

OPERATIONAL AND MAINTENANCE MANUAL

Overpressure smoke control system for vertical exit paths **mcr EXi**



mcr EXi 04.09.15.1

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CAUTION

**All previous issues of this O&M Manual expire on the date of issue hereof.
The O&M Manual does not concern devices manufactured before the date of its
publication.**

1. INTRODUCTION

The purpose of this operation and maintenance manual is to get the user acquainted with the intended use, design, the principle of operation, correct installation and operation of the mcr EXi system.

The manual also includes additional information about the operating conditions, maintenance and warranty conditions of the product.

This O&M Manual concerns the entire group of devices that are suitably set up in the system of pressure differentiation to protect against smoking vertical exit paths. Observing recommendations included in the manual ensures correct function of the devices in terms of fire protection of rooms as well as safety of the system users.

NOTE

Detailed description of mcr EXi components is presented in the individual operational and maintenance documents dedicated for each appliances.

2. THE SUBJECT OF THE MANUAL

The subject of this document is the mcr EXi overpressure smoke control system for vertical exit paths. The actuators of the mcr EXi system are the kits, suitably selected and set up, that are to create the conditions of overpressure in a protected space in compliance with the assumed design. Those appliances are produced by MERCOR SA Company, address: ul Grzegorza z Sanoka 2, 80-408 Gdańsk.

The mcr EXi system includes the following components:

- **Control units: mcr OMEGA C2100c and mcr OMEGA C2300c**
- **A set of bleeding appliances in roof version GZU/D** including instrumentation (dampers, air intake vents, exhaust vents, registers)
- **A set of bleeding appliances in wall version DZU/S, GZU/S or in duct version DZU/K, GZU/K**, including instrumentation (dampers, air intake vents, exhaust vents, registers)
- **A set of air supply appliances in roof version GZN/D, wall version GZN/S, DZN/S or in duct version DZN/K**, including instrumentation (dampers, air intake vents, exhaust vents, registers)

3. INTENDED USE

Range of use

Protection against the accumulation of smoke in vertical exit paths is a significant part of a whole building fire protection. A suitable protection of stair cases allows people to be evacuated safely and fluently from the area threatened with fire, it simplifies conducting fire-fighting operations and enables limiting fire damages due to smoke, hot gases and products of thermal decomposition.

The mcr EXi system made by MERCOR SA for the protection against smoke is installed in stair cases to provide safety for building users. This system is composed of adequately designed sets of appliances which, while cooperating with each other, prevent getting through the smoke into the protected spaces by creating the elevated pressure.

Operation description

The system is managed by the mcr OMEGA power supply and control unit. The mcr EXi overpressure system is activated automatically by spot smoke detectors that may be a part of the mcr EXi system or may include into the fire detection system that protects the entire building (a signal from FAS). It is also possible to activate the system manually by pressing the alarm button of smoke venting system.

After the release of fire detection signal inside the building, there is an activation of suitably adjusted air supply units: an upper air supply unit and/or a lower air supply unit, located in a specific places of the stair cage, in compliance with the design. After a few seconds, the stair cage is filled in with air and a pressure difference is generated between the stair cage and the rooms adjacent to it. The generated overpressure at the assumed level (20-80 Pa) guarantees that a force necessary to open the exit doors is no more than 100 N. When the exit door is opened, the surplus of air forced out of the stair cage stops the smoke and prevents it to get from the adjacent rooms into the stair cage space that functions as the vertical exit path. The required air flow rate through the open door is achieved by providing the air release outside the building from every adjacent room with the use of:

- openings in the external building walls (e.g. by automatic opening the windows – the mcr OSO system, outlet slot grilles),
- a vertical air outlet duct where flaps in the adjacent spaces (e.g. mcr FID S, mcr WIP) are connected with a common vertical air shaft, that releases smoke in the upper part of the building,
- or
- a mechanical air exhaust, appropriately designed and controlled to fulfil this function.

The pressure adjustment occurs automatically by a system of suitably located bleeding units in a form of GZU/URS (upper bleeding set) and/or DZU/(lower bleeding set).

Method of selecting the system

The system has been designed basing on the requirements of Standard PN-EN 12101-6:2007 *Smoke and heat control systems. Part 6: Specification for pressure differentiation systems. Sets of Equipment*. While designing the pressure differentiation system, you shall include a selection of the system class that guarantees the criteria applicable during the acceptance test.

Knowing the intended use of a given building and the assumed individual fire-fighting scenario for it, a suitable class of the system to prevent smoke spreading in the protected areas.

To configure the system with suitable sets of appliances, you can use a specially designed **OVERPRESSURE SYSTEM SELECTION SOFTWARE** that is available on website www.mercor.com.pl [► Strefa Architekta i Projektanta ► Wentylacja Pożarowa ► Programy doboru] ([Architect and Designer Zone ► Fire Ventilation ► Selection Softwares]).

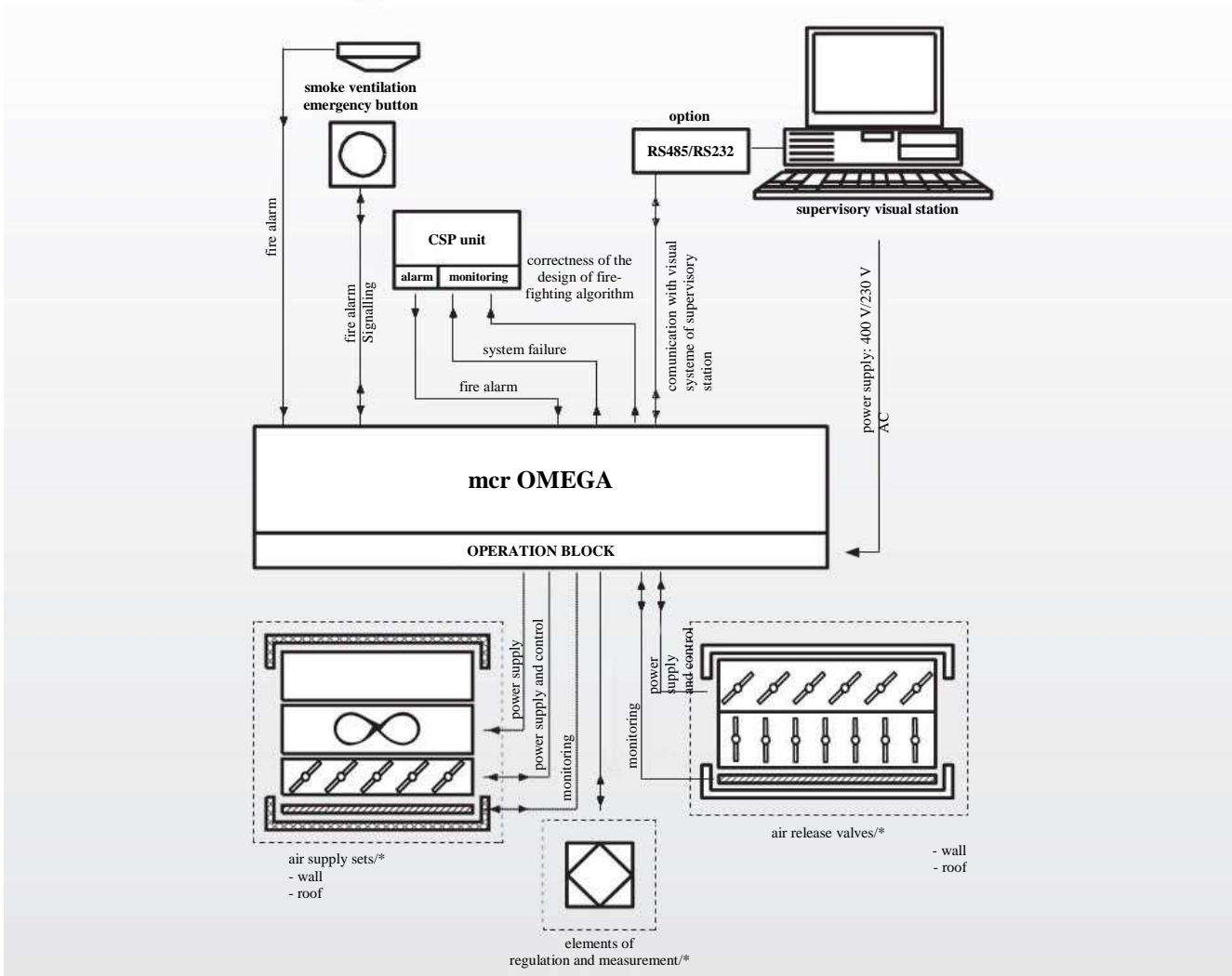
4. SYSTEM COMPONENTS

4.1. mcr Omega power supply and control unit

Device intended use

The mcr Omega C2100c unit is a key appliance in the EXi overpressure system for protecting against smoke propagation. The unit provides control, supply, monitoring and visualisation of the operating status of the appliances that make components of the system. Furthermore, it can be used as a controller for fire separators.

CZS type	Dimensions AxHxB [mm]	CZS type	dimensions AxHxB [mm]
mcr Omega 2100c-1	400x600x250	mcr Omega 2100c-4	1000x1000x300
mcr Omega 2100c-2	600x800x250	mcr Omega 2100c-5	1000x1200x300
mcr Omega 2100c-3	800x1000x300	mcr Omega 2100c-6	1200x1400x300



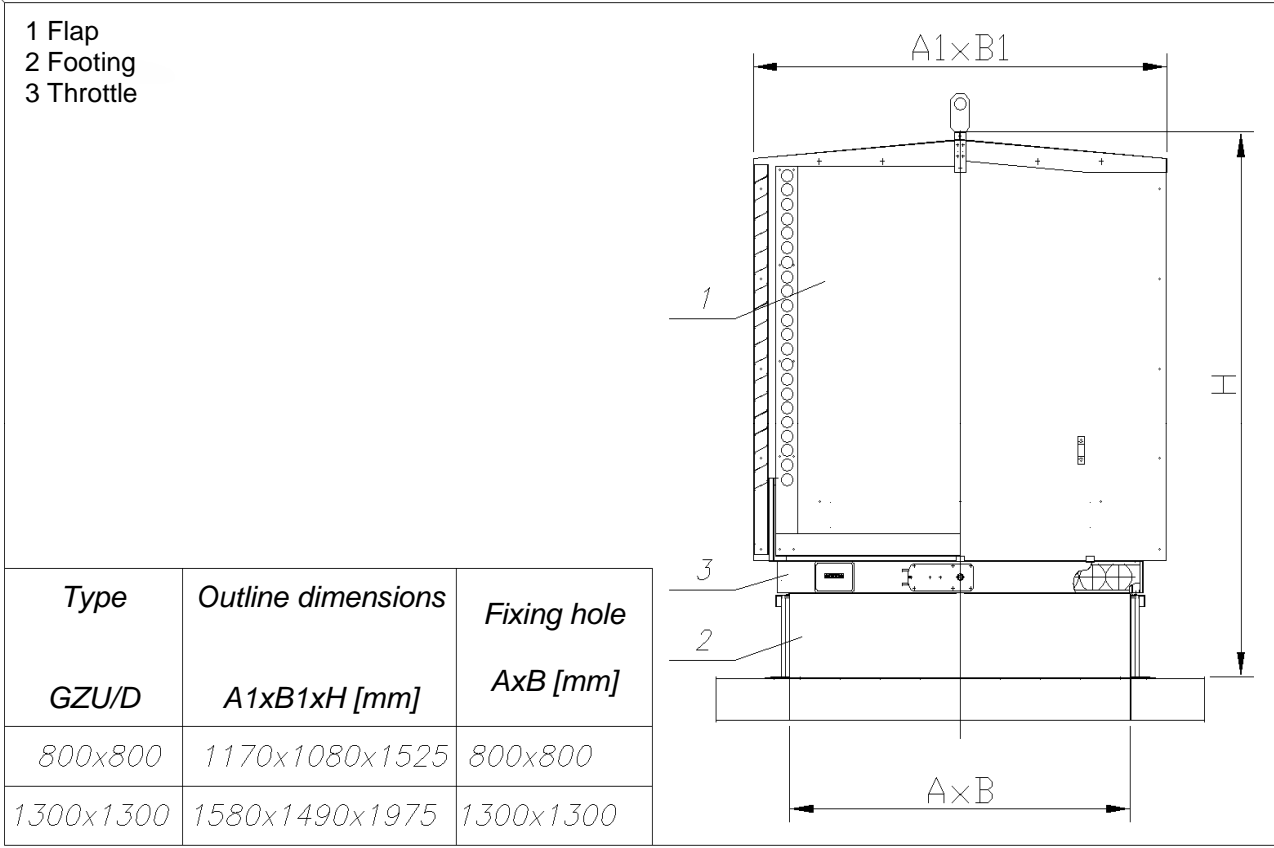
* / the location and number depending on air demand for the system.

The configuration and number of the individual components of the system depend on the scenario of fire-fighting, building specifications and the location of building staircase, a lift shaft or other protected zone.

4.2. Set of bleeding appliances _____

4.2.1 Set of bleeding appliances in roof version GZU/D _____

A standard air release unit in roof version is the mcr PLD safety bleeding damper that forms a set of GZU/D.



Exemplary configuration of the roof protection bleeding set

Device intended use

The GZU/D set is designed to maintain a suitable pressure difference upward and downward its barrier – it works as a safety valve that prevents protected spaces against pressure increase above a set limit.

Design

Basic components that make the structure of damper include: a cut-off barrier, exhaust vents and a body with gravity weights. The roof damper sets are manufactured in two basing sizes of rated dimensions 800x800 and 1300x1300.

Standard equipment of the appliance includes a multi-blade damper with an actuator and a return spring that serves as an element which prevents a free air flow when the system is in the stand-by status.

Additionally, the set may be equipped with an anti-ice system.

The set of bleed-overpressure dampers mcr PLD can be installed on special pedestals or fixed to roof planes using a base made by the manufacturer individually, depending on a type of roof on which the set is to operate.

Operation

PLD damper sets are normally closed. The opening of dampers occurs as the effect of pressure increase in the protected space. When pressure difference exceeds the set value of threshold (adjusted during the flap regulation on the object), the cut-off barrier of the flap opens rapidly and causes pressure equalizing. When pressure in the protected space is lowered the cut-off barrier automatically returns to its closed status under the effect of a special design of balance weight system. An immediate reaction of the appliance to pressure variation allows the system to achieve a suitable flow of air flux.

Driving and releasing systems

The drive system of mcr PLD bleed-overpressure flaps includes a system of suitably selected steel weights mounted on the cut-off barrier and gravity force. For multi-blade damper, an axial actuator manufactured by Belimo makes its driving element.

Technical specifications

Roof sets of bleed-overpressure flaps type mcr PLD are manufactured in two basic sizes of dimensions shown in the table below:

Footing dimension in the light of opening	Outline dimensions	Throttle/damper	Maximum bleed/release/relief for 50 Pa	Weight
<i>AxB [mm]</i>	<i>A1xB1xH [mm]</i>	<i>H1 [mm]</i>	<i>[m3/h]</i>	<i>[kg]</i>
1300x1300	1580x1490x1550	125	22 000	315
800x800	1170x1080x1100	125	10 000	129

Basic dimension versions of mcr PLD type flap sets.

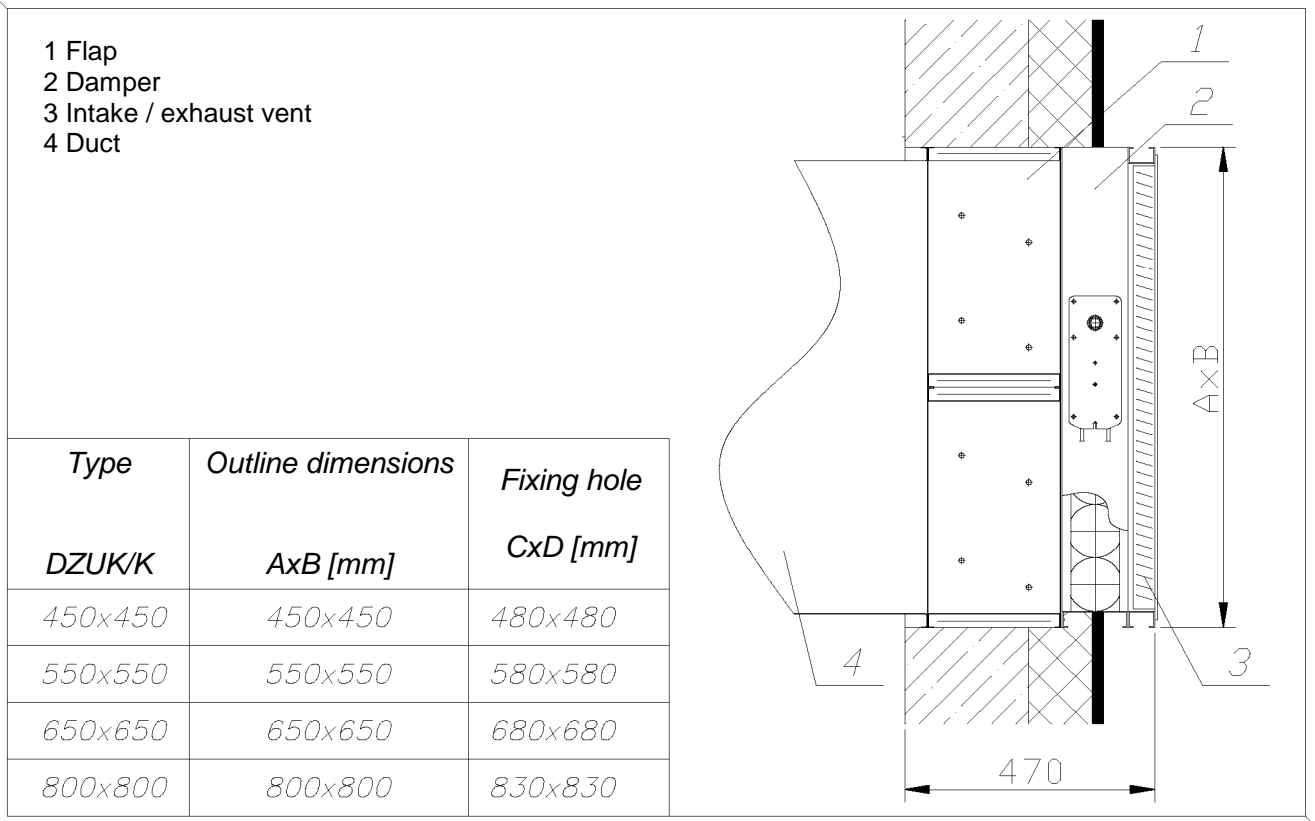
4.2.2. Set of bleeding appliances: DZU/S, DZU/K and GZU/S, GZU/K

Bleeding units also include bleed-overpressure flaps type PL1 that form sets type DZU/S or DZU/K (lower bleeding set in wall or duct version), used when a lower air release is provided, and sets type GZU/S, GZU/K (upper bleeding set in wall and dust version), used as a supplement of the set type CZU/D when the implementation of a whole bleeding with the units in roof version is impeded.

1 Flap
2 Damper
3 Intake / exhaust vent

Type	Outline dimensions	Fixing hole
	<i>AxB [mm]</i>	<i>CxD [mm]</i>
GZU/S		
450x450	450x450	480x480
550x550	550x550	580x580
650x650	650x650	680x680
800x800	800x800	830x830

Exemplary configuration of the lower/upper bleeding set in wall version.



Exemplary configuration of the lower/upper bleeding set in duct version.

Device intended use

Sets of types: DZU/S, DZU/K and GZU/S, GZU/K are designed to maintain a suitable pressure difference upward and downward its barrier – they work as a safety valve that prevents protected spaces against pressure increase above a set limit.

Design

Flap sets of type mcr PL1 consist of a housing made of galvanised steel sheet, inside which a barrier in a form of rotary blades is embedded. The individual barrier blades are made of galvanised steel sheet of a suitably selected profile. Thanks to their multi blade form, the blades do not extend outside the flap housing during their operation. On individual blades barrier loading weights are attached. Sealing strips are glued on the whole width of flaps to achieve better air tightness of the appliance. Standard equipment of the appliance includes a multi-blade damper with an actuator and a return spring that serves as an element which prevents a free air flow when the system is in the stand-by status.

Function

PL1 damper sets are normally closed. The opening of dampers occurs as the effect of pressure increase in the protected space. When pressure difference exceeds the set value of threshold (adjusted by the manufacturer), the flap blades open rapidly and cause pressure equalizing. When pressure in the protected space is lowered, the blades automatically return to their closed status under the effect of balance weight system. An immediate reaction of the appliance to pressure variation allows the system to achieve a suitable flow of air flux.

Driving and releasing systems

The drive system of mcr PL1 bleed-overpressure flaps include a system of suitably selected steel weights mounted on blades and gravity force. For multi-blade damper, an axial actuator manufactured by Belimo makes its driving element.

Technical specifications

Bleeding-overpressure flaps of type mcr PL1 are manufactured in four basic sizes. When larger sizes (higher air flow rates) are required, the appliance is supplied by the Manufacturer as the multi set of basic flaps (the battery of flaps). Flap dimensions (including multi sets) are given in the table below:

Height H [mm]	Width B [mm]											
	450	550	650	800	900	1100	1300	1350	1600	1650	1800	1950
450	1(450)				2(450)			3(450)			4(450)	
550		1(550)				2(550)				3(550)		
650			1(650)				2(650)					3(650)
800				1(800)					2(800)			
900	2(450)				4(450)			6(450)			8(450)	
1100		2(550)				4(550)				6(550)		
1300			2(650)				4(650)					6(650)
1350	3(450)				6(450)			9(450)			12(450)	
1600				2(800)					4(800)			
1650		3(550)				6(550)				9(550)		
1800	4(450)				8(450)			12(450)			16(450)	
1950			3(650)				6(650)					9(650)

Markings: **x(yyy)**

x – number of flaps per set

(yyy) – dimension of flaps forming a set

N. B.:

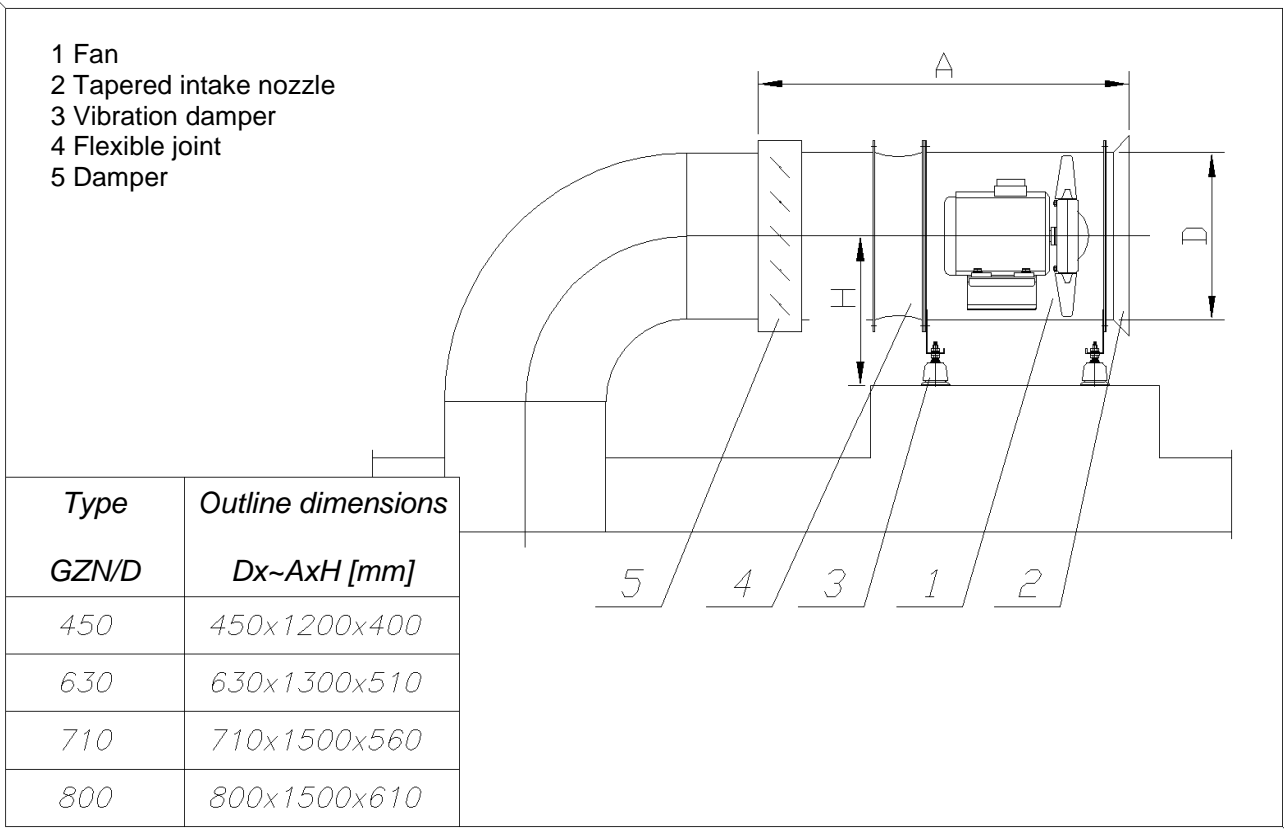
Presented dimensions [HxB] are gross dimensions of the flaps.

4.3. Set of air supply appliances

In air supply units of mcr EXi system, axial fans of type Monsun / BO are used in a form of cylinder or box. They are characterised by high capacities with a relatively low pressures. Except the fan, the air supplying units are equipped with a full set of instrumentation (dampers, intake vents, registers). Air supply sets co-operate with bleed-overpressure dampers. Their task is to supply an adequate volume of air to the protected space in order to provide a suitable overpressure acc. to the requirements of standard. The fans are installed indoors or outdoors: on suitable mounting footings with the motor in vertical position. It is also possible to install the sets vertically on previously installed mounting consoles.

4.3.1. Set of air supply appliances in roof version of type GZN/DR with an option of type GZN/DR equipped with reserve fan

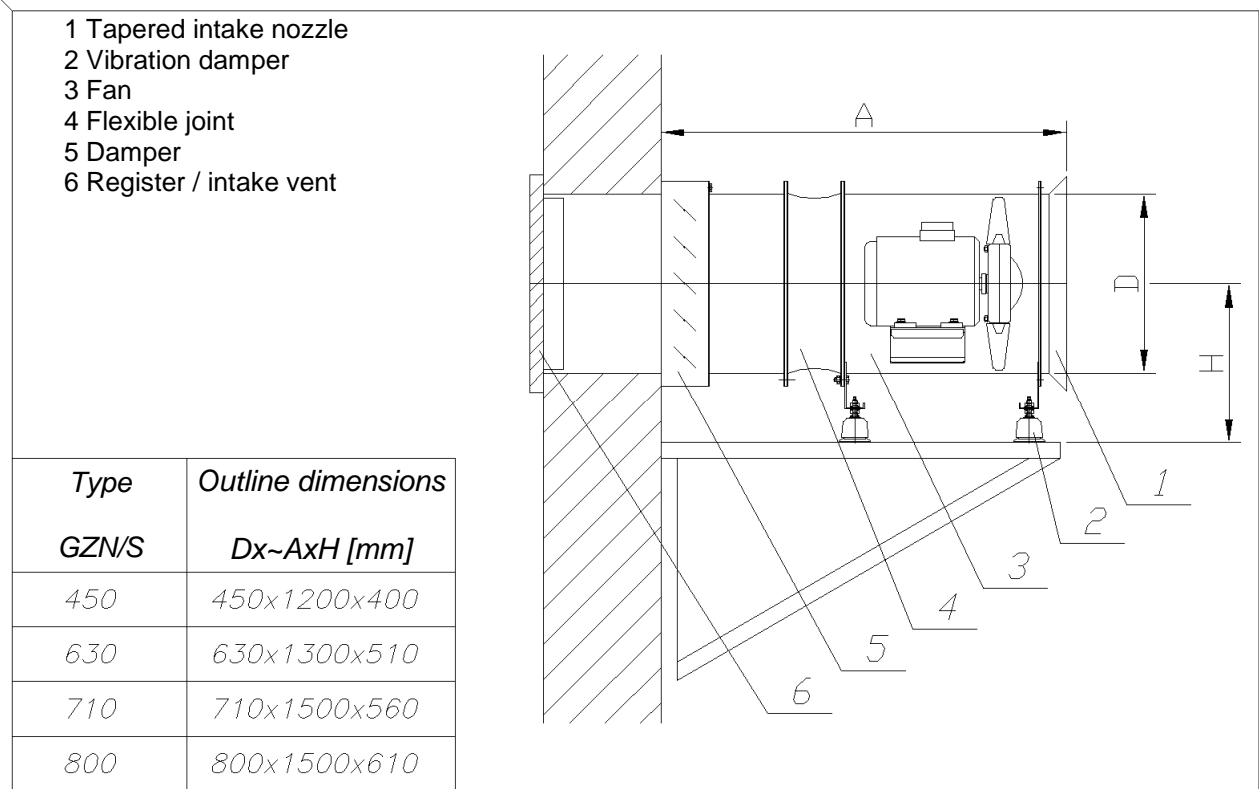
It is a typical variant of the air supply system that provides required volume of air. It is installed on the building roof with the addition of the rest part of installation to the basic unit.



Exemplary configuration of the upper air supply set in roof version.

4.3.2. Set of air supply appliances in wall version, type GZN/S, DZN/S

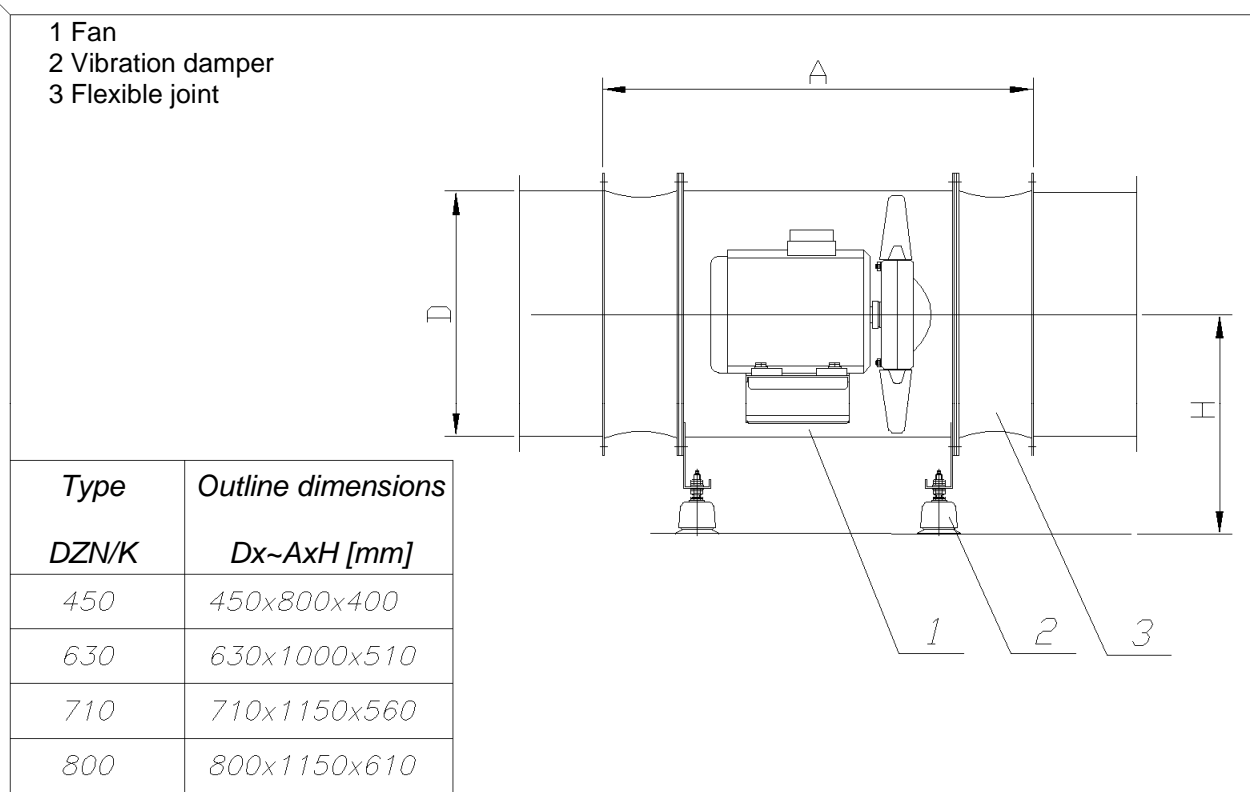
In the case of no possibility to apply duct units to ensure enough volume of air, wall versions are applied inside or outside the compartment.



Exemplary configuration of the lower/upper air supply set in wall version.

4.3.3. Set of air supply appliances in duct version, type DZN/K

This set is applied as a lower air supply unit to be completed with the elements of connecting installation. These units can be installed in different outdoor and indoor configurations.



Exemplary configuration of the lower air supply set in duct version.

4.4 Duct smoke detector

The system type GZN/D can be equipped with a duct smoke detector and a system of two air intake vents. Power supply and monitoring of the smoke detector and actuators is operated from mcr Omega control unit. The smoke detector has to be mounted inside the air intake duct of the fan.

4.5. Additional components of the system

The additional elements of the EXi overpressure system of smoke prevention may be the products of Assa Abloy company, e.g.:

- mcr ALPE steel fire-rated door,
- mcr DREW PLUS wood fire-rated door,
- mcr PROFILE ISO profile doors and walls.

5. TRANSPORT & STORAGE CONDITIONS

System elements shall be transported and stored in compliance with individual documents of O&M manuals dedicated for each product.

6. MAINTENANCE AND SERVICE

The equipment from Mercor SA requires periodic technical inspection and maintenance at least every 12 months throughout its operating life, i.e. during the warranty and post-warranty period. Inspection and maintenance may only be carried out by the manufacturer or contractors authorised by Mercor SA to service its products.

The obligation to carry out regular service inspections of fire protection devices results from the Art. 3(3) of the Regulation by the Minister of Internal Affairs and Administration of 7 June 2010 on fire protection of buildings, other civil structures and areas (Journal of Laws 2010 no. 109 item 719):

Do these recommended actions in the inspection intervals:

- Check the electrical connections, especially for all mechanical damage.
- Check the equipment casing, especially for all mechanical damage.
- Check for any obstructions to proper performance of the equipment.

To facilitate the activities under service inspection, servicing and warranty claim response, e.g. visual inspection or repairs, the equipment user/operator shall provide physical access to the equipment by removing thermal insulation, suspended ceiling, and other installations, as required and applicable to warrant unobstructed access.

In the case of roof mounted equipment, provide access to the area (via ladders or elevated platforms).

If the equipment is only operated for smoke exhaust during fire, test run it for ca. 10 minutes every 3 months.

Refer all matters related to technical inspection, maintenance and servicing of this equipment to the Mercor SA Service Department, serwis@mercor.com.pl, tel. +48 58 341 42 45 ext. 170, fax: +48 58 341 39 85, from 8 AM to 4 PM (Mo-Fri).

In addition, the overpressure system including the smoke detection system or any other type of fire alarming system, switching system, fans, electric power supply systems for the equipment, and automatically started ventilation appliances shall be submitted to the acceptance tests acc. to Standard PN-EN 12101-6:2007.

7. WARRANTY TERMS AND CONDITIONS

1. MERCOR SA grants 12 months of warranty for the equipment quality from the date of purchase, unless the sales contract states otherwise.
2. If physical defects of equipment are discovered during the warranty period, MERCOR SA warrants and represents to remove them in 21 days from serving the written warranty claim with the proof of purchase or sales contract, subject to Item 6.
3. MERCOR SA has the right to extend the time of repair if the defect removal is complicated or requires purchase of custom components or spare parts.
4. The warranty liability only covers all defects arising from causes present in the equipment at the date of sale.
5. Defects caused by improper operation or otherwise as listed in Item 6 herein, the buyer / warranty beneficiary will be charged with the costs of their removal.
6. The following components are not covered by the warranty:
 - Any damage or failure of the equipment caused by improper operation, tampering, failure to conduct periodic technical inspection and/or maintenance established in the Technical Manual "SERVICING AND MAINTENANCE".
 - Any damage beyond reasonable control of MERCOR SA, and specifically: caused by force majeure, such as torrential rainfall, flooding, hurricanes, inundation, lightning strike, power grid overvoltage, explosion, hail, collision with aircraft, fire, avalanche, landslide and indirect damage due to those causes. Torrential rainfall is understood as any rainfall with the effectiveness factor of 4 or higher according to the definition of the Polish Institute of Meteorology and Water Management – National Research Institute (IMGW-PIB). If the effectiveness factor value specified in the preceding sentence cannot be reasonably

established, the actual condition and extent of damage shall be considered at the site of their origin as the action of torrential rain. Hurricane is understood as any wind with a minimum speed of 17.5 m/s (and damage shall be recognised as caused by hurricanes if the action of such weather phenomenon has been found in the direct vicinity of the damaged property).

- Damage due to failure to immediately report any defect found.
 - Deterioration in the quality of coatings due to natural weathering/ageing.
 - Defects caused by abrasive or aggressive cleaning agents.
 - Damage caused by aggressive external influence, specifically chemical or biological in nature, or when the origin of which is related to the production processing or activity carried out within the facility protected by the equipment or in its direct vicinity.
 - Wearing parts and consumables (e.g. gaskets/seals), unless they have defects of workmanship and/or material.
 - Damage caused by improper transport, handling, unloading and/or storage of the equipment.
 - Damage caused by installation of the equipment in violation of this Technical Manual and/or good construction practice.
 - The equipment and/or parts thereof with removed or damaged nameplate (rating plate) and/or warranty seals.
7. Submit each warranty claim to MERCOR SA in 7 days from the date of discovery of a warranty eligible defect.
 8. Warranty claims may be submitted by calling at: tel. +48 58 341 42 45, by fax: +48 58 341 39 85, by e-mail: reklamacje@mercors.com.pl or by traditional mail: MERCOR SA, ul. Grzegorza z Sanoka 2, 80-408 Gdańsk, Poland.
 9. The buyer/warranty beneficiary is required to operate the equipment properly and carry out technical inspection and maintenance according to the Technical Manual "SERVICING AND MAINTENANCE".
 10. This warranty shall be made immediately void and null if:
 - The buyer/warranty beneficiary modifies the product design without prior authorisation from MERCOR SA.
 - Periodic technical inspection and/or maintenance are not carried out per schedule and/or are carried out by unauthorised personnel or service providers not authorised to do so by MERCOR SA and/or the equipment has not been properly operated.
 - Unauthorised personnel attempts any intervention in the product outside of the normal operation and maintenance of this equipment.
 11. Any circumstances listed in Item 10 will relieve MERCOR SA from the obligation of surety.
 12. The defects may be removed if the warranty claimant provides free access to facilitate this, especially to the rooms where the equipment has been installed, and provides the necessary inspection access, removal of thermal insulation systems, suspended ceiling, and any other installations which obstruct access to the equipment, etc.

The relevant provisions of the Polish Civil Code shall apply to all matters not regulated in these Warranty Terms & Conditions.