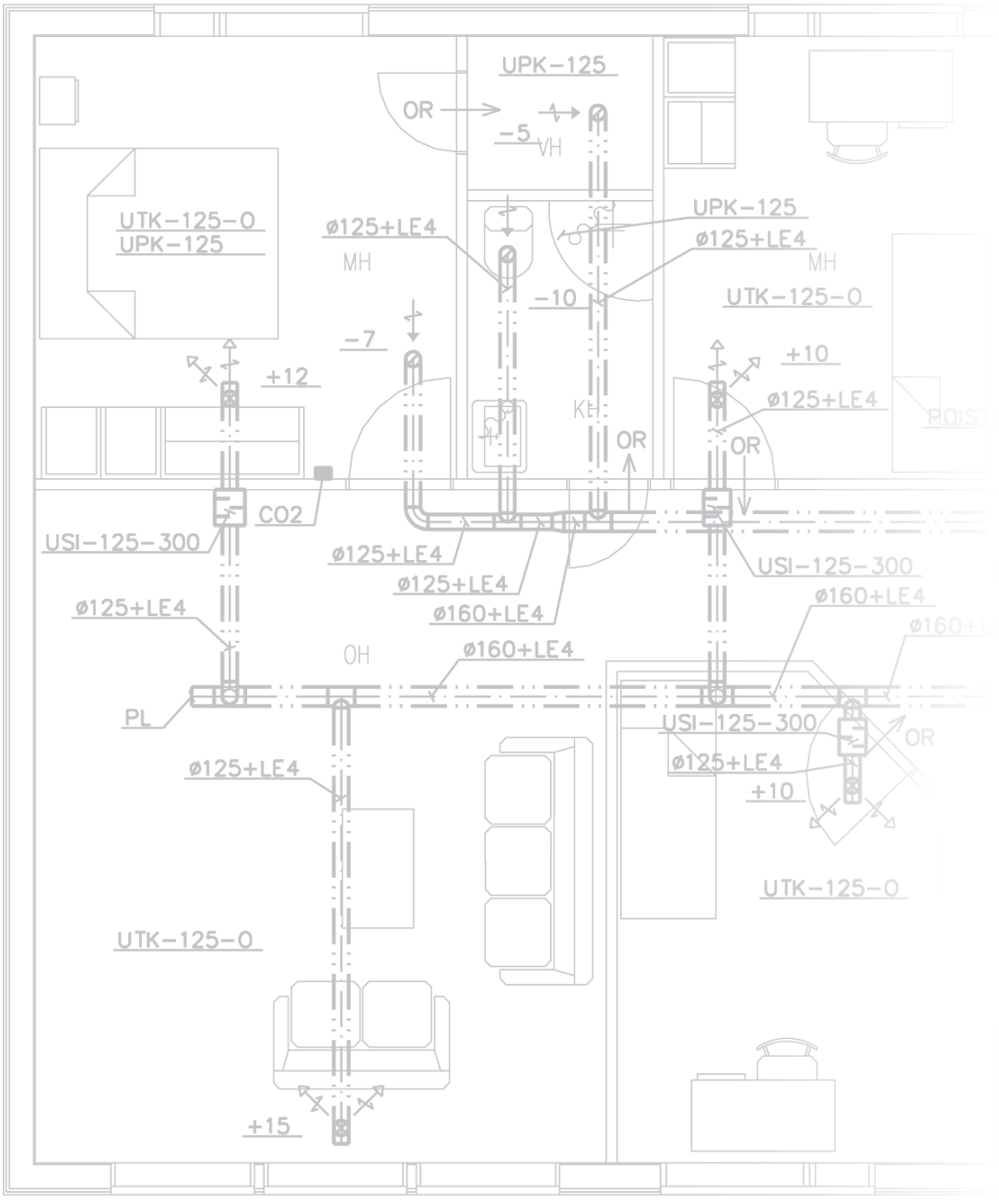
Apartment-specific ventilation in detached houses and apartment buildings

Design and Installation Guide



5/2020

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 both detached houses and apartment buildings is implemented with plastic Uponor ventilation ducts.

In the installation examples of ventilation, 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 environ- ments 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, develop- ment 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 of detached, terraced, or semi-detached houses. The structural fire compartmentalisation of the attic spaces of terraced and semi-detached houses must be apartment-specific.

The Uponor ventilation system comprises both uninsulated and insulated ducts and ducting 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 insulated ducts located in the insulation space above the ceiling are denoted as 'safe', avoiding 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 also includes insulated factory-made ducts and components ready for installation
- The system does not collect dust or dirt: antistatic PP material is resistant to all impurities
- Installation is fast and simple
- Easy-to-handle material
- Ducting that can be installed without separate sealing and locking
- Technically excellent structure for air flow
- The system presents no corrosion problems
- Odour problems also are prevented
- The system guarantees clean indoor air throughout the home
- It has a unique structure and jointing solution.

Technical specifications of the duct material

Raw material:	polypropylene; odourless and non-toxic
Colour:	black
Density:	≈ 900kg/m³
Tensile strength:	30MPa
Heat expansion:	0.06 mm/m °C

ALL DUCTS
Uponor Suomi Oy
Nastola - Forssa

Technical characteristics of the ducting

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

Fire-related performance:
Eurofins Certificate EUFI29-19006237-C

Compliance with fire safety requirements has been demonstrated in accordance with section 3 of the Decree of the Ministry of the Environment on fire safety in buildings.
Technical Research Centre of Finland's reports
Code VTT-R-05113-10
Date 01/10/2010
Code VTT-S-12299-06
Date 29/12/2006
Code VTT-S-03927-07
Date 14/05/2007
Code VTT-M-03934-07
Date 14/05/2007.

Impact-resistance:
Meeting of 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 duct and components are ensured in production in accordance with the test procedure IEC61340-4-10.

Heat-resistance:
Continuous –50 °C...+85 °C,
Short-term +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 co-operation with the Finnish Allergy and Asthma Association

Product name *Size* *Material and code* *Manufacturing date* *Manufacturing unit* *International approvals*

Duct markings

Technical specifications of duct insulation

Raw material:	foamed polyethylene;
Thermal conductivity:	0.0377W/Km
Colour:	grey
Density:	30kg/m³, insulation thickness 15mm In determining the sufficient insulation thickness, the insulating effect of the plastic duct has also been taken into account.
Fire performance:	no classification
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.

Quality

The plastic Uponor ventilation system ducts and components have been granted a Eurofins product certificate.

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-EN 1506. 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-EN 1506.

Tightness of ducting

The ducting air-tightness classification is D (VTT report VTT-S-11208-08). 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 m ends plugged to keep them clean. Duct components are delivered packed in plastic bags and cardboard boxes.

Storage

Withstands outdoor storage for two years 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

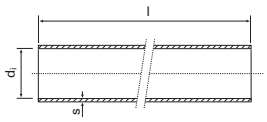
The ducting is swept clean at least every 10 years.
The ducting should also be checked and cleaned before commissioning, as necessary.

Ventilation ducts and components

Clean ventilation ducting

Duct material: polypropylene. Colour: black.

Round duct



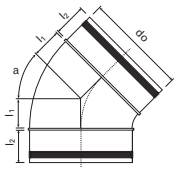
Delivered in three-metre poles.

di 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

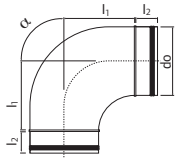
Material: polypropylene. Colour: black.

Bend 45°



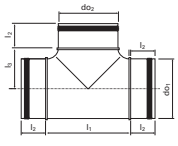
do x α	Uponor no.	LVI-nro	l1	l2
100 x 45°	1068057	8273029	46	40
125 x 45°	1068058	8273030	36	50
160 x 45°	1068059	8273031	45	50
200 x 45°	1068056	8273032	54	50

Bend 90°



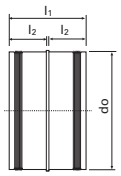
do x α	Uponor no.	LVI-nro	l1	l2
100 x 90°	1068053	8273033	81	40
125 x 90°	1068054	8273034	110	50
160 x 90°	1068055	8273035	160	50
200 x 90°	1068052	8273036	130	50

Branch



do_1/do_2	Uponor no.	HVAC no.	l1	l2	l3
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

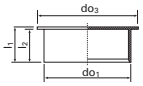
Connector



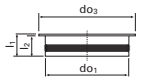
do	Uponor no.	HVAC no.	l1	l2
100	1068049	8273047	83	40
125	1068050	8273048	103	50
160	1068051	8273049	103	50
200	1068048	8273050	103	50

Plug

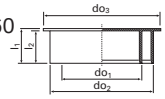
100



125

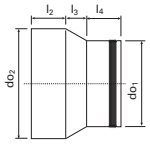


125/160



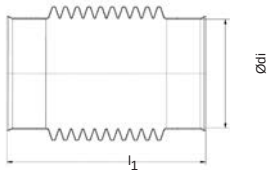
do_1/do_2	Uponor no.	HVAC no.	do3	l1	l2
100	1068067	8273051	120	43	40
125	1068068	8273052	145	33	30
125/160	1068069	8273053	180	53	50

Reducer



do_1/do_2	Uponor no.	HVAC no.	l2	l3	l4
100/125	1068070	8273044	50	20	40
125/160	1068071	8273045	51	30	50
160/200	1068072	8273046	51	40	50

Flexible bends



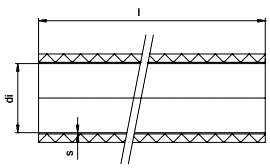
Centrally flexible duct component. Shorter duct components: stepless bending angle 0–45 °, longer: 0–90°. Connection with an extension connector or directly to the connector. Antistatic, color black

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

Insulated ducting

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

Round duct



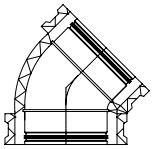
Delivered in three-metre poles.

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

Insulated duct components

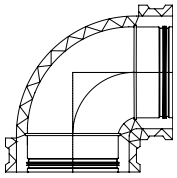
Material: polypropylene. Colour: black.
Insulation material: foamed polyethylene. Colour: grey
Insulation thickness: 15 mm
The required number of fasteners are delivered with the components.

Bend 45°



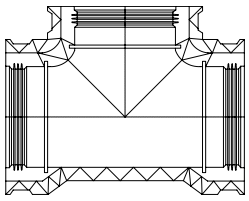
do x α	Uponor no.	HVAC no.
100 x 45°	1068082	8273071
125 x 45°	1068083	8273072
160 x 45°	1068084	8273073
200 x 45°	1068081	8273070

Bend 90°



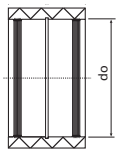
do x α	Uponor no.	HVAC no.
100 x 90°	1068078	8273067
125 x 90°	1068079	8273068
160 x 90°	1068080	8273069
200 x 90°	1068077	8273066

Branch



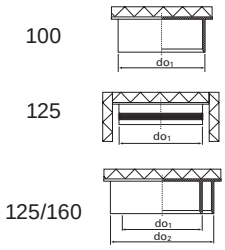
do_1/do_2	Uponor no.	HVAC no.
100/100	1068085	8273074
125/100	1068089	8273078
125/125	1068086	8273075
160/100	1068090	8273079
160/125	1068087	8273076
160/160	1068088	8273077
200/160	1068091	8273080

Connector



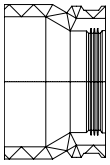
do	Uponor no.	HVAC no.
100	1068074	8273063
125	1068075	8273064
160	1068076	8273065
200	1068073	8273062

Plug



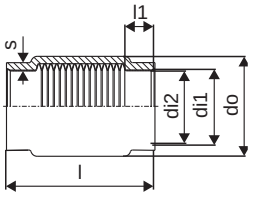
do_1/do_2	Uponor no.	HVAC no.
100	1068092	8273081
125	1068093	8273082
125/160	1068094	8273083

Reducer



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

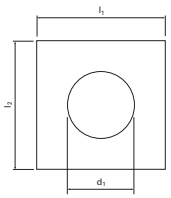
Insulated flexible duct components



Insulated duct component, centrally flexible. Shorter duct components: stepless bending angle 0–45°, longer 0–90°. Connection with an insulated connector or directly with an insulated spigot. Insulator 13 mm Insul Roll cell rubber. Antistatic, colour black.

Size	Uponor no.	HVAC no.
125 0-45	1078287	8273090
125 0-90	1078288	8273091
160 0-45	1078289	8273092
160 0-90	1078290	8273093

Vapour barrier grommet EPDM



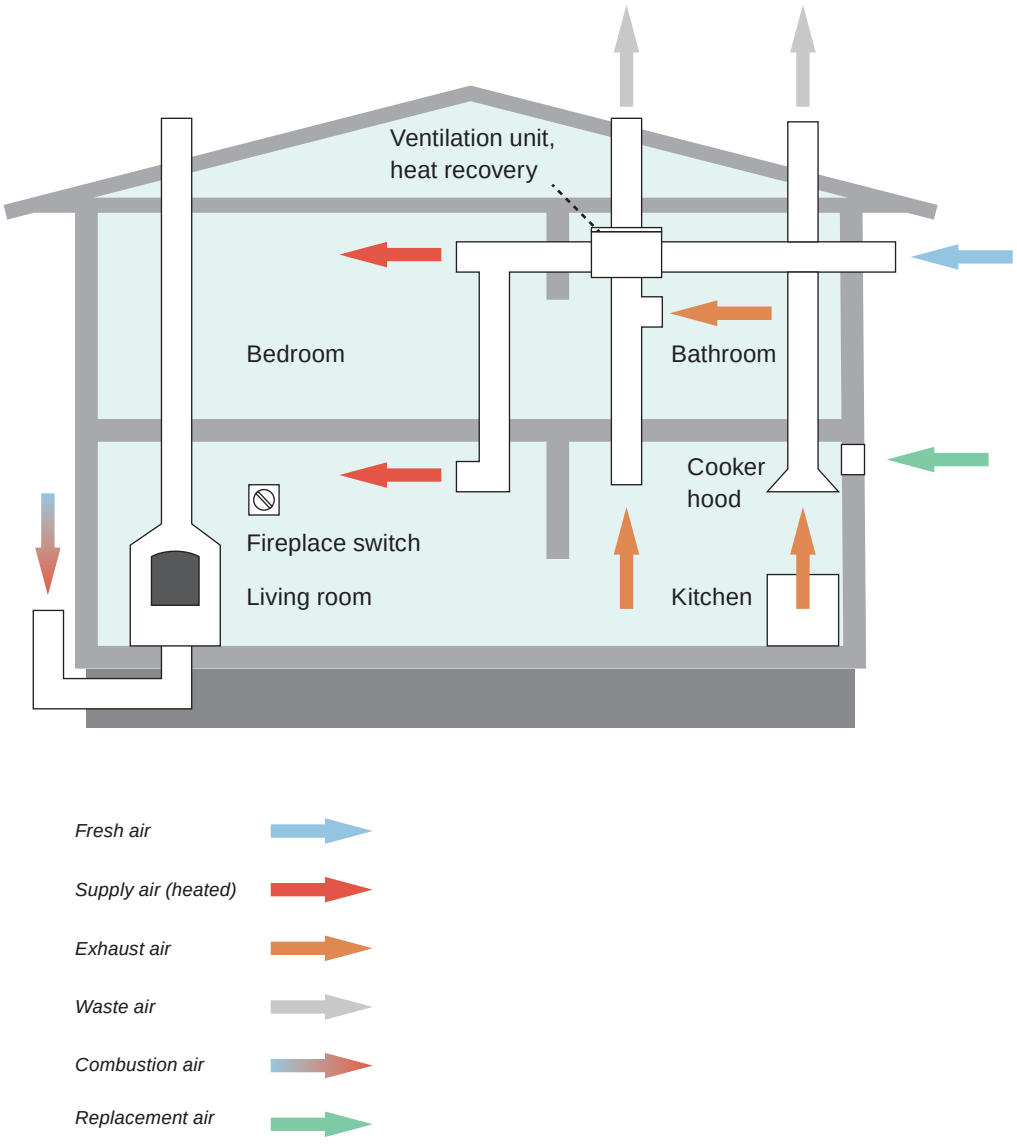
The vapour barrier grommet is attached in vapour-molded plastic with a suitable adhesive tape for this purpose. EPDM rubber, black.

Size d_1	Uponor no.	HVAC no.	l_1	l_2
100	1087860	8273094	200	200
125	1087861	8273095	240	240
160	1087862	8273096	260	260
200	1087863	8273097	280	280

Definitions

- **A fresh air duct** supplies fresh air to the ventilation unit.
- **Supply air ducts** distribute the fresh air from the unit to the rooms.
- **Exhaust air ducts** conduct indoor air to the ventilation unit, which uses the thermal capacity to warm incoming fresh air, as necessary.
- **A waste air duct** removes exhaust air by conveying it from the ventilation unit to the exhaust pipe on the roofs.
- **Mineral wool** refers to both glass wool and rock wool. Mineral wool does not burn or rot.

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



Ventilation design for detached houses

Uponor ventilation duct applications

Uponor ventilation ducting is used in accordance with the Ministry of the Environment's regulation on fire safety in buildings as apartment-specific ventilation for small, terraced and semi-detached houses in small and semi-detached houses of category P3, excluding local exhaust ventilation ducting in kitchens.

Kitchen hood/ fan exhaust duct

The exhaust ducts of kitchen hoods or fans are made of non-combustible steel sheet with a minimum thickness of 0.5 mm. The fi re-insulation of the duct in the attic and attic cavities must be prepared with insulation that has class-EI30 fire-resistance. The local exhaust duct is not connected to the ventilation system of the rest of the house; instead, it is vented to the roof separately and equipped with a separate exhaust fan.

Location of ducting

Supply and exhaust air ducts are normally installed

- embedded in roof insulation above the ceiling,
- in the attic,
- inside the intermediate fl oor/ceiling,
- above a suspended ceiling, or
- below the ceiling, inside a housing.

The supply air valves are mainly installed in living rooms and bedrooms, for the constant supply of fresh air into the rooms. 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, walk-in closets, kitchens, tambours, and toilets.

Used 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 fi tted 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.

With the Uponor Ventilation System you can use all the most common ventilation inlet and exhaust air valves and silencers on the market, according to the manufacturer's instructions.

Official regulations

Duct design and installation must follow regulations and instructions of the Ministry of the Environment on the indoor climate and ventilation of buildings, fire safety and the sound environment. Ventilation ducting must be protected by means of a suspended ceiling or housing structures from the side of inhabited spaces, in accordance with regulations and instructions of the Ministry of the Environment, with materials of at least class D-s2, d2.

Cleaning hatches

A sufficient number of cleaning hatches are placed in the duct in accordance with the Decree of the Ministry of the Environment on indoor climate and ventilation in buildings. The Uponor air duct cleaning hatches can be used with an appropriate size branch and plug.

Duct insulation

The thermal, condensation water and fire insulation of ducting are specified in the ventilation plan. Insulation must be marked in the drawing with reference to codes, such as

- LE1: thermal insulation, mineral wool, 50 mm
- LE2: thermal insulation, mineral wool 50 + 50 mm.
- LE3: thermal insulation, mineral wool, 50 + loose mineral wool or similar of at least 100 mm on top of the insulated duct
- LE4: In warm spaces, condensationand thermal insulation, expanded PE plastic, 15 mm. When installed inside the thermal insulation of the ceiling , at least 100 mm of mineralwool-based loose wool or similar mineral wool on top of the duct insulated with 15 mm PE plastic.
- LE5: condensation and thermal insulation, expanded PE plastic, 15 mm + mineral wool, 50 mm
- PE: fire-insulation, mineral wool EI30.

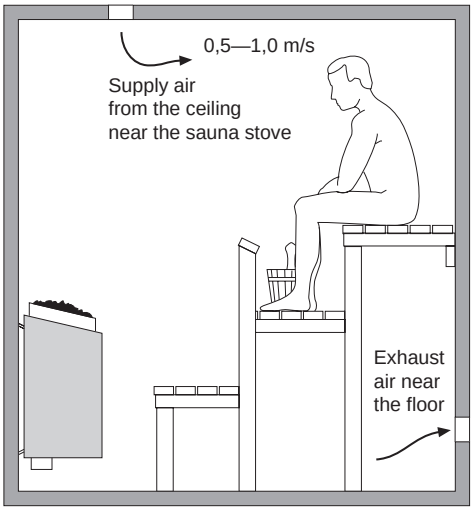
To facilitate on-site insulation work, use of insulated ducts and components with 15 mm expanded PE plastic insulation is recommended.

Sauna room ventilation

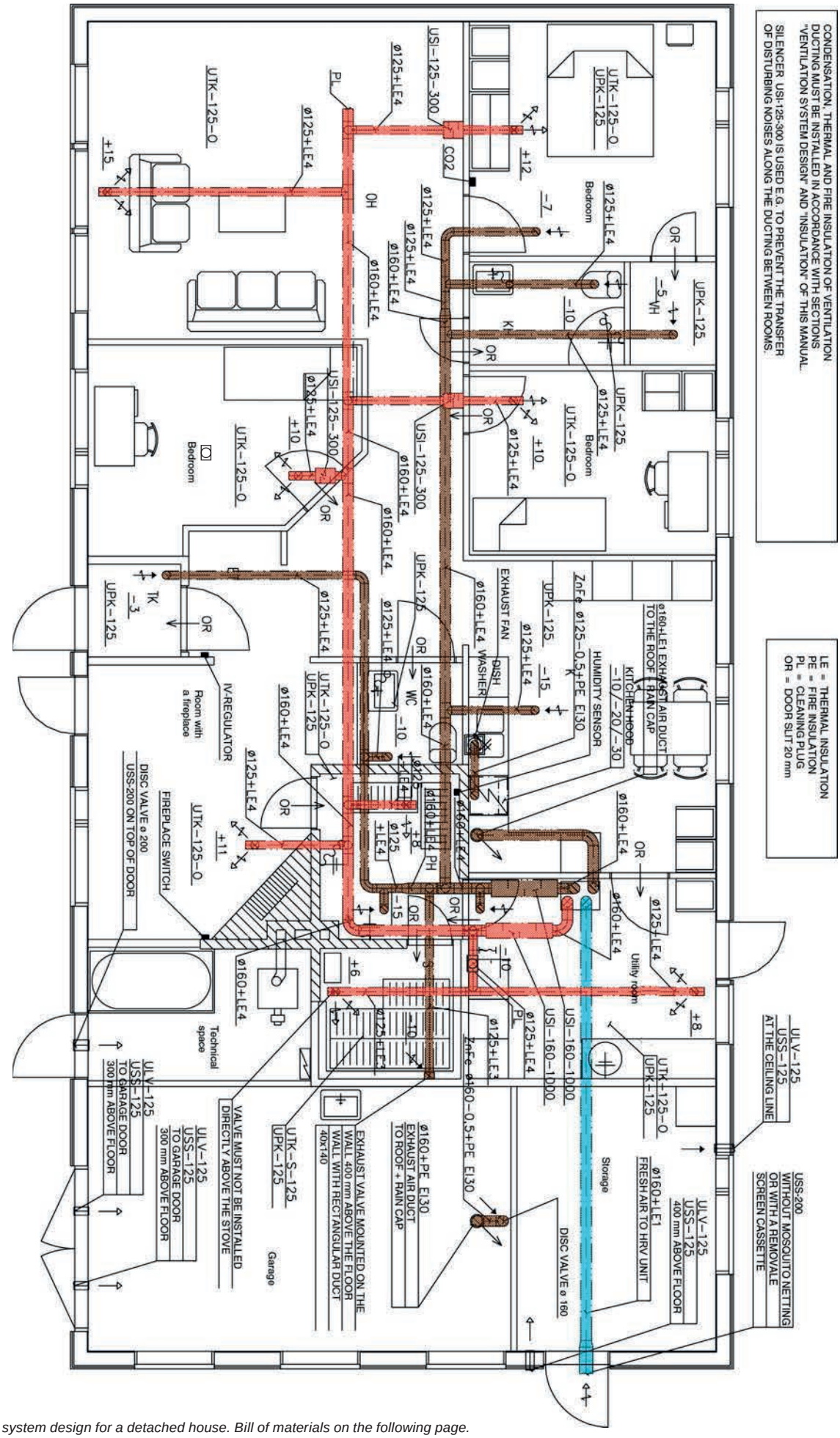
Temperature limitations must be observed in the design of sauna room ventilation. The ducting is either embedded in the sauna room insulation or installed above the insulation layer. In other circumstances, such as when immediately behind panelling, the ducting must be thermally insulated with 50 mm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

Please note: Use only dedicated heat-resistant sauna valves near the ceiling in sauna rooms. The supply air valve is marked with a red label and the exhaust air valve has a wooden knob.

Sauna valves must always be installed in combination with the mounting frame. The mounting frame must be attached to the wooden ceiling material with screws, after which the valve can be installed in place. The valve must not be installe directly on top of the sauna stove.



Ventilation of the sauna



Red: Intake air duct
Brown: Exhaust air duct
Blue: Fresh-air duct
Grey: Waste air duct

Example of a ventilation system design for a detached house. Bill of materials on the following page.

Bill of materials for the example ventilation system for a detached house on the previous page

Uponor no.	Size/code	Name	Manufacturer	pcs	m
1068043	ø160	Round duct, insulated	Uponor Suomi Oy	13	36
1068042	ø125	Round duct, insulated	Uponor Suomi Oy	18	48
1068080	ø160	Bend 90°, insulated	Uponor Suomi Oy	3	
1068079	ø125	Bend 90°, insulated	Uponor Suomi Oy	12	
1068087	ø160/125	Branch, insulated	Uponor Suomi Oy	11	
1068086	ø125/125	Branch, insulated	Uponor Suomi Oy	13	
1068088	ø160/160	Branch, insulated	Uponor Suomi Oy	1	
1068076	ø160	Connector, insulated	Uponor Suomi Oy	8	
1068075	ø125	Connector, insulated	Uponor Suomi Oy	9	
1068094	ø125/160	Plug, insulated	Uponor Suomi Oy	1	
1068093	ø125	Plug, insulated	Uponor Suomi Oy	9	
1068096	ø125/160	Reducer, insulated	Uponor Suomi Oy	2	
1068097	ø160/200	Reducer, insulated	Uponor Suomi Oy	1	
1087861	ø125	Vapour barrier grommet	Uponor Suomi Oy	21	

In addition, a list of products not included in the Uponor Finland product range

Size/code	Name	pcs	m^2
ø125	Supply air valve with air controller	7	
ø125	Supply air valve for sauna	1	
ø125	Exhaust valve	9	
ø125	Disc valve	4	
ø200	Outdoor grille with removable framed screen	2	
ø125	Outdoor grille with mosquito net	4	
ø125–300	Silencer	3	
ø160–1000	Silencer	2	
	Mineral wool thermal insulation, 50 mm, LE1 and LE3	7	
	Mineral wool fi re-insulation, 50 mm PE EI30		3
	Kitchen hood with through-hole to the roof and exhaust fan	1	
	TSupply/exhaust ventilation unit with humidity sensor	1	
ø125	Round ZnFe ventilation duct		5m
ø160	Round ZnFe ventilation duct		3m
ø125	Bend ZnFe 90°	2	
ø160	Bend ZnFe 90°	2	
40x140	Rectangular sauna ducting package	1	
ø160	Waste air duct to roof and rain cap	2	
ø160	Disc valve	1	
ø200	Disc valve	1	

Design of apartment-specific supply and exhaust air ventilation

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

Uponor ventilation duct applications

Uponor ventilation ducts are used as apartment-specific ventilation ducts in accordance with the regulations of the Ministry of the Environment.

The design must take into considera- tion 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 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 out-door air.

Because the exhaust air valves are designed for dehumidification and odour removal in addition to air circula- tion, 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

Duct design and installation must follow regulations and instructions of the Ministry of the Environment on the indoor climate and ventilation of buildings, fire safety and the sound environment.

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 the Decree of the Ministry of the Environment on the fire safety of buildings, 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 insulation work, using pre-insulated ducts and components with 15mm expanded PE plastic insulation is recommended.

Sauna room ventilation

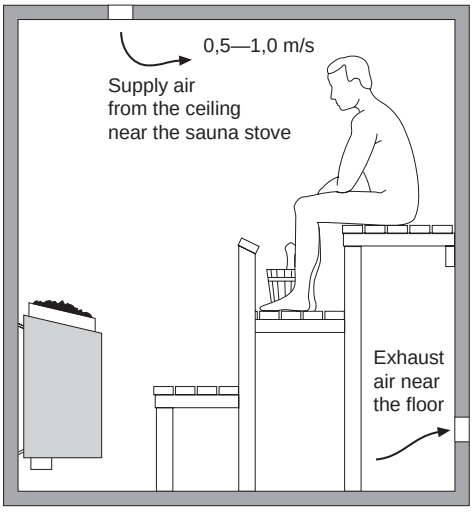
When one is designing sauna ducting, temperature limitations have to be observed. The ducting is either em- bedded in the sauna room insulation or installed above the insulation layer.

In other circumstances, such as when immediately behind panelling, the duct- ing must be thermally insulated with

50mm 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 stove.



Ventilation of the sauna

Energy consumption of the different exhaust ventilation solutions for kitchen hoods

The system descriptions of the ventilation solutions in this manual present three alterna- tive 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 augmenta- tion 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 con- sumption of the various alterna- tives, 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 ventila- tion 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 imple- mented 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 heat- ing 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 ven- tilation is implemented as its own system, and the kitchen hood's ex- haust ventilation as its own system. The kitchen hood exhaust ventila- tion 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 con- ducted 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 with- out 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, bypass- ing 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 of apartment-specific ventilation solutions in apartment buildings

This section presents installation examples for apartmentspecific 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.

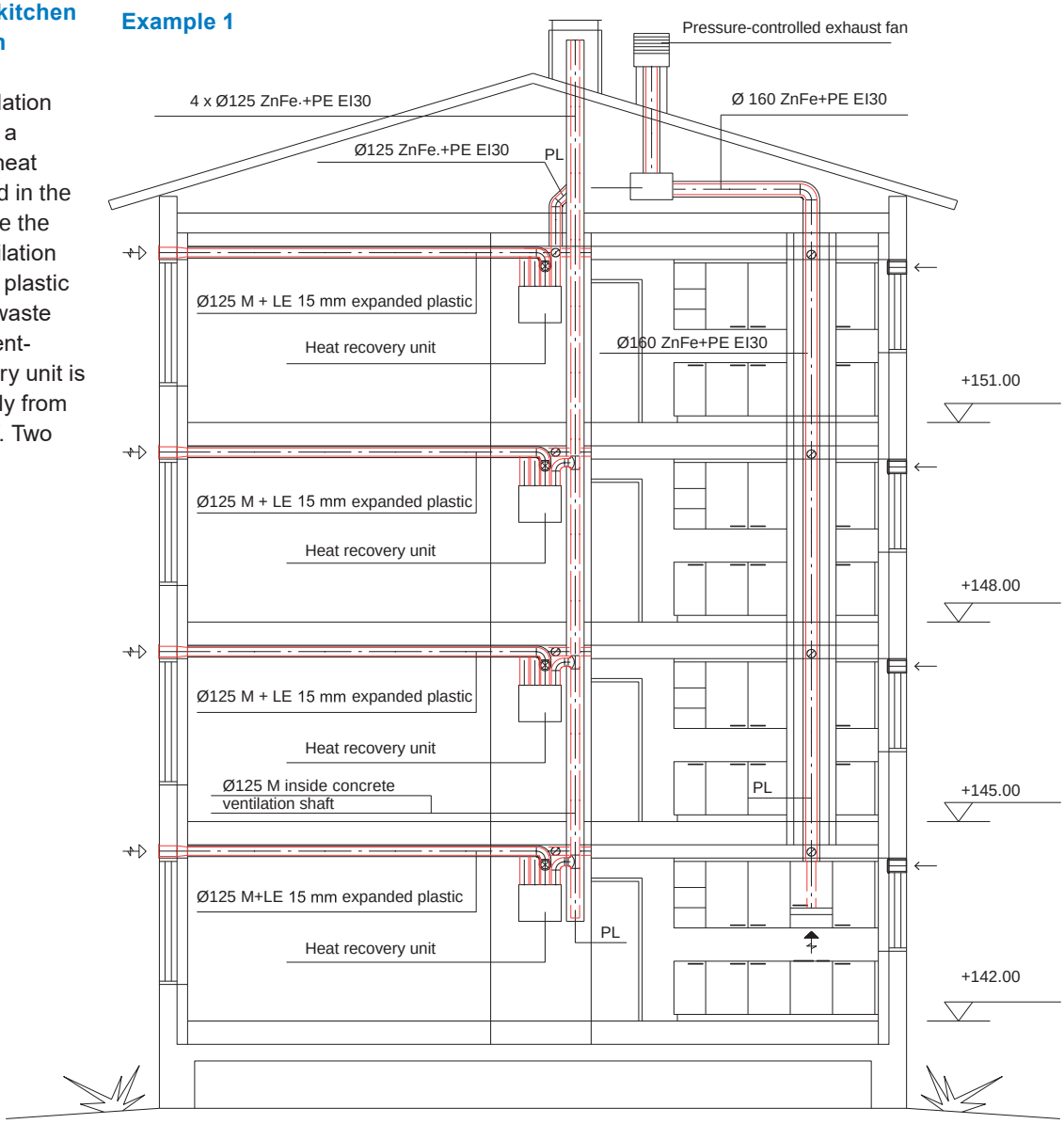
In the first version, the waste air duct is plastic Uponor ducting, installed inside a concrete shaft. The section in the attic area is a fire-insulated steel sheet spiral duct.

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.

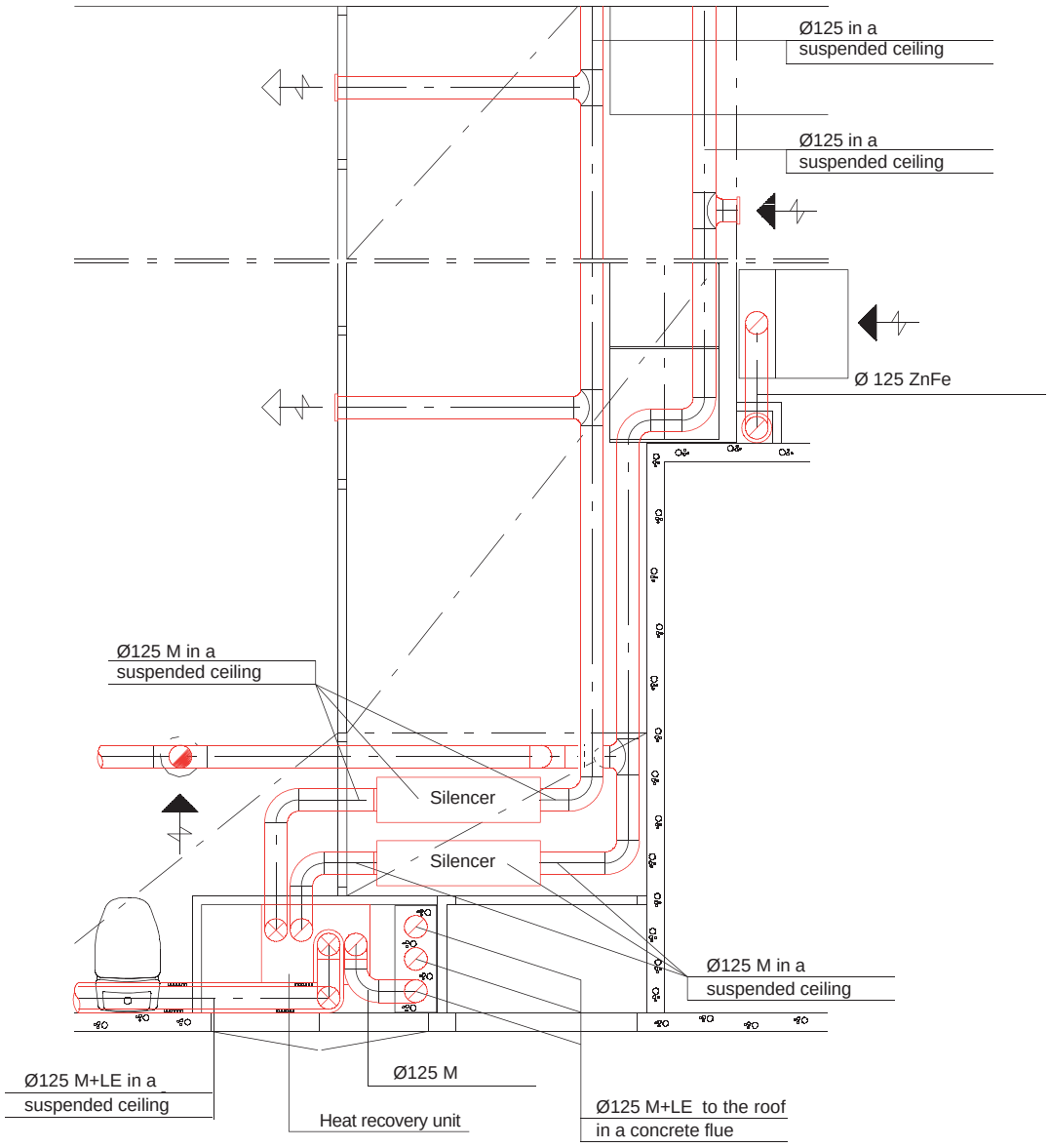
The apartment-specific ventilation is presented with two different heat recovery units.

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



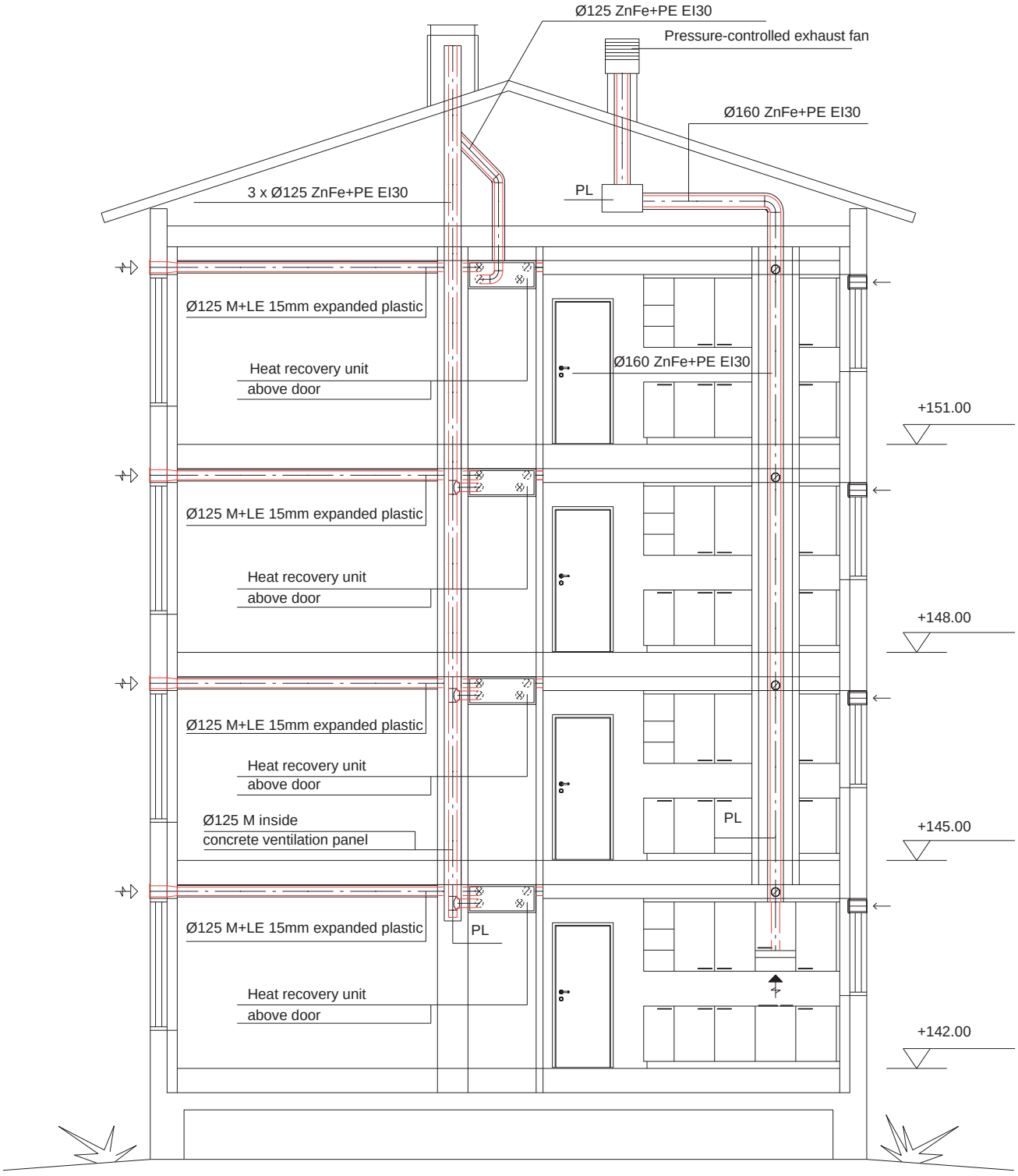
Example 1 A



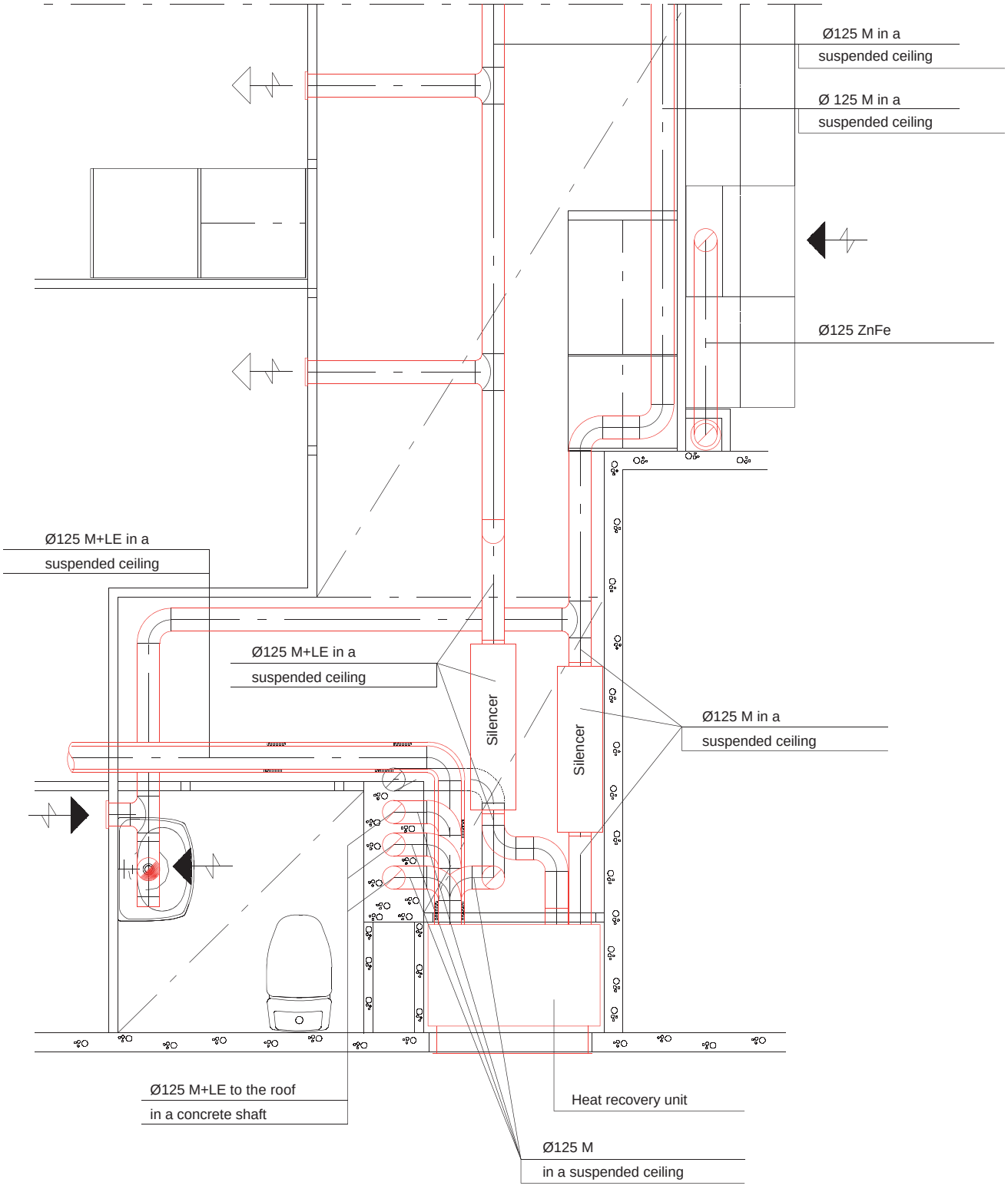
NB!

The exhaust ventilation of kitchen hoods is implemented with the shared duct principle with a dedicated pressurecontrolled 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 15mm expanded plastic
Heat recovery unit
above door
Ø160 ZnFe+PE EI30
+151.00
Ø125 M+LE 15mm expanded plastic
Heat recovery unit
above door
+148.00
Ø125 M+LE 15mm expanded plastic
Heat recovery unit
above door
Ø125 M inside
concrete ventilation panel
PL
+145.00
Ø125 M+LE 15mm expanded plastic
PL
Heat recovery unit
above door
+142.00

Example 2 A



NB!

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

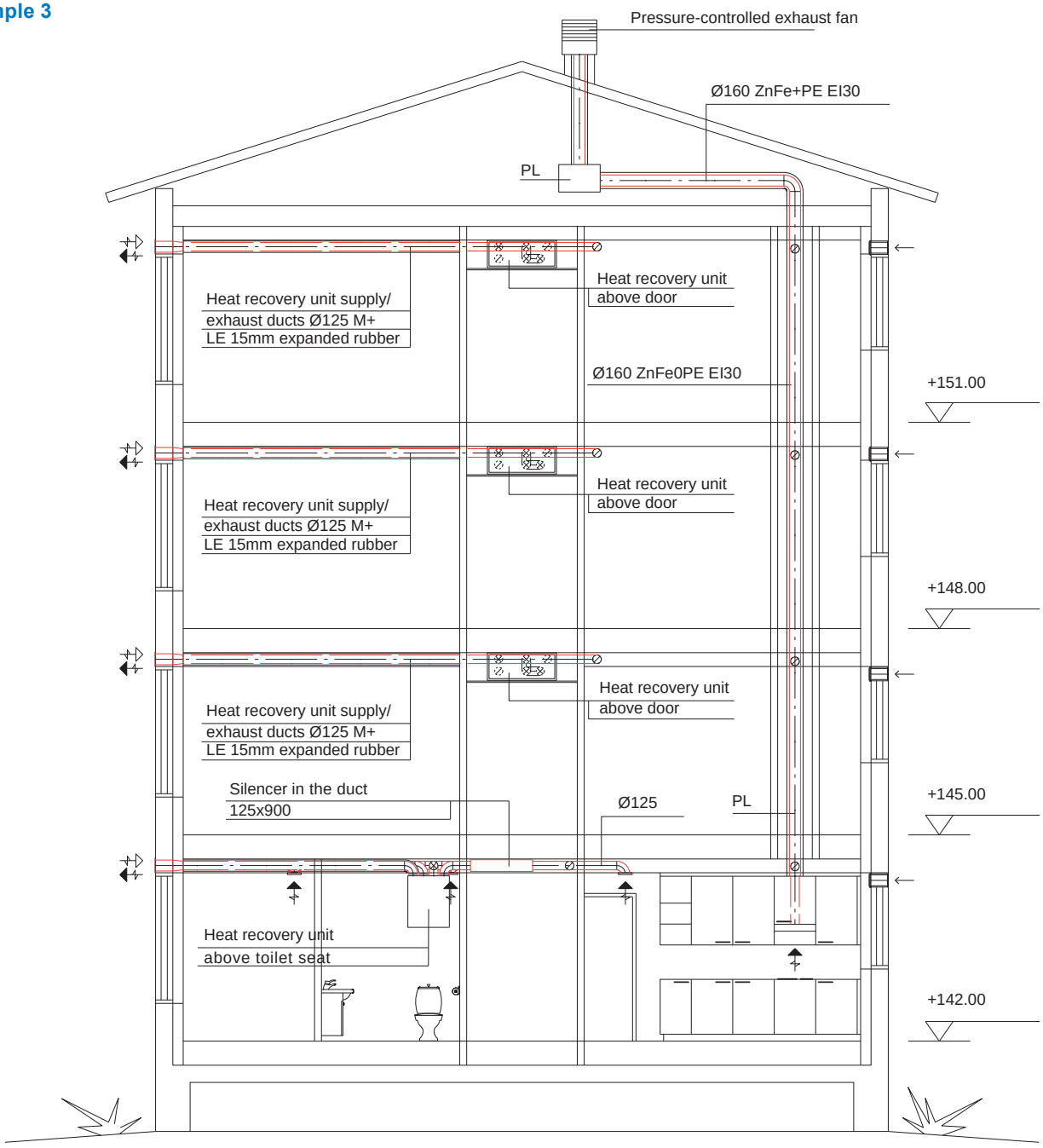
B. Apartment-specific heat recovery unit, waste air from the exterior wall and kitchen exhaust ventilation

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.

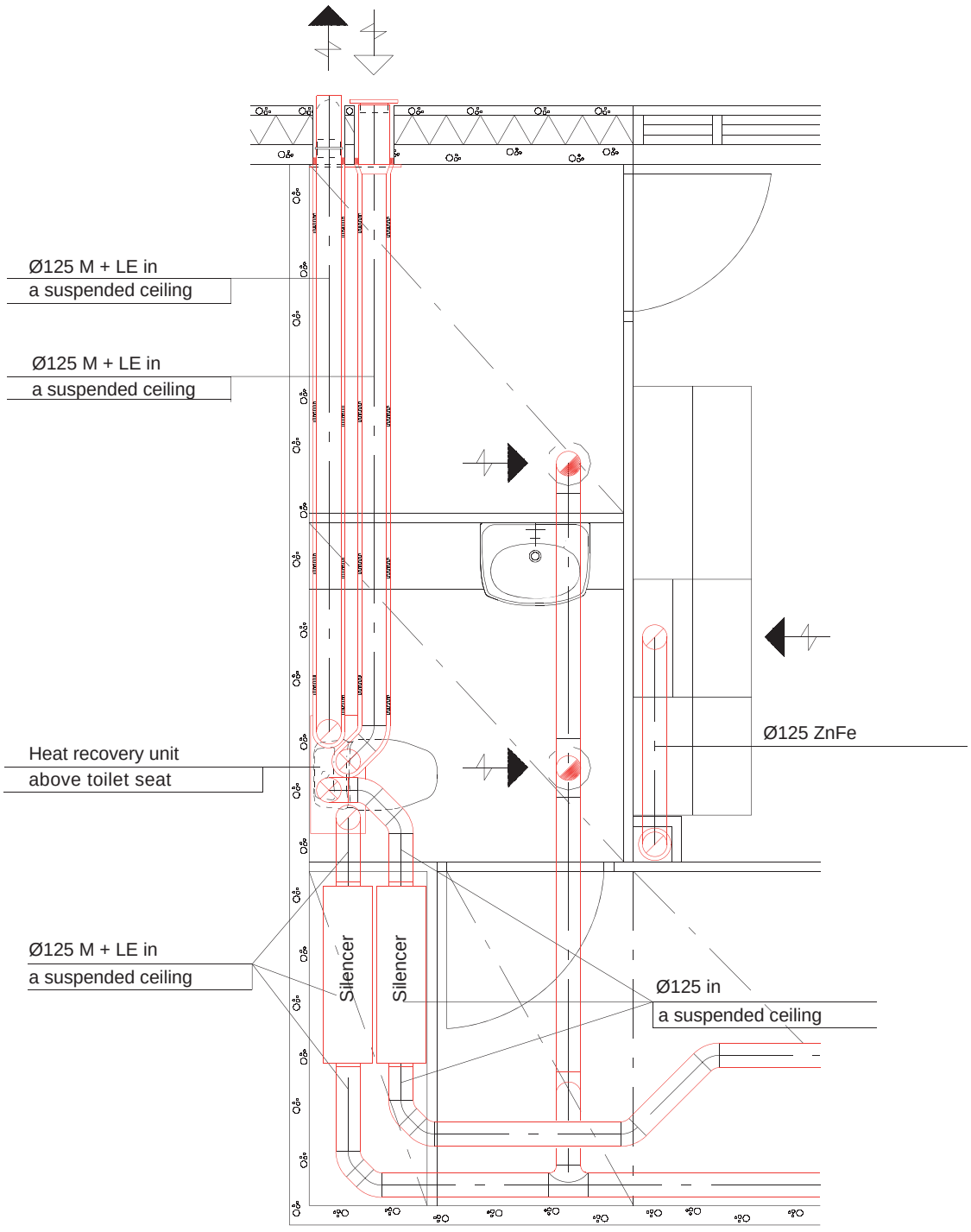
The apartment-specific ventilation is presented with two different heat recovery units. In both versions, the kitchen exhaust ventilation is presented as a dedicated shared duct exhaust from the hood to a pressure-controlled exhaust fan or a shared duct fan. The kitchen exhaust air duct is a steel sheet 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 3 A

Heat recovery unit above toilet seat



NB!

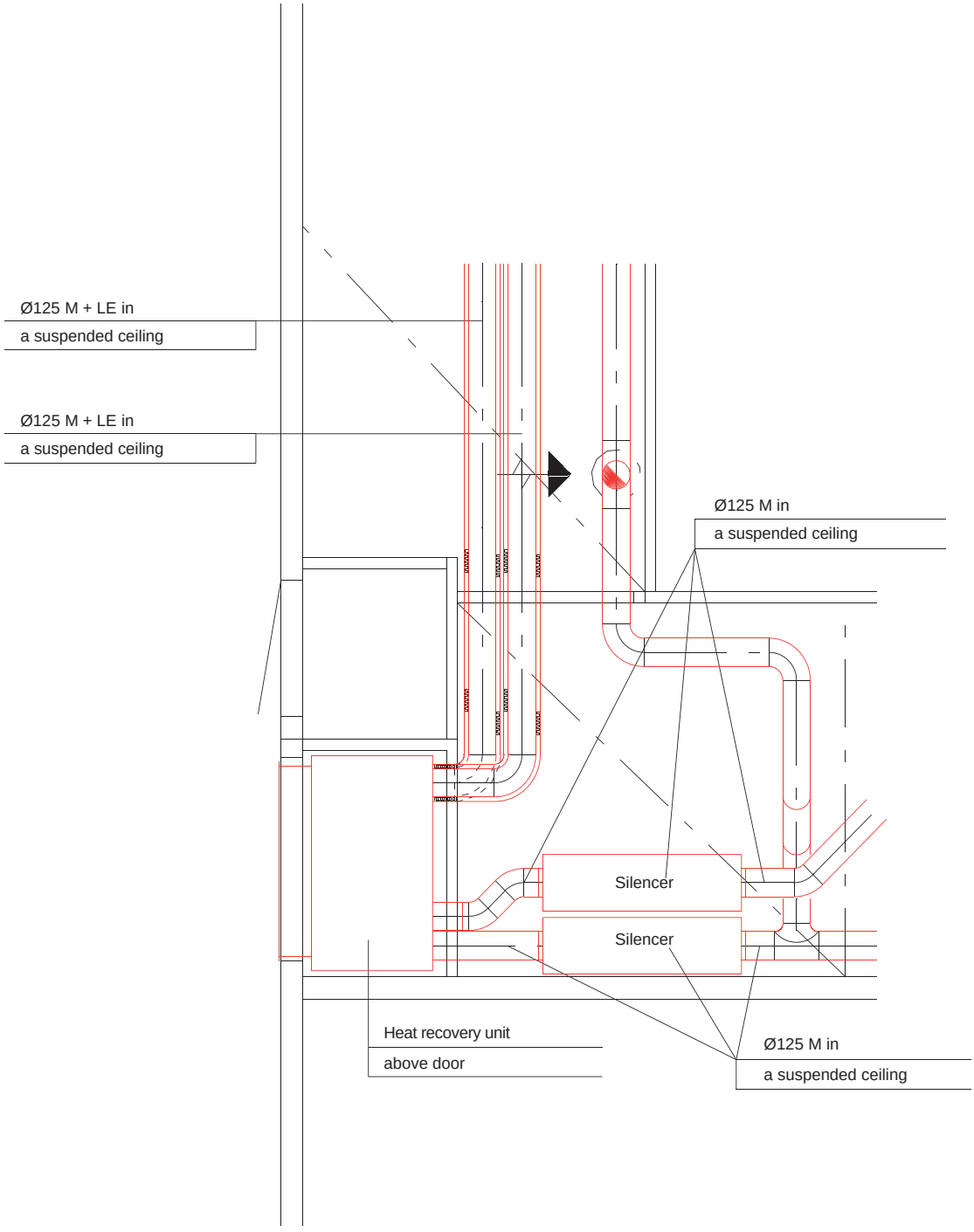
A suitable exterior wall valve for exhaust air, manufactured from steel sheet

NB!

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

Example 3 B

Heat recovery unit above flat door



NB!

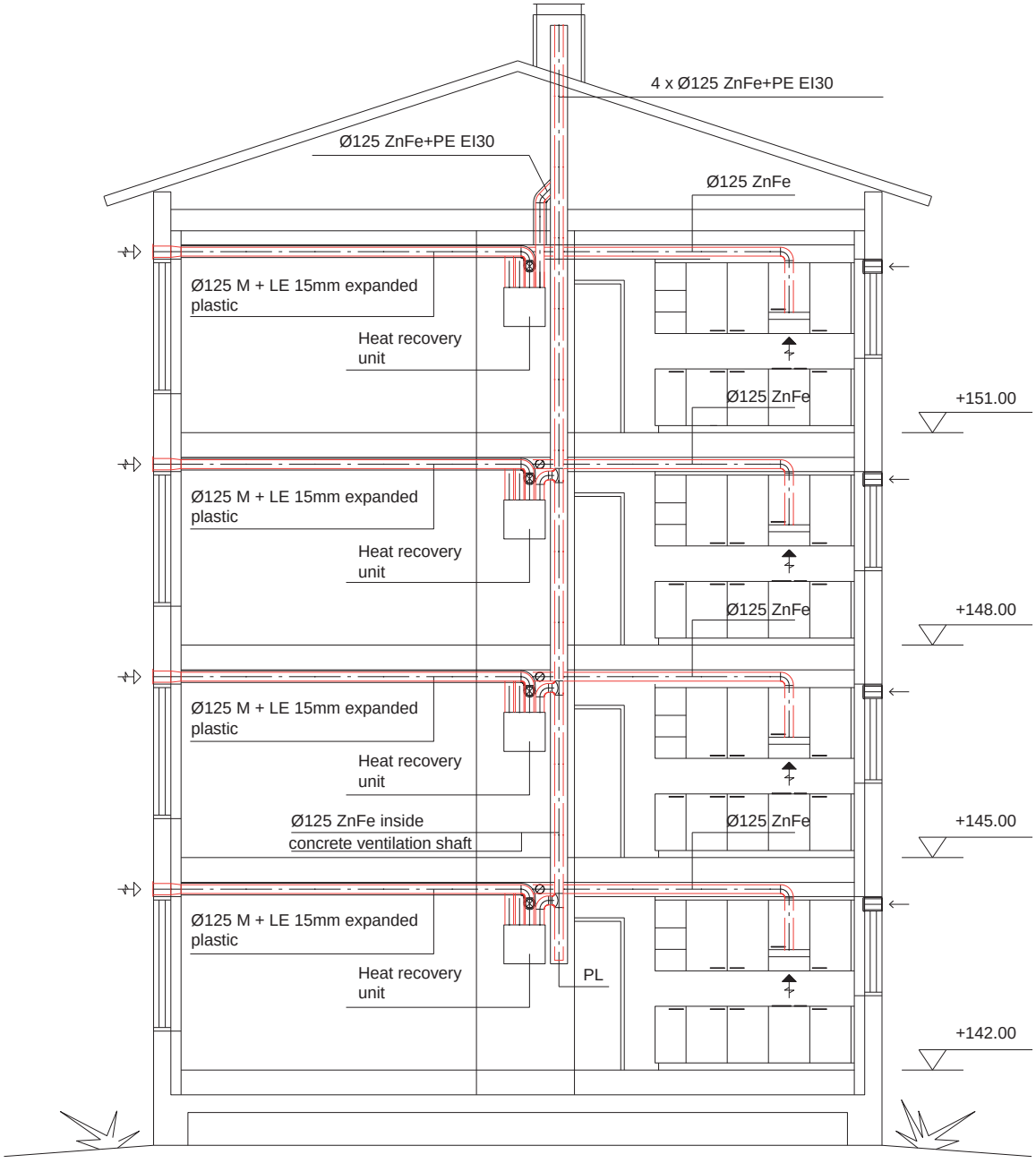
The exhaust ventilation of kitchen hoods is implemented with the shared duct principle with a dedicated pressure-controlled exhaust fan

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

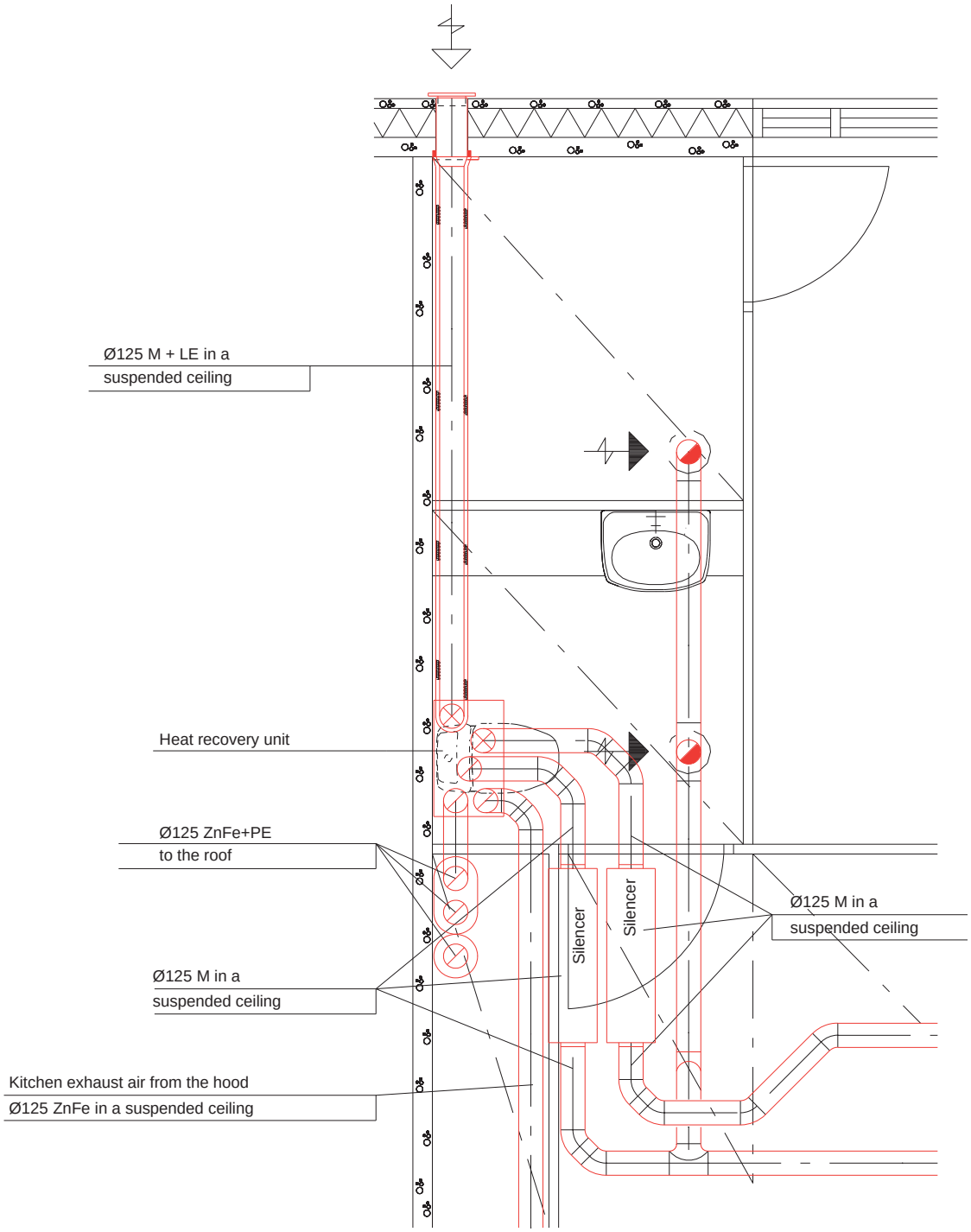
In this system, ventilation is implemented with a apartment-specific heat recovery unit. The ventilation ducts of the heat recovery unit are plastic Uponor ducts with the exception of the hood and waste air ducts, which are steel sheet spiral ducts. The hood exhaust air is conducted to the heat recovery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



Example 4 A

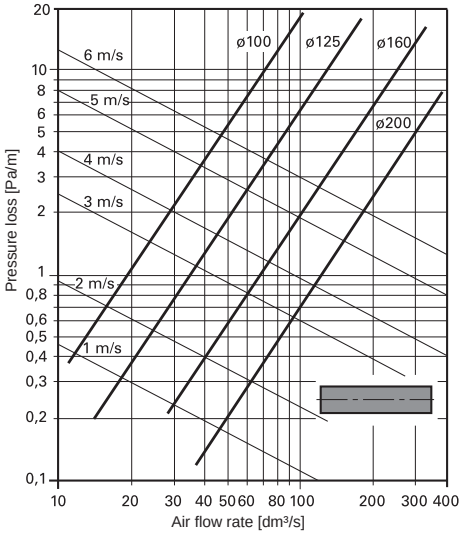

Ø125 M + LE in a
suspended ceiling
Heat recovery unit
Ø125 ZnFe+PE
to the roof
Ø125 M in a
suspended ceiling
Ø125 M in a
suspended ceiling
Kitchen exhaust air from the hood
Ø125 ZnFe in a suspended ceiling
Silencer
Silencer

Dimensioning of the ducting, and the pressure loss graphs

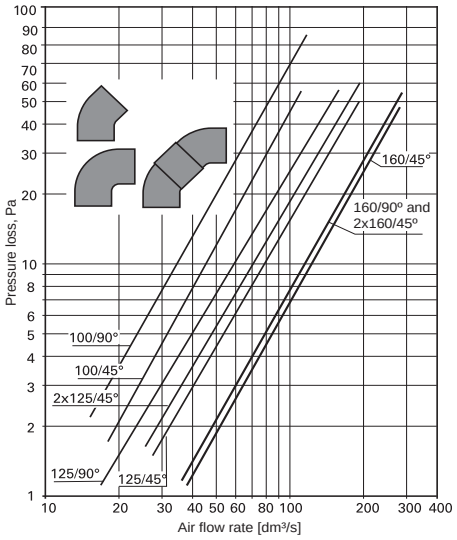
The main supply and exhaust air ducts must be dimensioned loose to the maximum extent possible, which minimises pressure loss in the ducting.

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

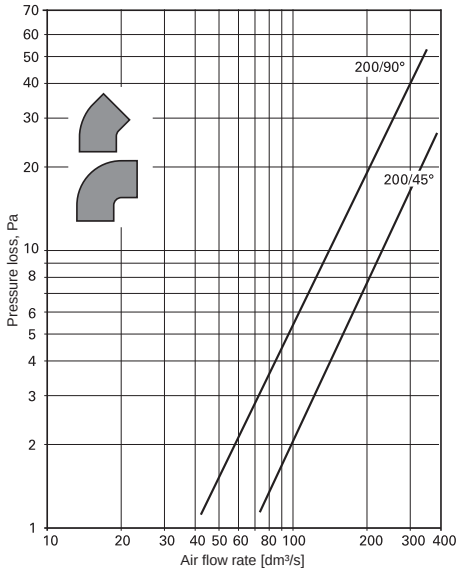
Ducts ø 100, ø 125, ø 160 and ø 200



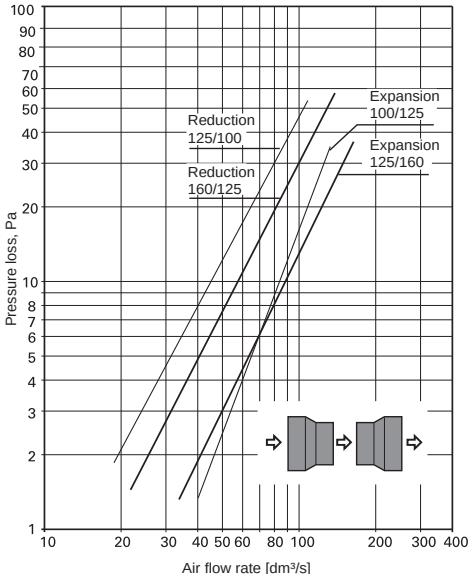
Bends 100/45°, 100/90°, 125/45°, 2x125/45°, 125/90°, 160/45°, 2x160/45° and 160/90°



Bends 200/45° and 200/90°

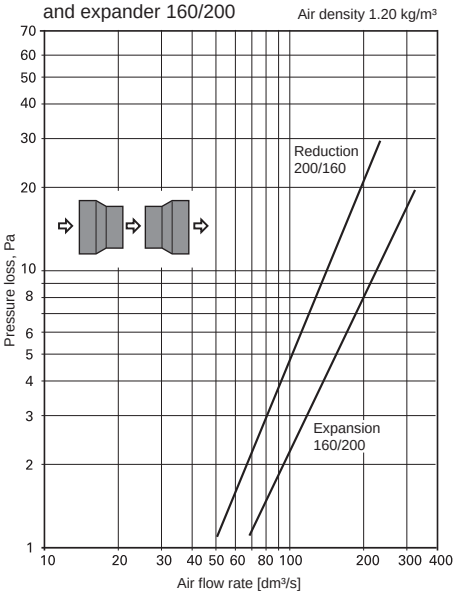


Reducer: Reducers 125/100, 160/125 and expanders 100/125 and 125/160

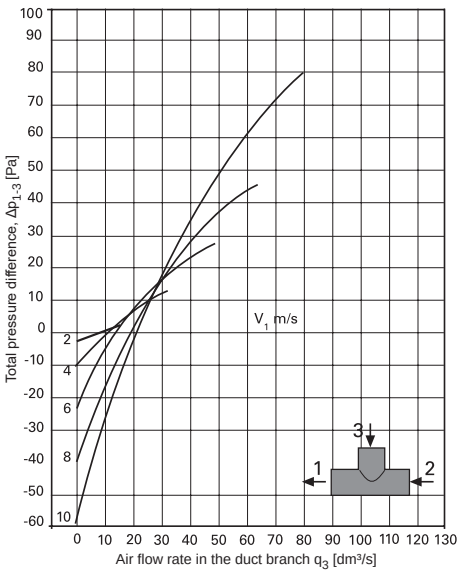


Reducer: Reducer 200/160, and expander 160/200

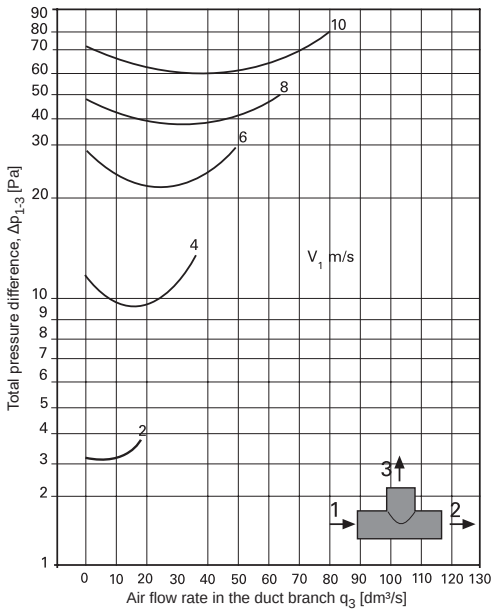
Air density 1.20 kg/m³



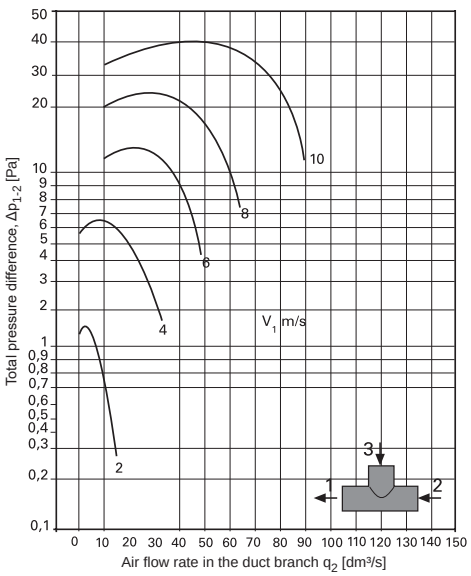
Branch 100/100
Side exhaust. Total pressure difference $\Delta p_{1\text{-}3}$



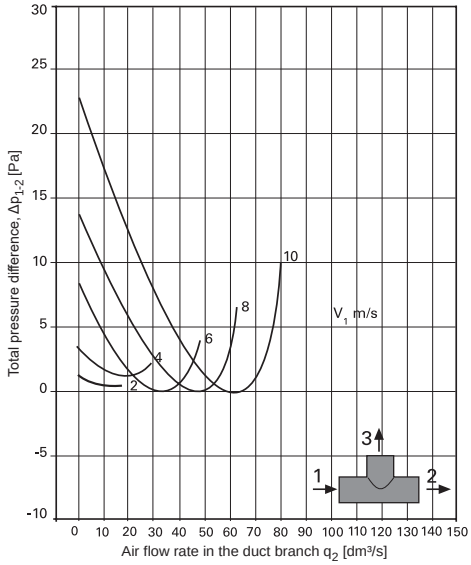
Branch 100/100
Side exhaust. Total pressure difference $\Delta p_{1\text{-}3}$



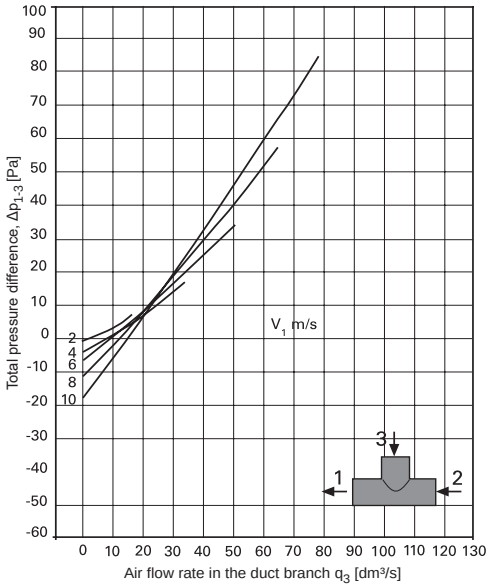
Branch 100/100
Side exhaust. Total pressure difference $\Delta p_{1\text{-}2}$



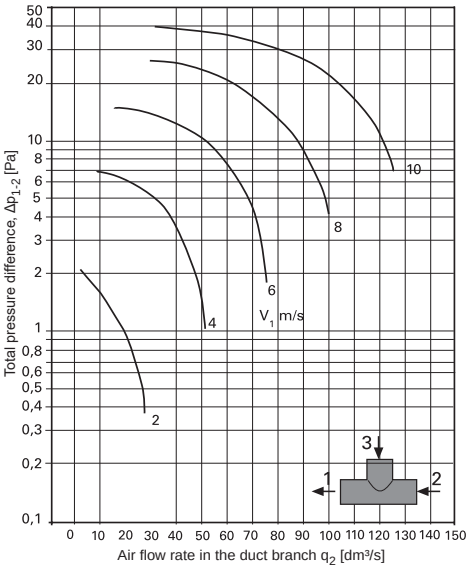
Branch 100/100
Side inlet. Total pressure difference Δp_{1-2}



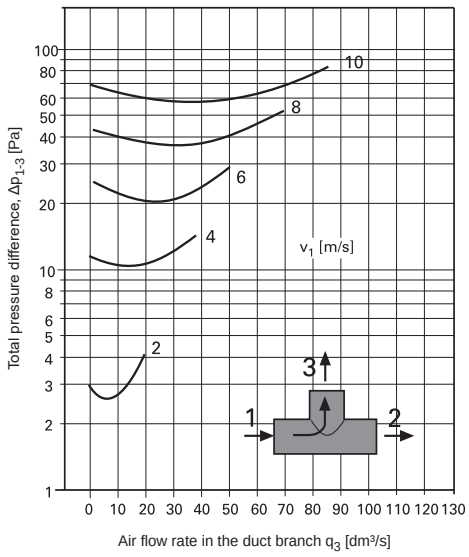
Branch 125/100
Side exhaust. Total pressure difference Δp_{1-3}



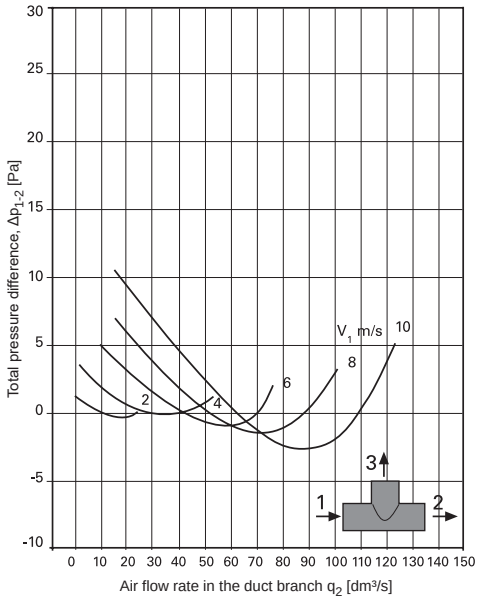
Branch 125/100
Side exhaust. Total pressure difference Δp_{1-2}



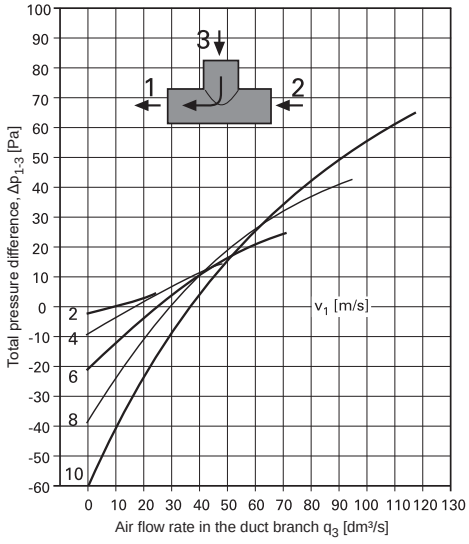
Branch 125/100
Side inlet. Total pressure difference Δp_{1-3}



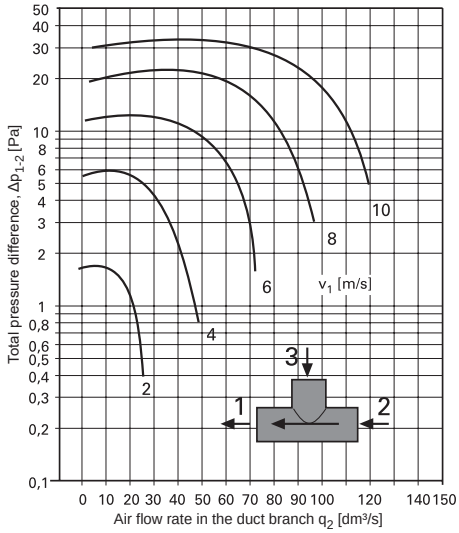
Branch 125/100
Side inlet. Total pressure difference Δp_{1-2}



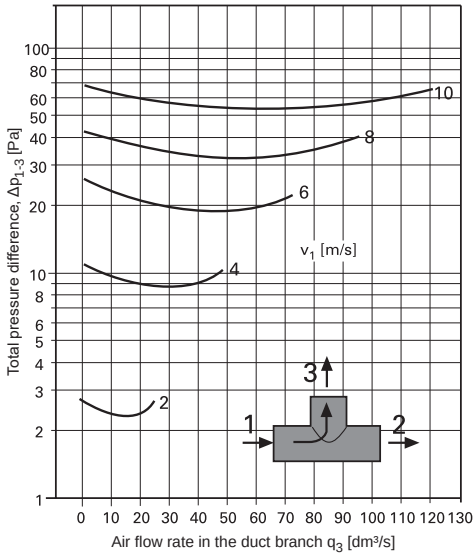
Branch 125/125
Side exhaust. Total pressure difference Δp_{1-3}



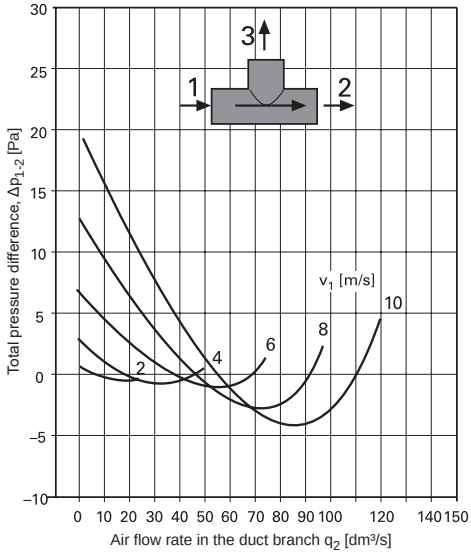
Branch 125/125
Side exhaust. Total pressure difference Δp_{1-2}



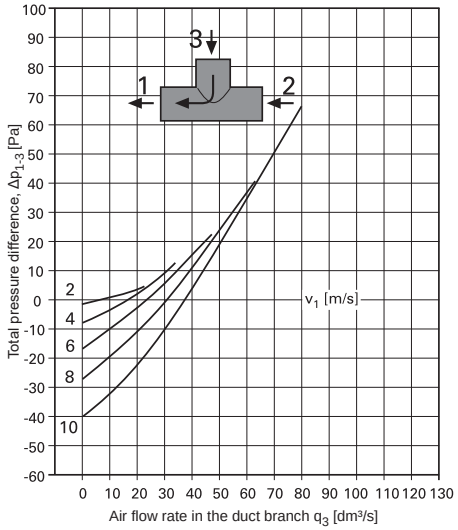
Branch 125/125
Side inlet. Total pressure difference Δp_{1-3}



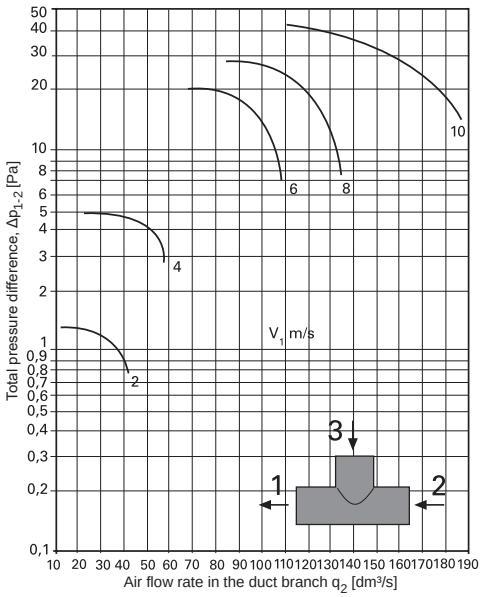
Branch 125/125
Side inlet. Total pressure difference Δp_{1-2}



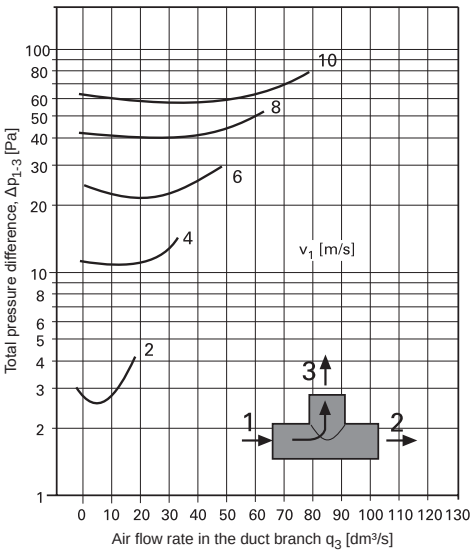
Branch 160/100
Side exhaust. Total pressure difference Δp_{1-3}



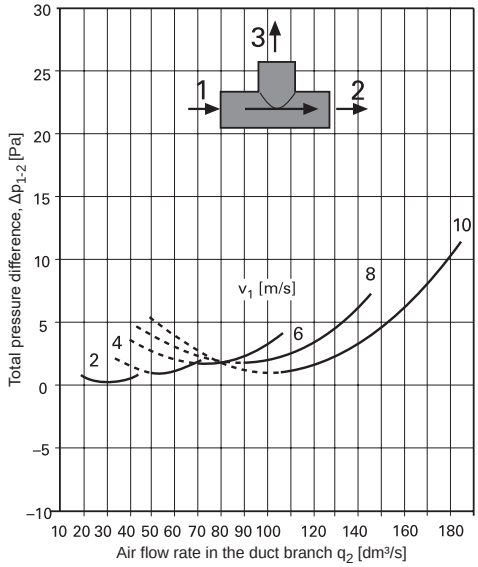
Branch 160/100
Side exhaust. Total pressure difference Δp_{1-2}



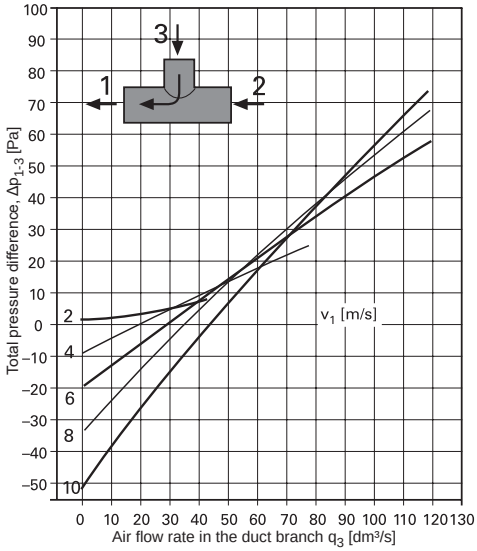
Branch 160/100
Side inlet. Total pressure difference Δp_{1-3}



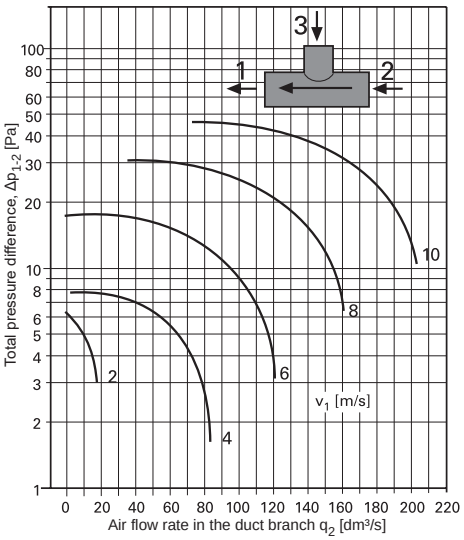
Branch 160/100
Side inlet. Total pressure difference Δp_{1-2}



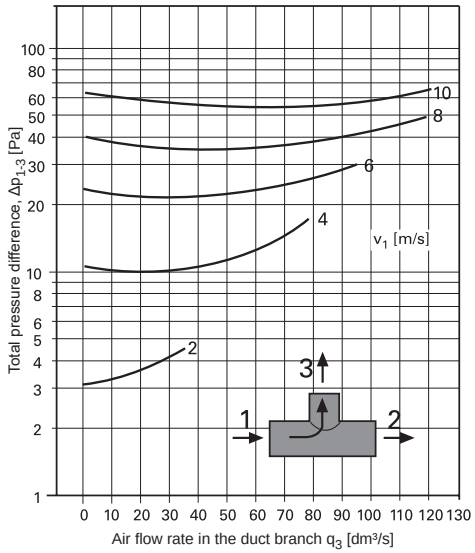
Branch 160/125
Side exhaust. Total pressure difference Δp_{1-3}



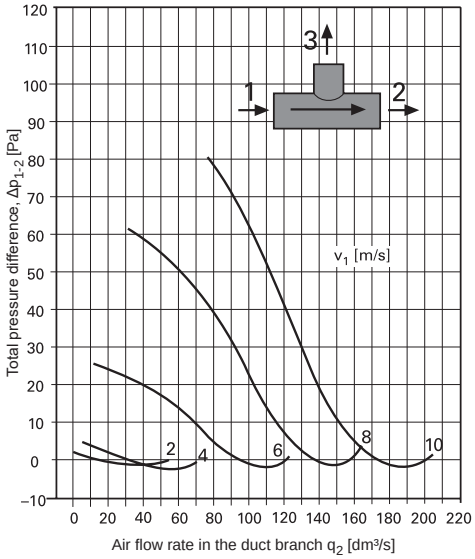
Branch 160/125
Side exhaust. Total pressure difference Δp_{1-2}



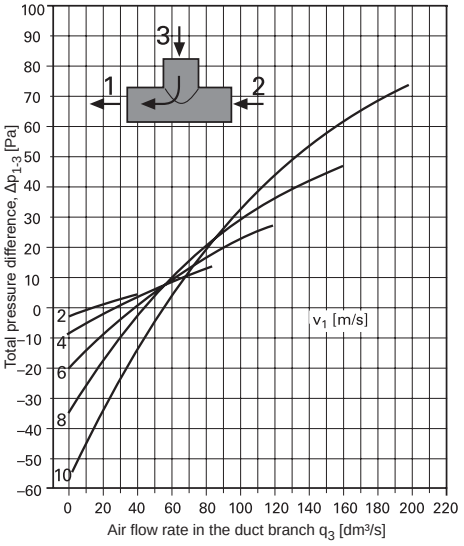
Branch 160/125
Side inlet. Total pressure difference Δp_{1-3}



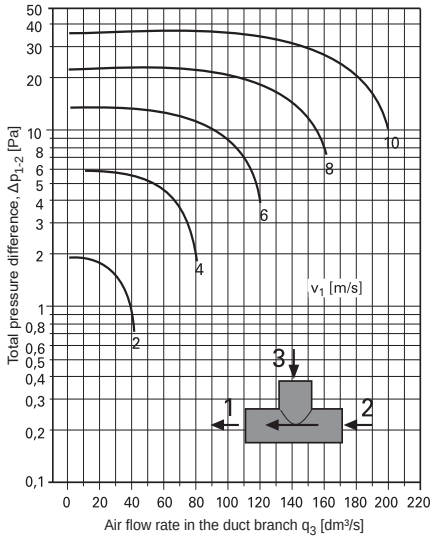
Branch 160/125
Side inlet. Total pressure difference Δp_{1-2}



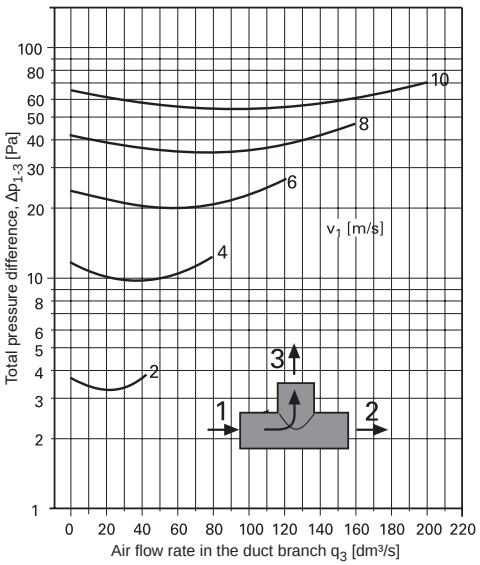
Branch 160/160
Side exhaust. Total pressure difference Δp_{1-3}



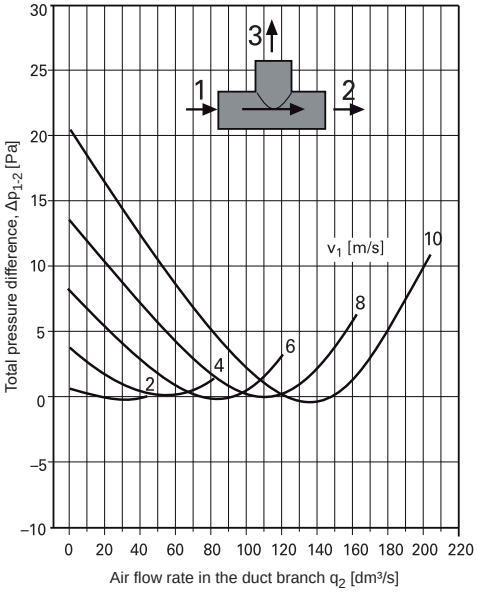
Branch 160/160
Side exhaust. Total pressure difference Δp_{1-2}



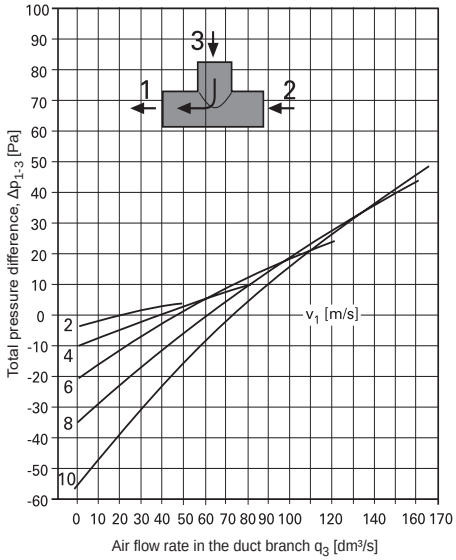
Branch 160/160
Side inlet. Total pressure difference Δp_{1-3}



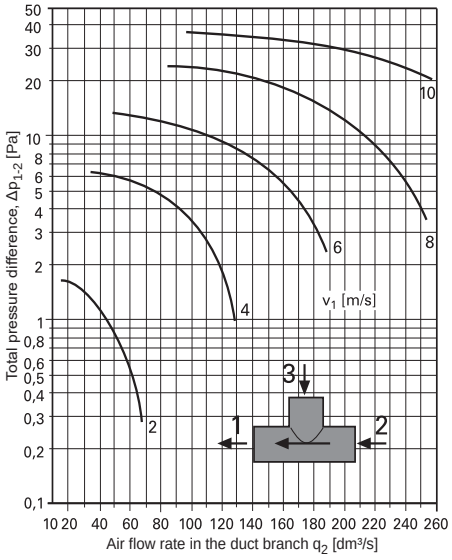
Branch 160/160
Side inlet. Total pressure difference Δp_{1-2}



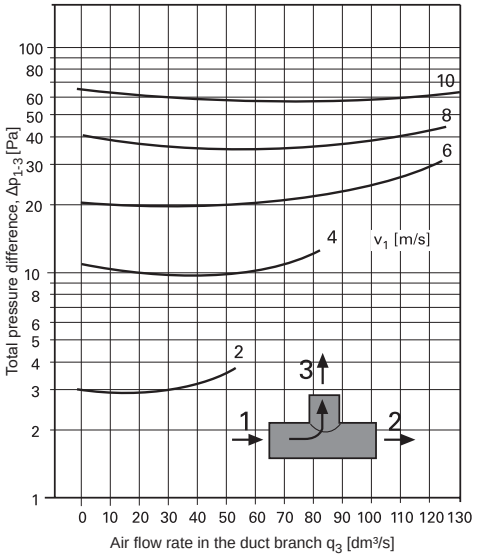
Branch 200/160
Side exhaust. Total pressure difference Δp_{1-3}



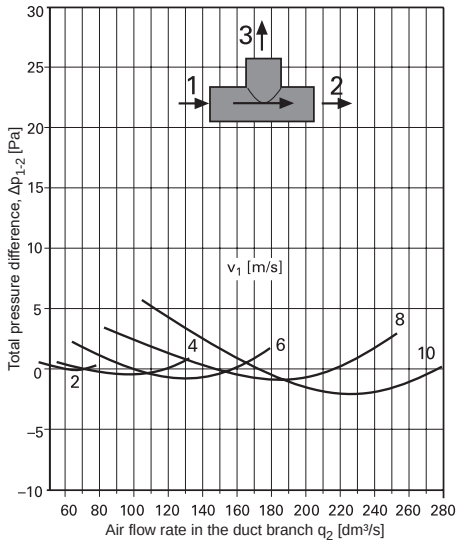
Branch 200/160
Side exhaust. Total pressure difference Δp_{1-2}

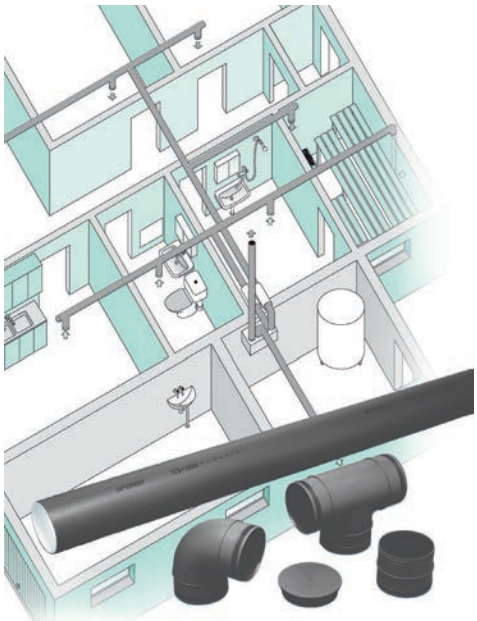


Branch 200/160
Side inlet. Total pressure difference Δp_{1-3}

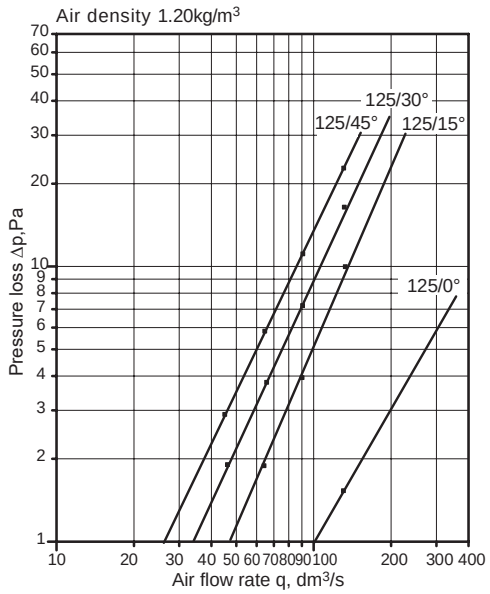


Branch 200/160
Side inlet. Total pressure difference Δp_{1-2}

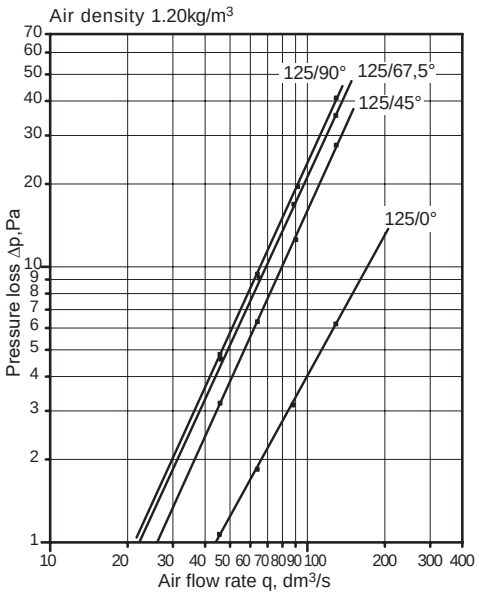




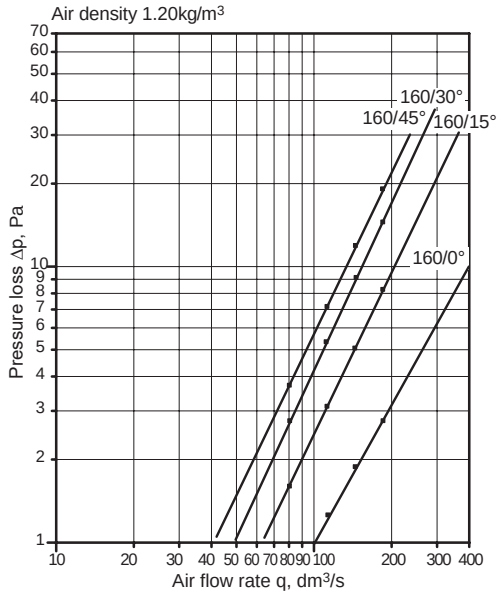
Flexible bend 125x0-45°



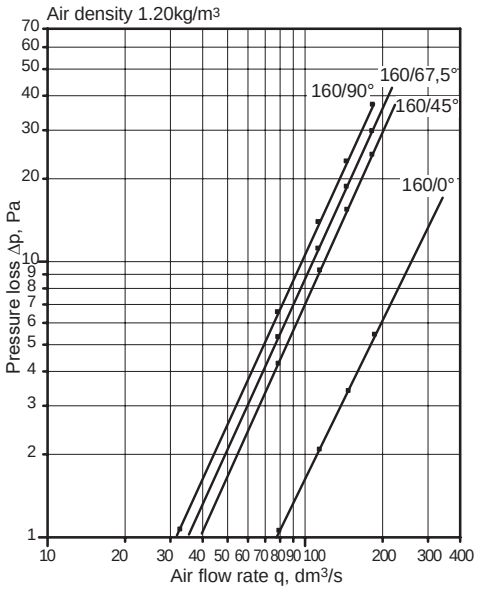
Flexible bend 125x0-90°



Flexible bend 160x0-45°



Flexible bend 160x0-90°



Installation

Introduction

Uponor ventilation ducting and components are made of polypropylene plastic. They are lightweight and easy to handle.

Duct installation is not recommended at 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 fittings are packed in plastic bags and cardboard boxes to keep them clean. The ducts and fittings must be prevented from contamination by keeping the ducts plugged and storing the fittings 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 installed ducting must be protected with duct plugs, which must be left in place until the valves are installed and adjusted.

Cleaning doors of the ducting must be positioned and installed in a manner that allows cleaning.

Connections are made by pushing the duct on top of the fitting 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.

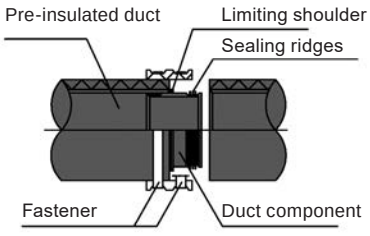
However, the vertical ducting sections must be supported so that their weight does not rest on the coupling. If brackets cannot be used, the connection may be secured with 8–10mm pop rivets, where necessary.

Cutting and connecting insulated ducting and duct components

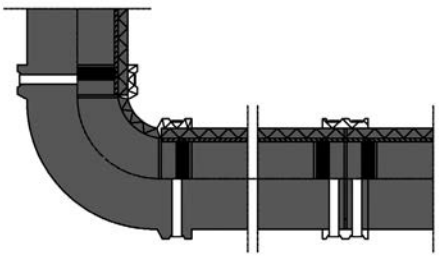
Insulated ducts are cut with the insulation material and connected to each other in the same way as uninsulated ducting and duct components. The connection is secured with a fastener delivered with the components. In some cases, it should be noted that the duct's thermal insulation must be removed in 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.

Tip!

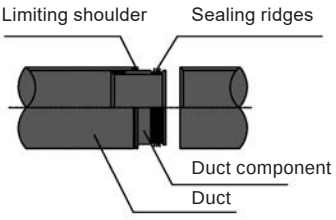
Make an installation mark 5 cm from the end of the duct. This will ensure that the duct has been pushed in all the way and that the connection is tight.



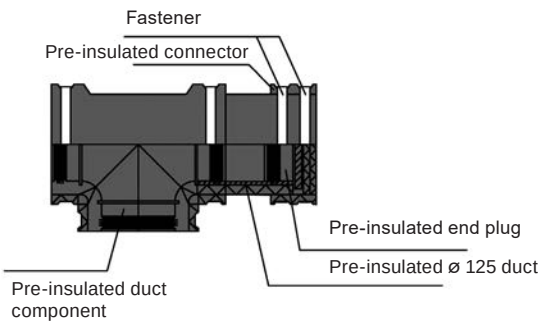
Connecting insulated ducts to each other.



Connecting insulated ducts and ducting components to each other.



Connecting uninsulated ducts to each other.



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

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 connector. 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., a roof), the through-hole is sealed with a vapour barrier cap. One side of closed-cell caps is self-adhesive.

The cap is usually installed above the vapour barrier, where it remains tight between the thermal insulation and the vapour barrier.

- Clean the vapour barrier of dust etc.The sealing flange is placed evenly over the vapour barrier (A) and sealed on its edges tightly with a suitable adhesive tape.
- Using a sharp knife, make an aperture corresponding to the size of the cap hole in the vapour barrier (B). 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 (C).
- Align the head of the duct in place and connect it to the ducting (D).

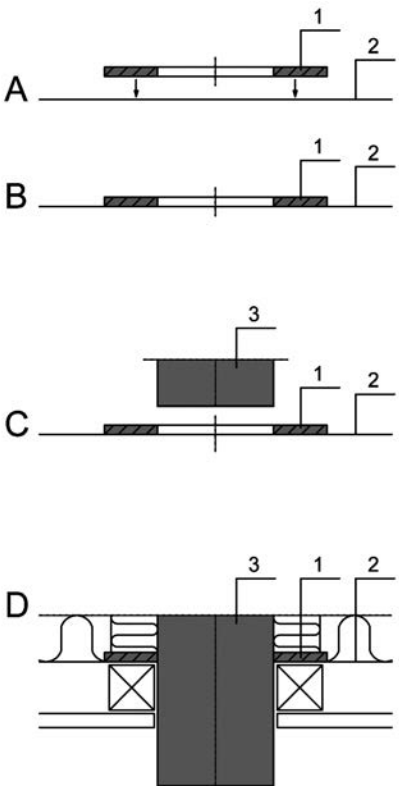
Insulated ducting and vapour barrier inlets

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

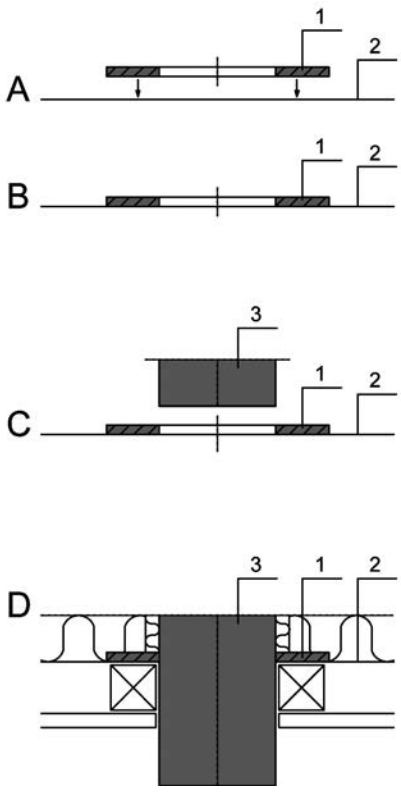
The thermal insulation ends at the cold-side surface of the vapour barrier cap. Ducting on the warm side of the vapour barrier may be uninsulated, if the ducting does not require condensate-insulation.

The supply air duct on the warm side of the vapour barrier in, for example, a suspended ceiling, must be insulated with expanded PE plastic if the supply air is cooled or if the air in the supply air duct is not post-heated during the wintertime.

In this case, the expanded PE insula- tion is cut at the vapour barrier cap and sealed air-tight to the vapour barrier cap.



1 = Cap
2 = Vapour barrier
3 = Uninsulated duct



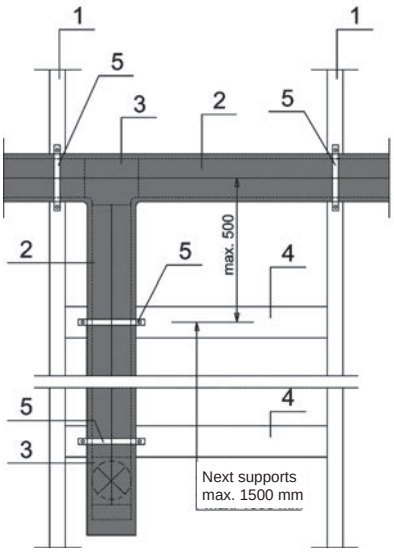
1 = Cap
2 = Vapour barrier
3 = Insulated duct

Supporting

Supporting is implemented with supports designed for ventilation ducting.

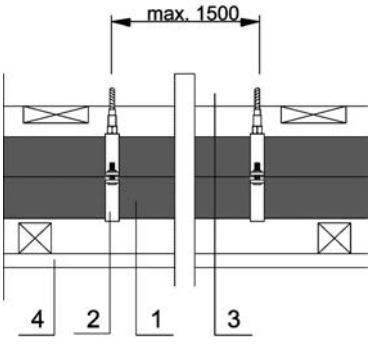
The maximum support interval for horizontal ducting is 1500mm. A support should be installed adjacent to each connection/fitting.

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



1. *Lower roof truss support*
2. *Insulated (15 mm) duct*
3. *Branch*
4. *Support (if the duct support is not installed on the roof truss)*
5. *Support*

Example of supporting of an attic-mounted duct and a tee.



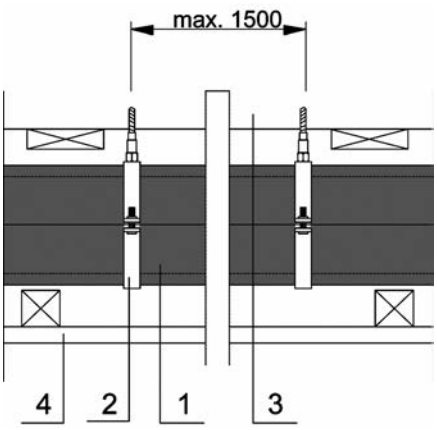
1. *Insulated duct*
2. *Support*
3. *Lower roof truss support*
4. *Suspended ceiling*

Example of supporting of an insulated duct above a suspended ceiling.

The ducting must also be attached to the roof structures, to prevent it from moving during, for example, cleaning.

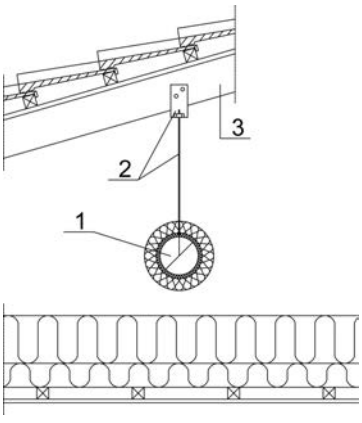
Supporting of insulated ducts

Supporting of insulated ducts is implemented in the same way as those for uninsulated ducts. You should note, however, that the insulation is not cut in the locations of the supports; the supports rest over the insulation. In this case, a larger duct support is used.



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

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



1. *Duct + thermal insulation LE5 (15+50)*
2. *Support*
3. *Upper roof truss support*

Example of supporting of an insulated duct in an attic.
Support interval max. 1500mm.

Insulation

The insulation of ducts is specified in the ventilation plans. Usually, the alternatives are:

Warm spaces (inside the vapour barrier):

- **Supply and exhaust air ducts** require no insulation, with the exception of ducts in sauna ceilings, which must be thermally insulated with 50mm 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 the winter, the ducts must be insulated with expanded PE plastic.

- **Fresh and waste air ducts** are insulated with expandable PE plastic insulation, which functions as insulation against condensation.

With extra-long fresh air ducts, the possibility of heat loss should be considered. If necessary, fresh air ducts can be insulated with 2x15 mm expanded PE plastic or, alternatively, 15 mm expanded plastic + 50 mm mineral wool insulation.

Cold spaces (outside the vapour barrier):

- **Supply and exhaust air ducts** as well as f**resh and waste air ducts** installed inside the thermal insulation of the ceiling with at least 100 mm of mineral-wool-based loose material or mineral wool insulation material on top of them, are installed with condensa- tion- and thermal insulation of 15 mm of expanded PE plastic.

- Alternatively, for **waste, supply, and exhaust air ducts** installed inside the thermal insulation of the ceiling with at least 100 mm of mineral-wool-based loose material or similar on top of them, the duct may also be insulated with 50 mm mineral wool.

- **Supply and exhaust air ducts** located above the thermal insulation of the ceiling are always thermally insulated with 15 mm expanded PE plastic + 50 mm mineral wool or 50 + 50 mm mineral wool.

- **Waste air ducts** above the thermal insulation of the ceiling may be insulated with 50mm mineral wool.

- **Fresh air ducts** located above the thermal insulationof the ceiling are insulated with mineral wool of at least 50mm.

- **Kitchen fans or hoods** in the attic and attic cavities must be insu- lated with class-EI30-fireresistance insulation. Insulation of the duct, using the insulation material specified above, is recommended from the kitchen fan/hood up to the roof.

The mineral wool insulation is wrapped tightly around the duct and bound with steel wire or tensioning clamps.

General

Condensation-insulation of ducts and duct components is implemented with factory- installed 15 mm expanded PE plastic insulation.

The condensation and thermal insulation of factory-insulated ducts can be tightly sealed through the installation of separate internal

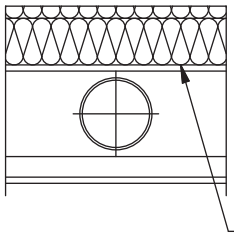
joint insulation sleeves on the duct ends connected withinternal joints. These connections are secured with two fasteners. The socket coupling of the thermal insulation and the insulated ducts and duct compo- nents can be tightly connected by inserting the insulated ducts as far as the stop collar of the insulated duct components and always securing the connections with one fastener.

In general, condensation and ther- mal insulation must be installed in such a manner that the result is an uninterrupted and perfectly sealed structure.

When expanded PE plastic is used for insulating ducts in cold spaces embedded inside the thermal insu- lation of the ceiling, the thermal insulation material of the ceiling must always be mineral-wool- based. Respectively, the thermal insulation of the ceiling may be implemented with any commercially available insulation material, when the duct is insulated with mineral wool.

Ducting in warm spaces, inside suspended structures or housings

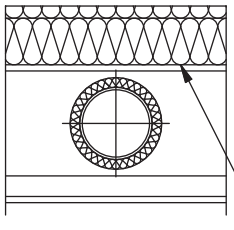
- Air temperature inside the duct above 10 °C



- Exhaust air ducts
- Supply air ducts

No insulation. However, the ducts in the sauna ceiling are thermally insulated with 50mm mineral wool.

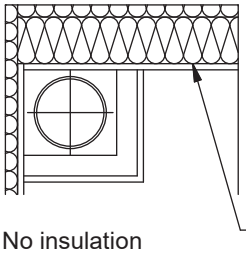
- Air temperature inside the duct below +10 °C



- Fresh air duct to the ventilation unit
- Waste air duct from the ventilation unit
- Supply air duct

Expanded PE plastic insulation, 15 mm, LE4, additional insulation in accordance with the energy efficiency plan

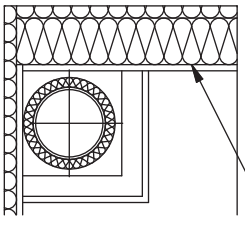
- Air temperature inside the duct above +10 °C



- Exhaust air ducts
- Supply air ducts

No insulation

- Air temperature inside the duct below +10 °C



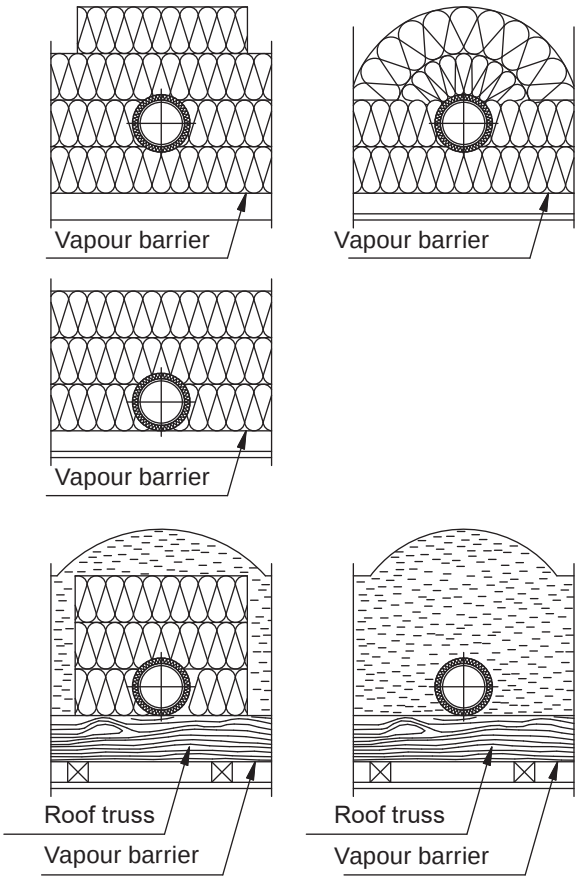
- Fresh air duct to the ventilation unit
- Waste air duct from the ventilation unit
- Supply air duct

Expanded PE plastic insulation, 15 mm, LE4, additional insulation in accordance with the energy efficiency plan

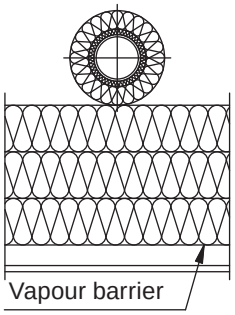
Ducting in cold spaces

(in attics, embedded in roof insulation, or above that)

- Supply air duct
- Exhaust air duct
- Fresh air duct to the ventilation unit
- Waste air duct from the ventilation unit



Duct in loose mineral wool or similar. PE expanded plastic insulation, LE 4, or 50 mm mineral wool, LE3, is used. Installation of a duct embedded in loose mineral wool or similar is not recommended.



Ducts located in cold spaces above the thermal insulation of the roof are insulated with 15 mm expanded PE plastic + 50 mm mineral wool, LE5 or 50 mm + 50 mm mineral wool, LE2.

Alternative duct insulation methods

Notes

Uponor Suomi Oy
PO Box 21

FI-15561 Nastola, Finland

P +358 20 129 211
W www.uponor.com
E infofi@uponor.com

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