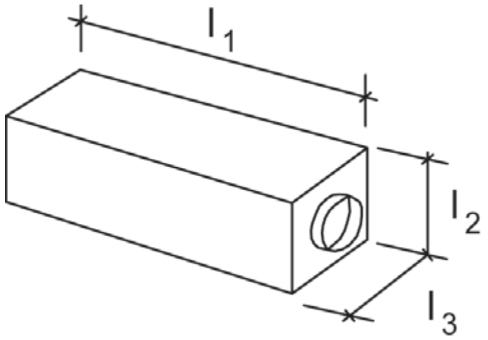


Flexible bend 160x0-90°



Suppression effect of silencers by octave band, ISO 7235:2003

	Noise suppression ΔL (dB)							
	Octave band centre frequency (Hz)							
Size	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
125x300	2.0	6.5	9.5	15.5	11.0	7.5	8.0	6.0
125x650	5.0	14.5	15.5	23.5	33.0	24.5	22.0	15.5
125x1000	10.5	18.0	20.5	29.0	37.0	36.0	36.5	26.5
160x650	6.0	12.5	12.0	21.0	29.5	18.0	14.5	11.5
160x1000	10.5	17.0	16.0	25.0	30.5	27.5	23.0	16.5
200x1000	15.0	10.5	14.5	21.0	27.5	17.5	12.5	9.0



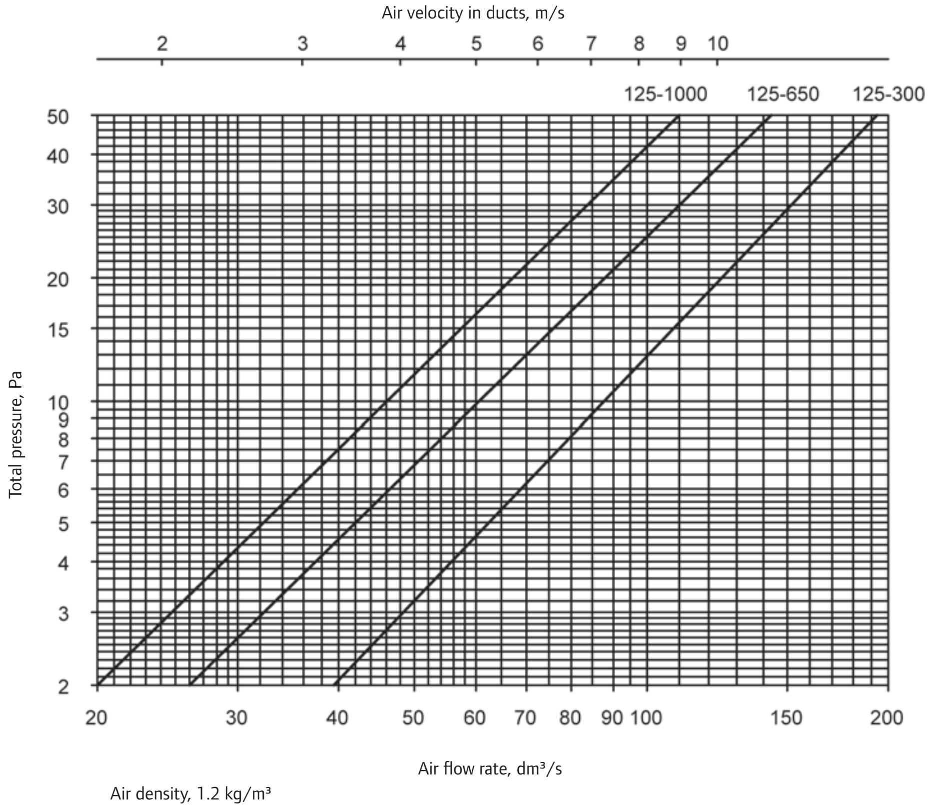
Silencer pressure losses, ISO 7235:2003

125x300	**1**	**2**	**3**	**4**	**5**
q_{VD} / dm³/s	43.7	51.4	65.4	77.5	100.4
V_{al} / m/s	3.6	4.2	5.3	6.3	8.2
P_{tD} / Pa	2.5	3.5	5.6	7.9	13.2
ζ_t / -	0.32	0.33	0.33	0.33	0.33
125x650	**1**	**2**	**3**	**4**	**5**
q_{VD} / dm³/s	43.1	49.6	62.4	76.1	93.9
V_{al} / m/s	3.5	4.0	5.1	6.2	7.7
P_{tD} / Pa	5.2	6.9	10.3	15.0	22.3
ζ_t / -	0.70	0.71	0.667	0.651	0.634
125x1000	**1**	**2**	**3**	**4**	**5**
q_{VD} / dm³/s	39.4	51.9	66.4	77.5	98.4
V_{al} / m/s	3.2	4.2	5.4	6.3	8.0
P_{tD} / Pa	7.2	12.4	19.3	26.2	40.8
ζ_t / -	1.17	1.15	1.10	1.09	1.06
160x650	**1**	**2**	**3**	**4**	**5**
q_{VD} / dm³/s	71.1	86.6	104	127	157
V_{al} / m/s	3.5	4.3	5.2	6.3	7.8
P_{tD} / Pa	5.2	7.9	11.1	16.4	25.2
ζ_t / -	0.70	0.71	0.696	0.686	0.689
160x1000	**1**	**2**	**3**	**4**	**5**
q_{VD} / dm³/s	74.1	95.2	116	144	180
V_{al} / m/s	3.7	4.7	5.8	7.2	8.9
P_{tD} / Pa	9.2	15.0	22.6	34.8	55.4
ζ_t / -	1.13	1.11	1.13	1.13	1.15
200x1000	**1**	**2**	**3**	**4**	**5**
q_{VD} / dm³/s	100	150	200	250	300
V_{al} / m/s	3.18	4.77	6.37	7.96	9.55
P_{tD} / Pa	5.2	11.7	20.9	32.6	46.9
ζ_t / -	0.858	0.858	0.858	0.858	0.858

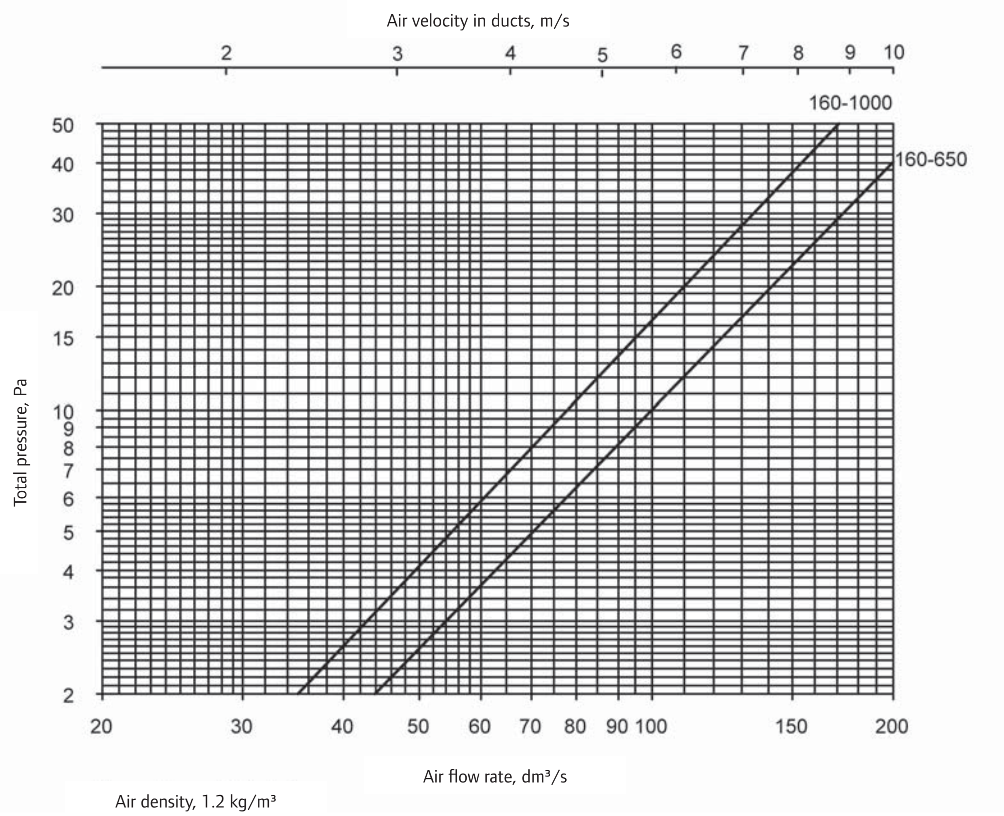
q_{VD} = Air flow rate, dm³/s
V_{al} = Air face velocity, m/s
P_{tD} = Total pressure loss of air, Pa
ζ_t = Total pressure drag coefficient, -

Silencer pressure loss, ISO 7235:2003

USI-125-300, USI-125-650, and USI-125-1000



USI-160-650 and USI-160-1000



Installation

Introduction

Uponor ventilation ducting and components are made of polypropylene plastic. They are lightweight and easy to handle. Duct installation is not recommended in temperatures below –15 °C. Ducts must not be thrown, dragged, dented, or otherwise damaged. Ducts are delivered from the factory with both ends plugged and packed in plastic bags and cardboard boxes to keep them clean. The ducts and components must be prevented from contamination by keeping the ducts plugged and storing the components in the respective bags during on-site warehousing. They must be protected from direct sunlight during long-term storage.

Remove duct plugs and protective bags only at the time of installation. Open ends of pre-installed ducting must be protected with duct plugs, which must be left in place until the valves are installed and adjusted.

The cleaning hatches of the ducting must be positioned and installed so as to allow cleaning.

Connections are made by pushing the duct on top of the connection piece as far as the limiting shoulder. Connections are made manually; the components may be lubricated with clean water or water mixed with washing-up liquid. The connections are made without screws or rivets.

Ducting

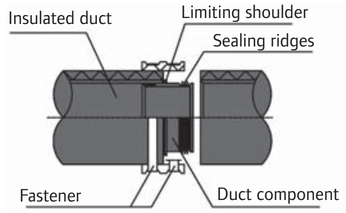
Cutting and connecting ducts

Uponor ducts must be cut perpendicularly by means of a saw with a fine tooth pitching (1–2 mm). Remove the sawdust from both the outside and inside surfaces, and bevel the inner edge of the cut head to facilitate insertion of the connection piece. Duct connections, changes in direction, and branching must be implemented with duct components. The components are equipped with sealing ridges made of the component material. The ducts do not have ridges.

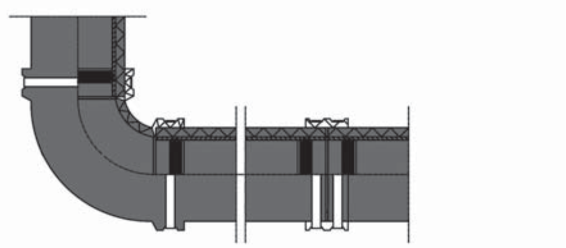
However, the vertical ducting sections must be supported so that their weight does not rest on the coupling. If brackets cannot be used, the connection may be secured with 8–10 mm pop rivets where necessary.

Cutting and connecting pre-insulated ducts and components

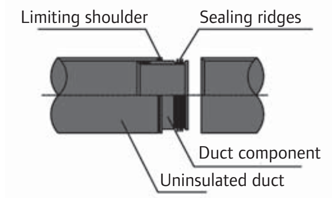
The pre-insulated ducts are cut with their insulation and connected to each other in the same way as uninsulated ducts and components. The connection is secured with a fastener delivered with the components. In some cases, it should be noted that the duct's insulation must be removed in some places. For example, when the duct is penetrating a vapour barrier, the duct's insulation is removed from the warm-side section of the vapour barrier cap, if no condensation insulation is required.



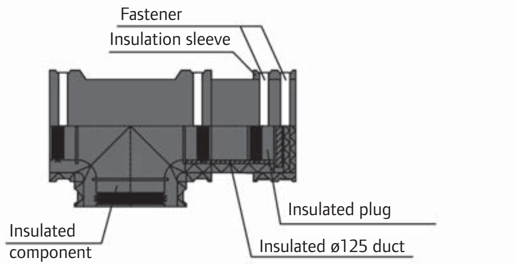
Connecting pre-insulated ducts to each other.



Connecting pre-insulated ducts and duct components to each other.



Connecting uninsulated ducts to each other.



Additional insulation of the pre-insulated cap installed at the end of a pre-insulated ø 125 duct. The installation company will deliver and install the additional insulation.

Installation of flexible bends

The flexible bends are manufactured by means of duct sizing, and they are connected to the system with fittings such as connectors. Due to the manufacturing method of the flexible bends, the tightness of joints must be ensured by means of vulcanising tape.

Vapour barrier inlets

When a duct penetrates a structure with a vapour barrier (e.g., the exterior wall), the through hole is sealed with a vapour barrier cap. One side of closed-cell caps is self-adhesive.

- Clean the vapour barrier from dust etc. Remove the protective plastic from the cap and press it tightly against the vapour barrier.
- Using a sharp knife, make an aperture corresponding with the size of the cap hole in the vapour barrier. Ensure that the cap is pressed against the vapour barrier on each side.
- Carefully push/pull the duct through the cap hole while rotating the duct.
- Align the head of the duct in place and connect it with the ducting.

Pre-insulated ducts and vapour barrier through holes

When cutting pre-insulated ducts, you must bear in mind that the insulation is cut from a different place than the actual duct is.

Duct supports

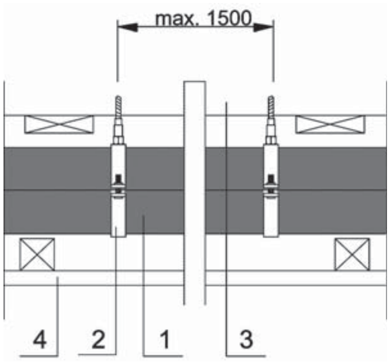
Supporting is implemented with supports designed for ventilation ducting.

The maximum support interval of horizontal ducting is 1500 mm. A support should be installed adjacent to each connection/component.

Vertical ducting sections must be supported so that their weight does not rest on the coupling. Also the descending ducts must be supported well, to prevent movement when one is installing valves or cleaning the duct/valve. The supports can be mounted, for instance, on the supporting pole nailed under the duct.

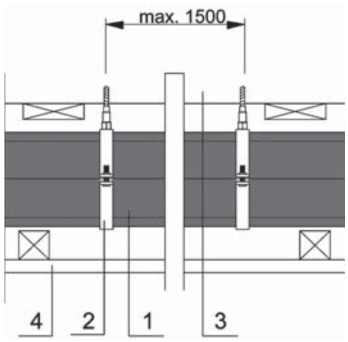
Support for pre-insulated ducts

Supports for pre-insulated ducts are implemented in the same way as those for uninsulated ducts. You must note, however, that the insulation is not cut in the locations of the supports; the supports rest over the insulation.



1 = Pre-insulated duct
2 = Support
3 = Lower roof truss support
4 = Suspended ceiling

Example of the supporting of a pre-insulated duct above a suspended ceiling.



1 = Uninsulated duct
2 = Support
3 = Lower roof truss support
4 = Suspended ceiling

Example of the supporting of an uninsulated duct above a suspended ceiling.

Insulation

The insulation of plastic ducts is specified in the ventilation plans.

Normal insulation alternatives are as follows:

In a warm space (flat):

· **Supply and exhaust air ducts** do not require any insulation, with the exception of ducts inside sauna ceilings, which must be thermally insulated with uncoated 50 mm mineral wool. If the supply air is to be cooled, the supply air ducts must be insulated with expanded PE plastic. If the air flowing in the supply air duct will not be post-heated in winter, the ducts must be insulated with expanded PE plastic.

· **Outdoor air ducts** are insulated with expandable PE plastic insulation, functioning as condensation insulation.

Kitchen hood

· **The kitchen hood's** steel sheet duct is fire-insulated with insulation of EI30 fire-resistance.

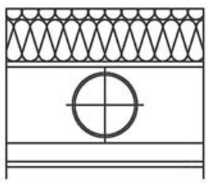
Supply and outdoor air ducts and components are condensation insulated by 15 mm expandable PE plastic insulation, pre-installed around the ducts at the factory.

If necessary, the PE plastic insulation may be cut open vertically, wrapped around the duct, and glued at the seam. In this case, the transverse and vertical seams are closed tightly with contact adhesive.

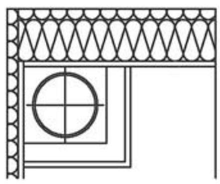
The condensation insulation of factory-insulated ducts can be tightly sealed through installation of separate connector insulation sleeves on the duct ends connected with connectors. The connections are secured with fastener. The socket coupling of the insulation and the pre-insulated ducts and duct components can be tightly connected by inserting the insulated ducts as far as the stop collar of the insulated duct components and securing the connections with fastener.

Plastic ducting in a flat, inside a suspended structure or a housing

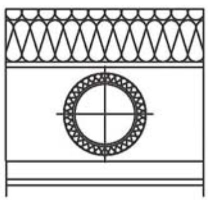
Temperature of air passing through the duct: above 10 °C



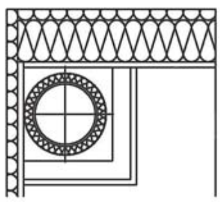
Temperature of air passing through the duct: above 10 °C



Temperature of air passing through the duct: below 10 °C



Temperature of air passing through the duct: below 10 °C



Insulation alternatives for plastic ducting. See also the 'Insulation' section.

Installing and adjusting valves

Introduction

Valves are installed and adjusted after the final cleaning of the work site.

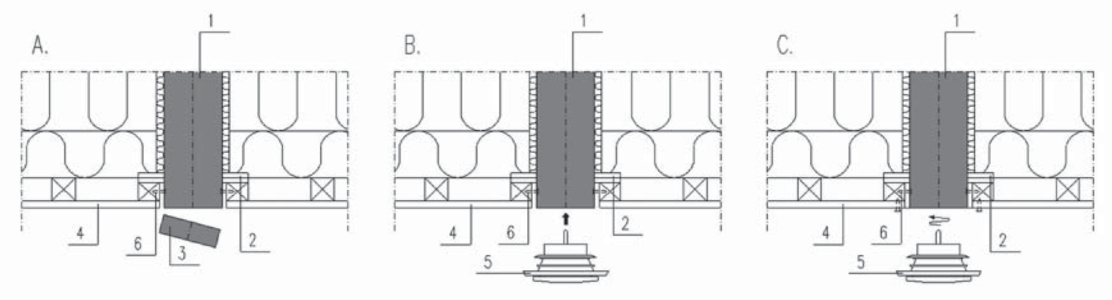
The ventilation system is taken into use only when the building is completely finished.

Approved valves must be used in mechanical supply and exhaust air ventilation, and the maximum allowed room-specific air flow through the throttle is 42 dm^3/s with a 100 Pa pressure difference.

All visible dirt must be cleaned off the valves on a regular basis. Valve adjustments must not be changed during cleaning. Moreover, the valves should not be blocked or closed at any stage.

An example of connecting a valve to ducting in an apartment-specific supply and exhaust air ventilation system

1 = Pre-insulated duct
2 = Vapour barrier cap
3 = Duct section to be shortened
4 = Finished ceiling surface
5 = Valve
6 = Mounting screw



A. Cut the duct to the level of the finished roofing, using, for example, a saw with fine tooth pitching or duct cutting pliers. Secure the duct from inside with two mounting screws.

B. Insert the valve in the duct. The valve locks onto the end of the duct.

C. **The supply and exhaust valves of saunas**, intended for ceiling mounting, are equipped with mounting frames that are secured to the ceiling structure with screws. Attach the valve to the frame by rotating it. Ceiling-mounted frames installed above the sauna stove must always be secured with screws.

Outdoor grille

Outdoor grilles are equipped with an easily removed framed screen or a door screen.

The screen cassette must be cleaned regularly, up to once a month during the warm season (April–October). The need for cleaning may vary greatly according to the location of the building.

The white ABS plastic screen can be painted with, for instance, spray paint, and a separate undercoat is usually not required. The suitability of the paint for ABS plastic should be verified. Before painting, clean the surface with, for instance, acetone.

NB:
In mechanical supply and exhaust air ventilation, no screen is used in the outdoor air grille.

Fresh air valve for wall mounting

(outdoor air valve with a filter for mechanical exhaust air ventilation) The valve is installed in a hole, ø 106 mm, drilled/sawed above the window. The valve is opened and closed with the pull cord.

Installation

Pull the inside valve open with the pull cord and unscrew the cover. Rotate the grille slightly anti-clock wise and pull it out.

Shorten the extension duct according to wall thickness. Install the duct and the valve body in their place and secure them with screws. Screw the grille and the cover back in place and adjust the opening.

Mount the base of the outdoor grille with screws. Install the outdoor grille by pressing it onto the grille base.

Maintenance

Clean the fi lter twice a year with warm water.

Fresh air valve for vent hole

(outdoor air valve with a filter for mechanical exhaust air ventilation) The valve is installed in a hole, ø 106 mm, drilled/sawed above the vent hole of the window.

Installation

Pull the inside valve open with the pull cord and unscrew the cover. Rotate the grille slightly anti-clockwise and pull it out.

Install the valve body and the rear false cover with screws. If the vent hole is over 90 mm thick, extend the valve with the supplied raising ring.

Screw the grille and the cover back in place and adjust the opening by rotating the cover.

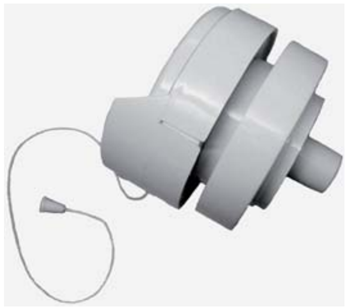
Air guide

The air guide can be directed upward, to the left, or to the right. If, for instance, a radiator is located to the left of the valve, the air guide is directed to the left.

The guide may be pulled out for rotation by first opening the valve with the pull cord and unscrewing the cover.

Maintenance

Clean the filter twice a year with warm water.



Slit valve

(outdoor air valve with a filter for mechanical exhaust air ventilation) The valve is installed either in a 19 x 250 mm space tooled in the top window frame or between the window frame and wall structure.

If the slit valve is located above the radiator line, the inner nozzle is directed up and the outer one down.

Maintenance

Clean the fi lter twice a year with warm water. The filter in the duct section of the valve can be pulled out after removal of the shutter strips by loosening of the two mounting screws.

Clean air valve

(exhaust air valve for mechanical exhaust air ventilation)
The valve is installed in a hole, ø 106 mm, drilled/sawed in the middle above the window.

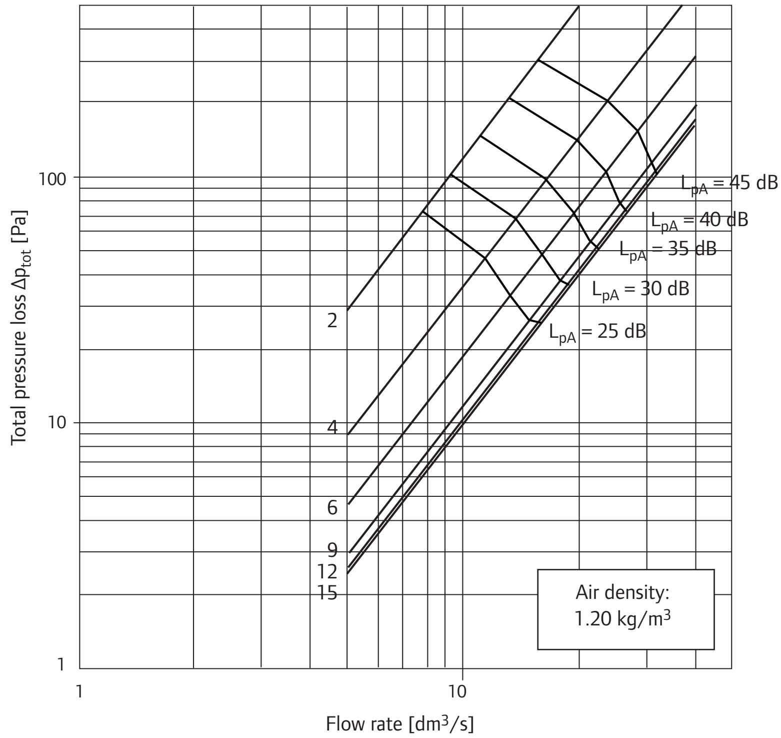
Adjustment of the ventilation valves in an apartment-specific supply and exhaust air ventilation system

The valves are pre-adjusted before the actual adjustment and measurement.

Adjust the valves in accordance with the adjustment curves by rotating the valve disc (ceiling-mounted valves) or by opening rows of holes (wall-mounted valve). After adjusting it, lock the valve into position.

A gauge may also be used for adjusting and checking the adjustment of valves.

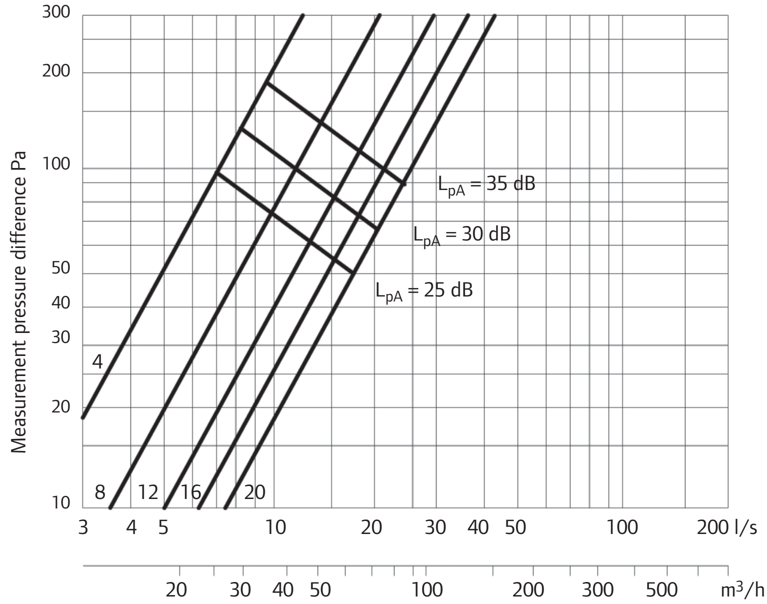
UTK-P-100 with air guide + throttle component



Summary of the flow-property and acoustic measurements of the supply air valve UTK-P-100 with air guide at various adjustment positions.

mm	U-values
2	0.92
4	1.69
6	2.39
9	3.04
12	3.25
15	3.31

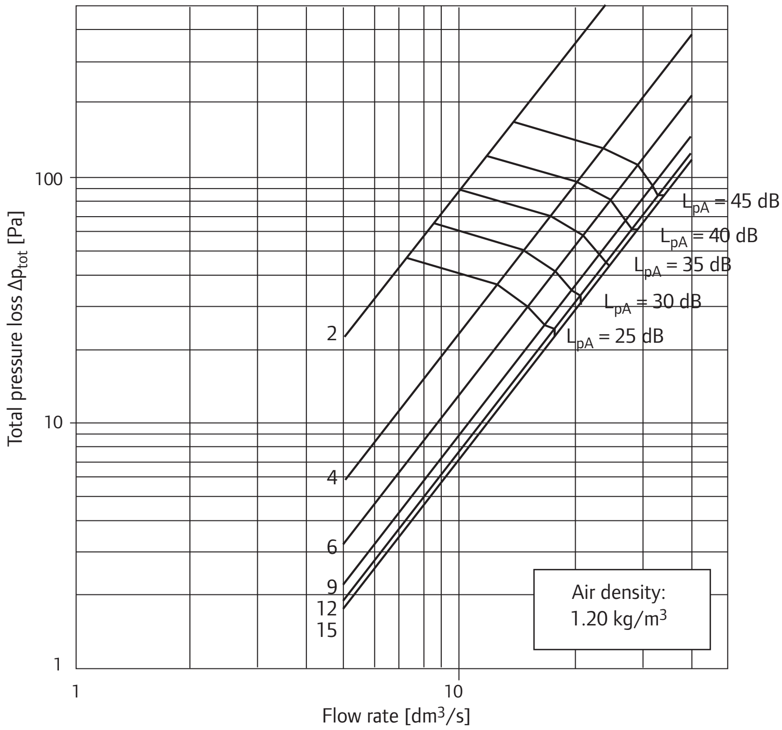
UPK-P-100 + throttle component



Summary of the flow-property and acoustic measurements of the exhaust air valve UPK-P-100 at various adjustment positions.

mm	U-values
4	0.7
8	1.2
12	1.7
16	2.1
20	2.5

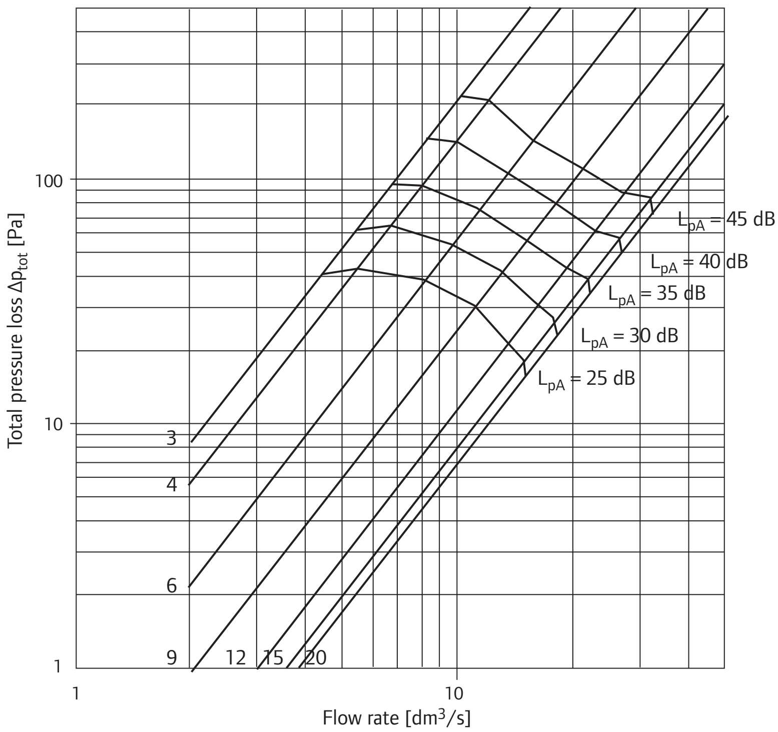
UTK-P-125 with air guide + throttle component



mm	U-values
2	1.06
4	2.06
6	2.78
9	3.41
12	3.73
15	3.83

Summary of the flow-property and acoustic measurements of the supply air valve UTK-P-125 with air guide at various adjustment positions.

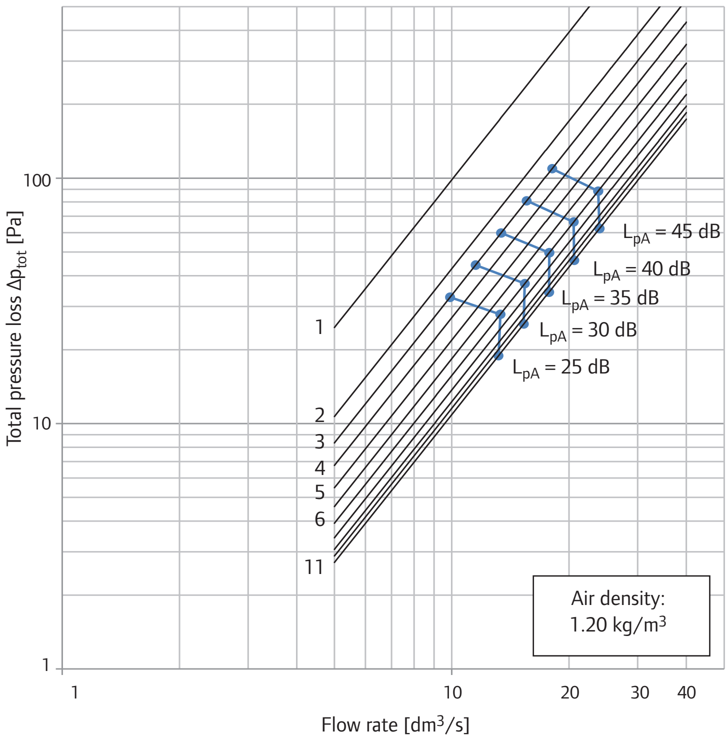
UPK-P-125 + throttle component



mm	U-values
3	0.68
4	0.82
6	1.28
9	1.90
12	2.66
15	3.06
20	3.16

Summary of the flow-property and acoustic measurements of the exhaust air valve UPK-P-125 at various adjustment positions.

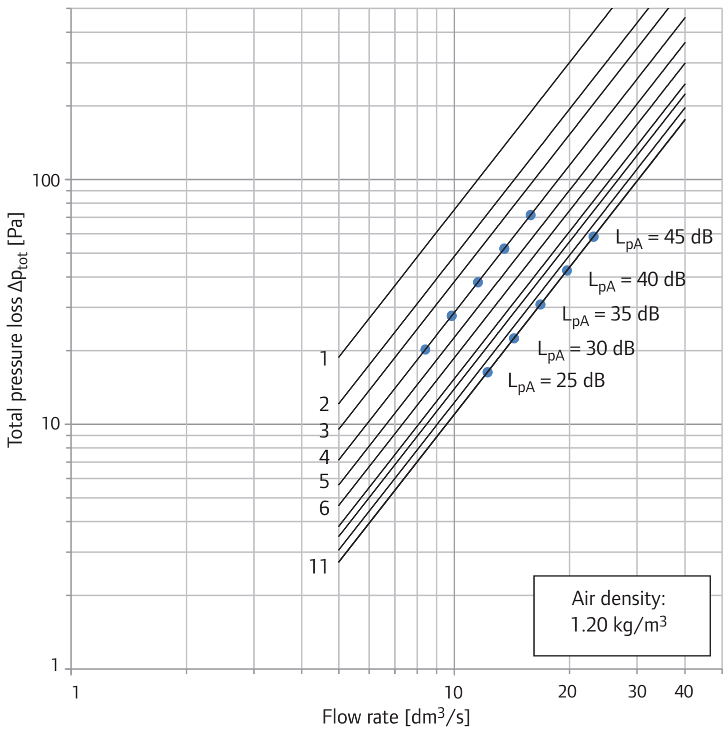
UTS-P-100 + throttle component



Summary of the flow-property and acoustic measurements of the supply air valve UTS-P-100 at various adjustment positions.

mm	U-values
1	1.04
2	1.65
3	1.91
4	2.19
5	2.50
6	2.82
7	3.19
8	3.64
9	4.18
10	4.58
11	4.84

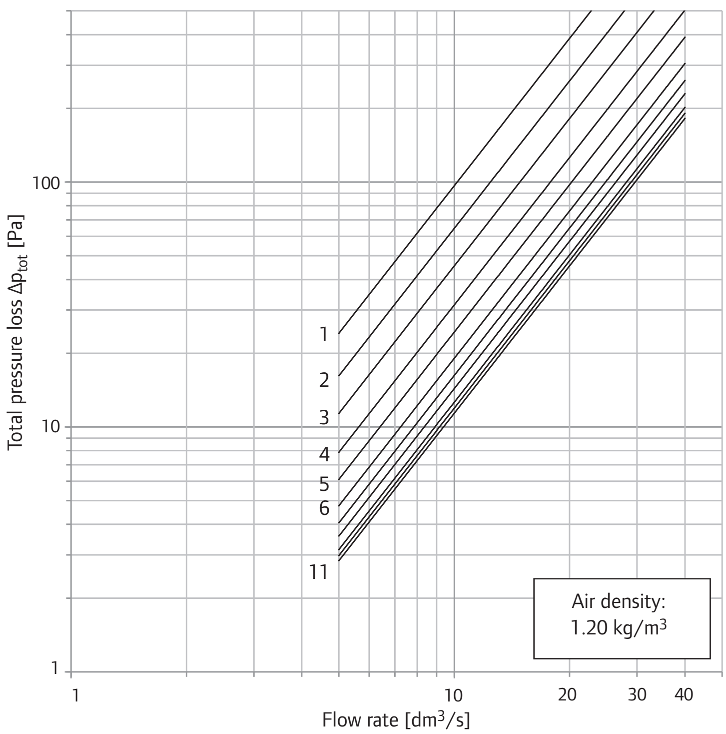
UTS-P-125 + throttle component: side holes are open



mm	U-values
1	1.1
2	1.4
3	1.6
4	1.9
5	2.1
6	2.3
7	2.5
8	2.6
9	2.8
10	2.9
11	3.0

Summary of the flow-property and acoustic measurements of the supply air valve UTS-P-125 at various adjustment positions when the side holes are open.

UTS-P-125 + throttle component: side holes are closed

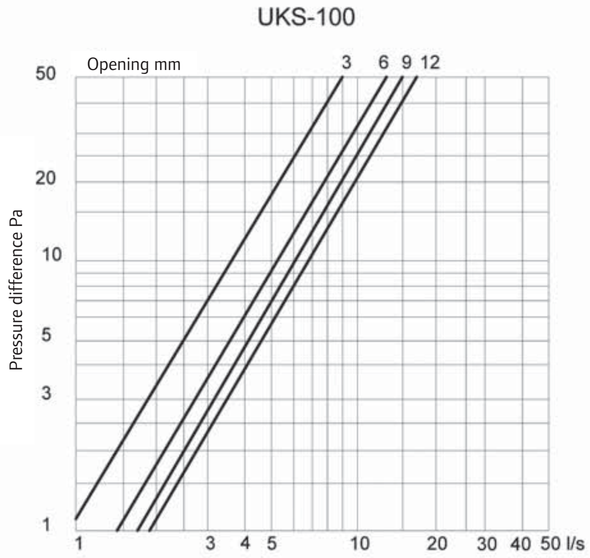


mm	U-values
1	1.0
2	1.3
3	1.4
4	1.8
5	2.0
6	2.2
7	2.4
8	2.6
9	2.8
10	2.9
11	3.0

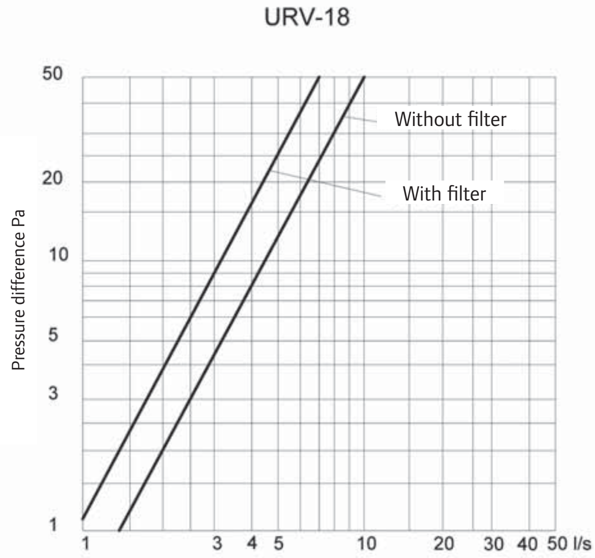
Summary of the flow-property and acoustic measurements of the supply air valve UTS-P-125 at various adjustment positions when the side holes are closed.

Flow rate and pressure difference

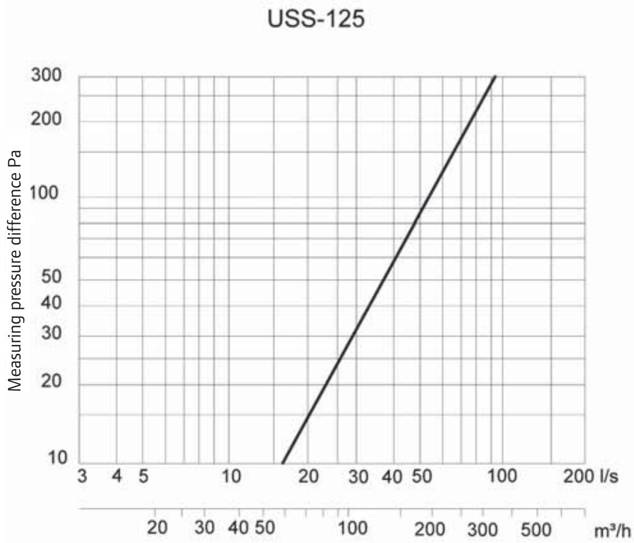
Fresh air valve ø100

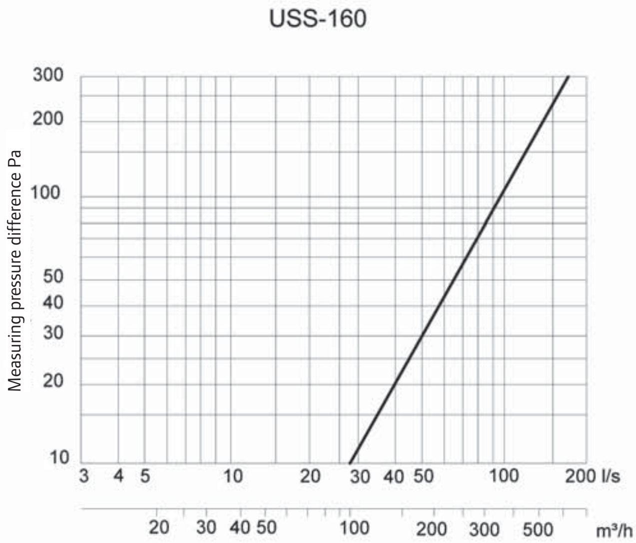


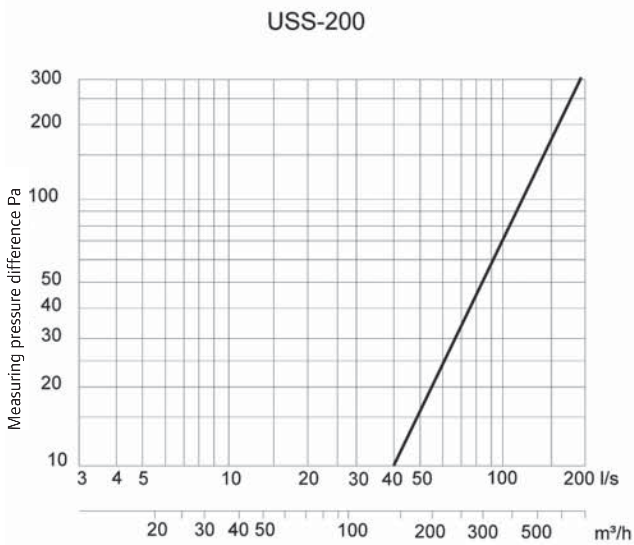
Slit valve 18x245x340



Outdoor grilles







Notes

Notes

Notes

ISO 9001
ISO 14001
DNV
SERTIFIOITU
ORGANISAATIO

ALL DUCTS

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