

## **OPERATION AND MAINTENANCE MANUAL**

**mcr EXi-F pressure differential system kit for smoke and  
heat control systems**

**No EXi-F 005  
2022**

**FIRE VENTILATION SYSTEM DEPARTMENT**

**INDEX:**

<b>1. INTRODUCTION</b> .....	<b>3</b>
<b>2. PRODUCT OVERVIEW</b> .....	<b>3</b>
<b>3. SYSTEM APPLICATIONS</b> .....	<b>4</b>
3.1. APPLICATIONS .....	4
3.2. OPERATION.....	5
3.3. SYSTEM SELECTION GUIDE .....	8
<b>4. SYSTEM COMPONENTS</b> .....	<b>8</b>
4.1. MCR OMEGA CONTROL UNIT .....	8
4.2. MCR EXI-F AIR SUPPLY UNITS .....	13
4.2. DIFFERENTIAL PRESSURE TRANSMITTER.....	17
4.2.1. MCR ICS DIGITAL DIFFERENTIAL PRESSURE TRANSMITTER.....	17
4.3. AUXILIARY COMPONENTS OF MCR EXI-F SYSTEM.....	19
4.3.1. INTAKE VENT SWITCHING SYSTEM.....	19
4.3.2. DUCT SMOKE DETECTOR UG-3-A4.....	20
4.3.3. MANUAL CONTROL PANEL (MCP).....	21
<b>5. WIRING SYSTEM</b> .....	<b>22</b>
<b>5.1. MCR OMEGA CONTROL SUPPLY UNIT</b> .....	<b>22</b>
5.2. MCR EXI-F AIR SUPPLY UNITS .....	23
5.3. MCR ICS PRESSURE TRANSMITTERS .....	24
5.3.1 MCR ICS DIGITAL PRESSURE TRANSMITTER .....	24
5.4. DAMPER ACTUATORS .....	25
5.5. DUCT SMOKE DETECTOR.....	26
<b>6. TRANSPORT AND STORAGE</b> .....	<b>27</b>
<b>7. MAINTENANCE AND SERVICING</b> .....	<b>27</b>
<b>8. WARRANTY TERMS AND CONDITIONS</b> .....	<b>27</b>

## 1. INTRODUCTION

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This operation and maintenance manual (OMM) provides information on applications, design, operation, installation and maintenance of mcr EXi-F smoke control system for escape routes.

This manual also includes additional information on operating conditions, maintenance and warranty terms and conditions.

This manual applies to a group of devices operating as a smoke control pressure differential systems for escape routes. Please follow the guidelines in this Operation and Maintenance Manual to ensure user safety and failure-free device operation.

## 2. PRODUCT OVERVIEW

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This manual applies to mcr EXi-F positive-pressure smoke control system for escape routes. The system includes a group of products selected and configured to establish a protected area with a specific positive pressure in accordance with the design requirements. The system is manufactured by „MERCOR” SA, ul. Grzegorza z Sanoka 2, 80-408 Gdańsk.

mcr EXi-F system components:

1. mcr Omega control unit (CU Omega);
2. mcr ICR pressure regulator (mcr Omega unit component);
3. air supply unit with accessories (dampers, intake vents, exhaust vents, grilles);
4. digital differential pressure transmitter mcr ICS

mcr EXi-F system auxiliary components:

1. manual control panel (MCP);
2. intake vent switching system (dampers with actuators);
3. duct smoke detectors;
4. mcr PL overpressure bleed damper (reduction of the system tightness – increase of required leakage)
5. elevated control panel (ECP)

### NOTE

**This Operation and Maintenance Manual replaces all previous versions. This Operation and Maintenance Manual does not apply to any devices manufactured before its issue date.**

### 3. SYSTEM APPLICATIONS

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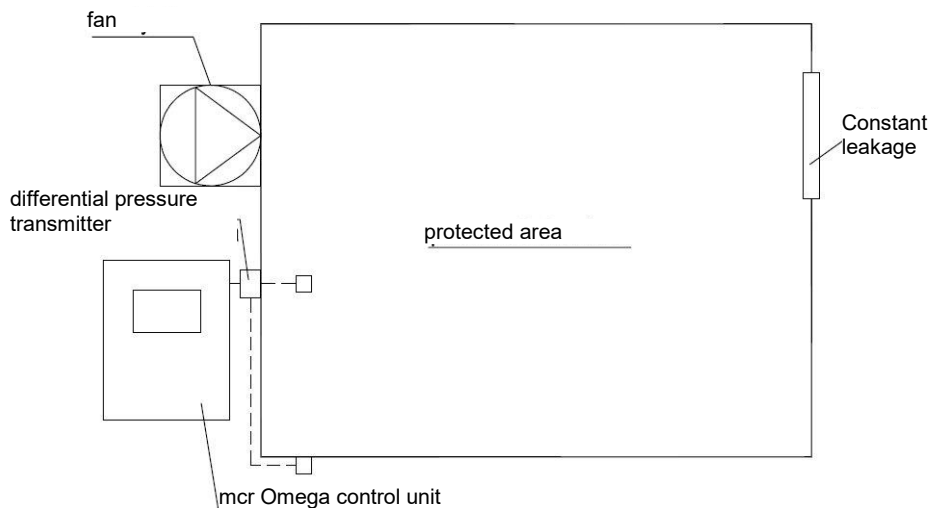
#### 3.1. Applications

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Smoke control in the escape routes is one of the most crucial fire prevention measures in the building. Secure escape routes guarantees safe and efficient evacuation of people from fire-exposed areas, facilitate fire-fighting operations and reduce damage caused by smoke, fire gases and products of thermal decomposition.

mcr EXi-F kits control smoke in any protected area (staircases, lift wells, escape routes) by creating positive pressure and thereby preventing smoke ingress. mcr EXi-F system can be used in staircases with protected lobbies and is compatible with systems including at least one pressure transmitter per protected area.

mcr EXi-F system consists of a configured set of devices preventing smoke ingress to the protected area by increasing pressure.



**Fig. 1.** Example mcr EXi-F system diagram

Depending on the demand, air can be supplied to the protected area using either a single-point or a multi-point air supply.

mcr EXi-F includes mcr ICR pressure regulator for the air supply unit control and does not require safety relief valves to control pressure. The exhaust vents can be installed as an auxiliary component in the protected area.

mcr EXi-F system devices can be used in pressure differential systems, where the air is discharged from the fire-exposed floor using gravity vents or exhaust fan (smoke ventilation system).

## **3.2. Operation**

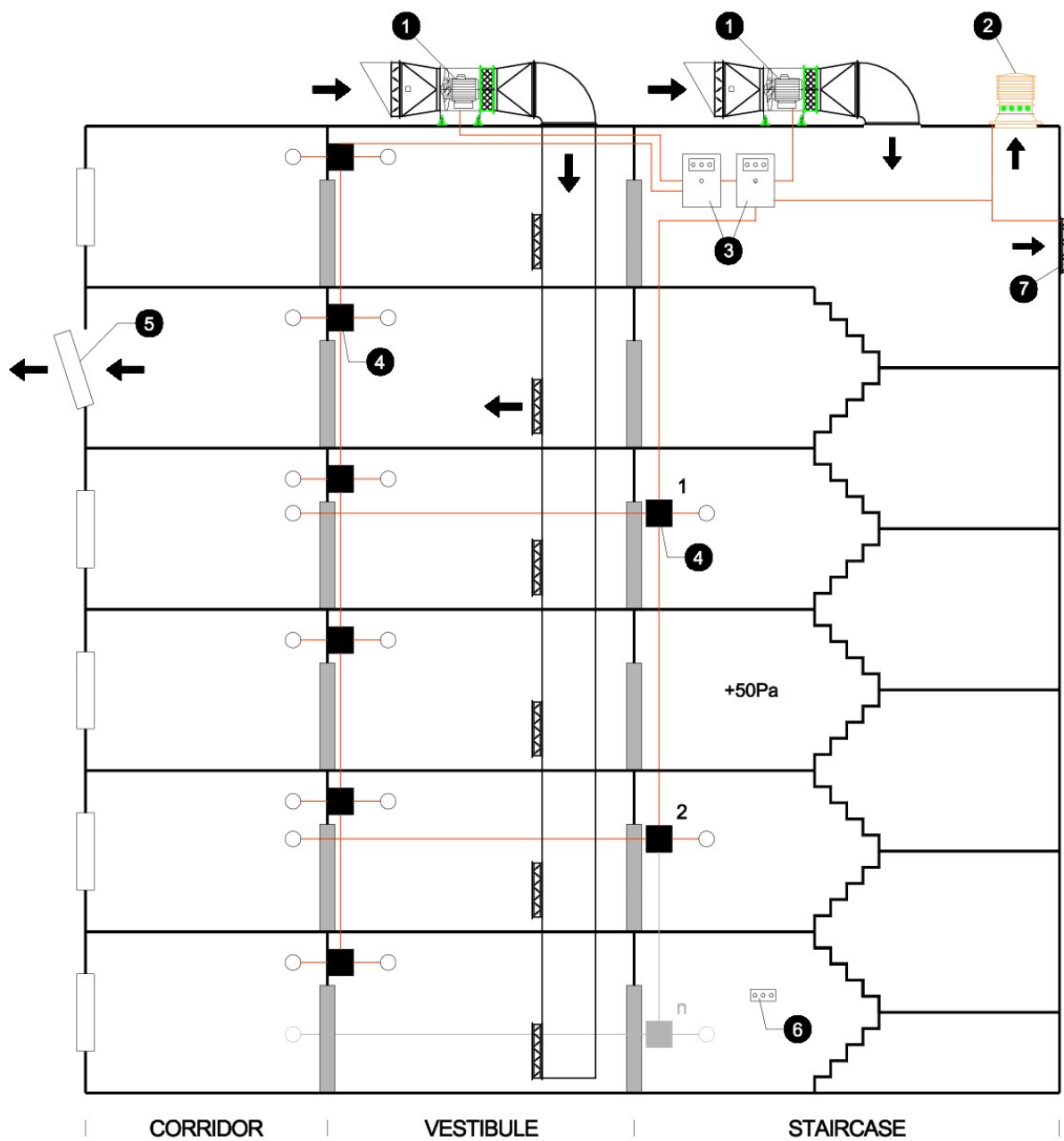
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The system is managed by mcr Omega control unit (CU) including all the required components (e.g. mcr ICR positive pressure regulator). Positive-pressure mcr EXi-F system is activated automatically via SAP signal or manually via CU or the manual control panel. After detecting the fire in the building, the air dampers of the air supply units are activated, and the air supply unit is activated with a delay (necessary to open the shut-off dampers). After several seconds, the protected area is filled with air to create the differential pressure between the protected area and the adjacent areas.

The required positive pressure is controlled by a variable air volume supplied to the protected area by the air supply unit(s). Provided that the door to the protected area are closed, the main fan of the air supply unit maintains a stable positive pressure. The actual pressure in the protected area is measured and controlled by mcr ICS. The positive pressure in the staircase (20-80 [Pa]) guarantees that the force required to open the exit door does not exceed 100 [N]. Opening the door results in pressure drop in the protected area, thus increasing the fan speed and providing the design air flow rate through the door separating protected and non-protected areas.

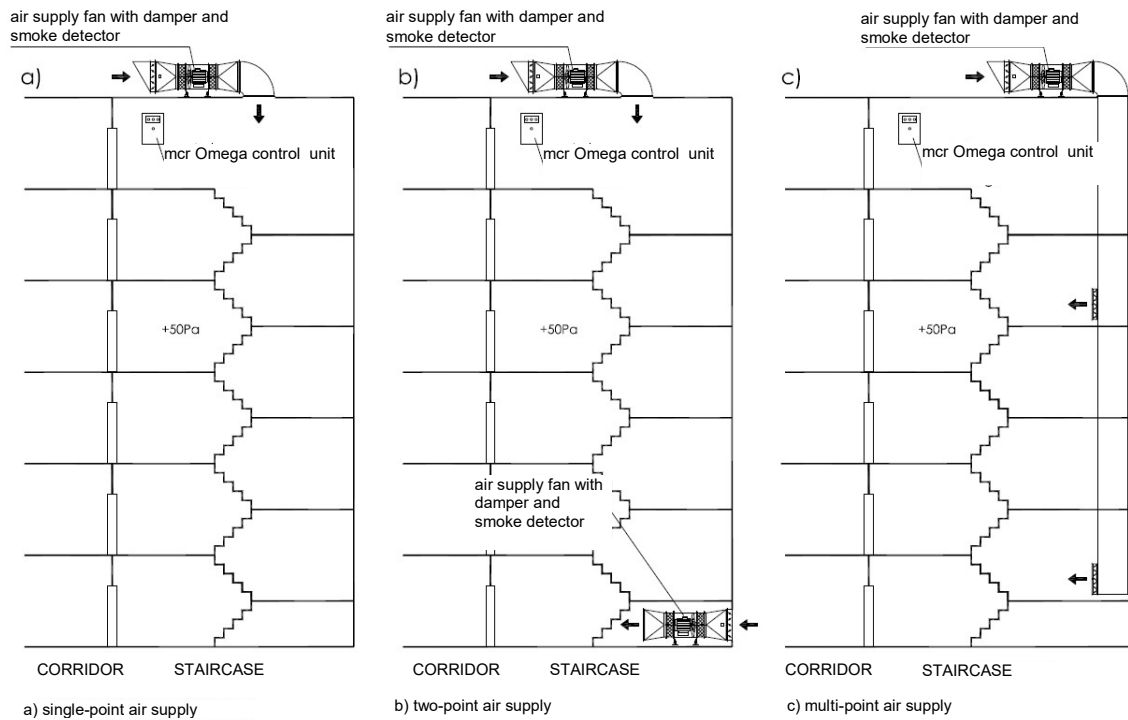
For the air flow rate to reach the required value, air relief is provided using one or more of the following:

- opening in the external wall (e.g. automatically doors – mcr OSO system, grilles),
- vertical air vent shaft with vents in the adjacent areas (e.g. mcr FID S, mcr WIP, mcr WIP PRO) are connected to the common vertical shaft for discharging the smoke at the top of the building,
- mechanical exhaust with a proper design and control system.

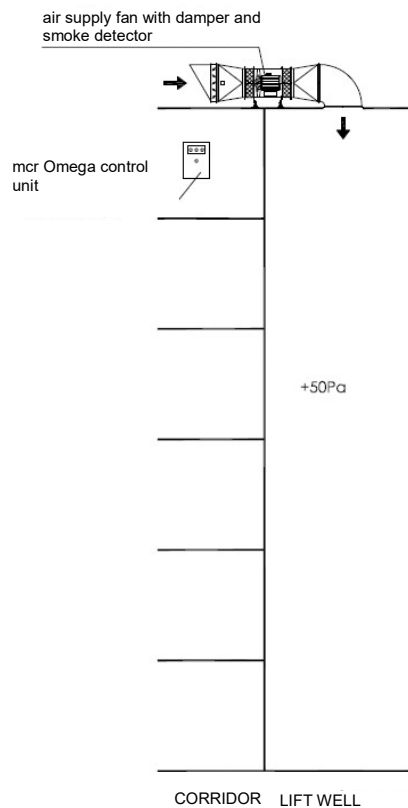


- |   |   |
|---|---|
| ① air supply unit with damper and smoke detector      | ⑥ manual control panel (MCP)                    |
| ② permanent unseal of the system mcr RPC (optionally) | ⑦ louvered vent mcr LAM (optionally)            |
| ③ mcr Omega control unit                              | ➔ air flow direction                            |
| ④ pressure transmitter                                | — wiring  |
| ⑤ air relief  | — optionally, depending on the number of floors |

**Fig. 2.** Example positive pressure mcr EXi-F system



**Fig. 3.** Example air supply to the protected area diagram



**Fig. 4.** Example positive pressure system for lift shaft

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## **3.3. System selection guide**

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mcr EXi-F systems should be installed in accordance with the design developed for a specific building to one of the following design requirements:

- PN-EN 12101-6:2007 Smoke and heat control systems. Part 6: Specification for pressure differential systems. Kits.
- NFPA 92A Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences, 2012 Edition;
- ITB No. 378/2002 Designing fire ventilation systems of escape routes in high and high-rise buildings.

and:

- the Regulation of the Minister of Infrastructure of 12 April 2002 on technical conditions for buildings and their location. Dz.U. No. 75 of 2002, item 690 as amended;
- Technical Approval ITB-KOT-2021/1788.

## **4. SYSTEM COMPONENTS**

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### **4.1. mcr Omega control unit**

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#### **Applications**

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mcr EXi-F pressure differential system kit uses mcr Omega control unit; the unit is compatible with an analog and digital pressure regulators and a frequency converter (inverter). The control unit is used for controlling and monitoring mcr EXi-F pressure differential system components. The device carries out all the required control and operation procedures for the differential pressure system, including timer function of the smoke exhaust fan control.

The unit can also be used as a controller for fire divisions. All the functions related to the positive pressure and fire divisions are controlled by the control unit.



# mcr® EXi-F positive pressure smoke control system

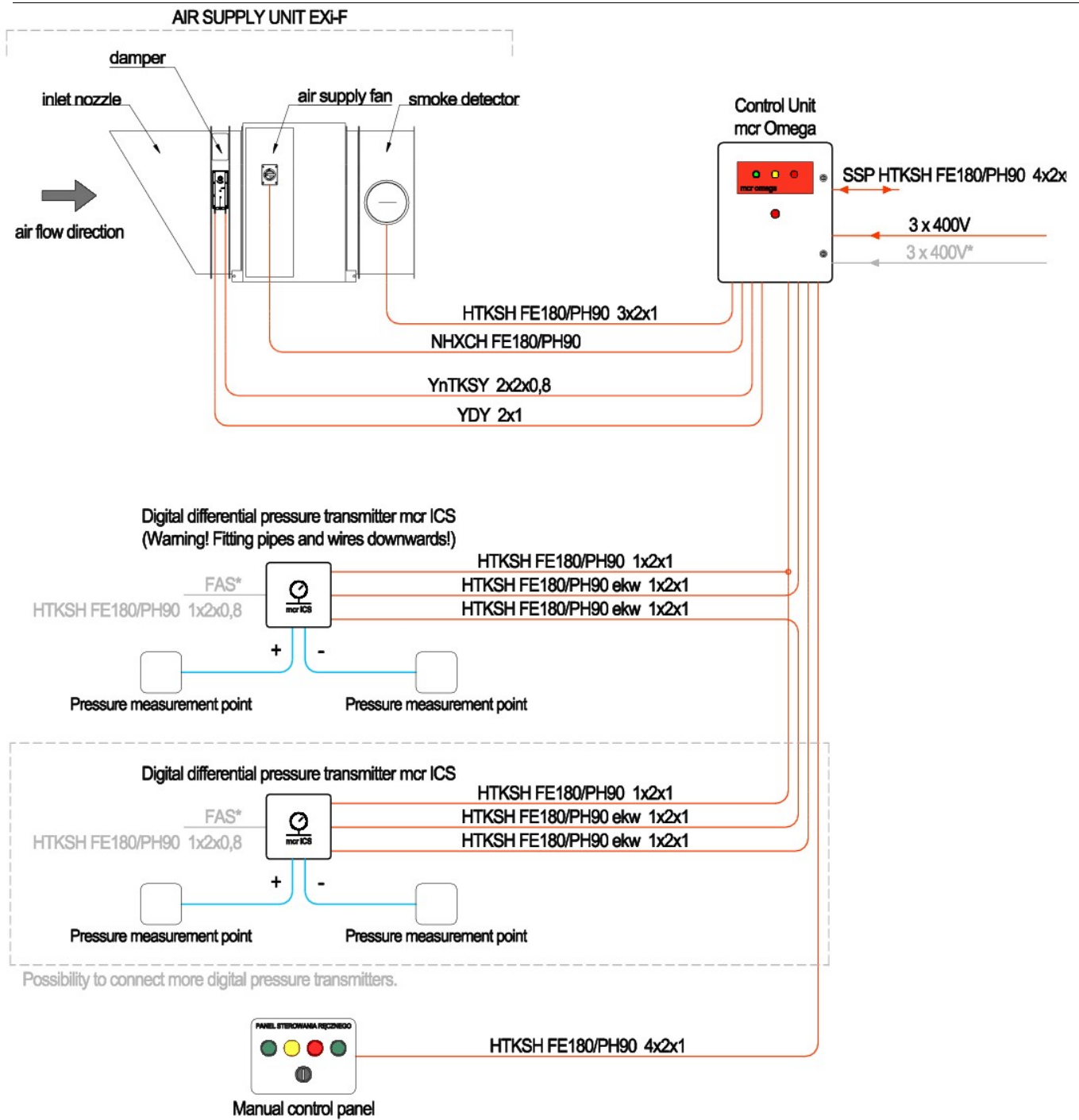


Fig. 5. Example mcr EXi-F system control configuration diagram

## Operation

The automatics used in mcr Omega unit control, supply, monitor and visualize operation of all mcr EXi-F kit components.



**Fig. 6.** mcr Omega control unit - general view

Main control unit (CU) tasks:

- power supply, control and monitoring of the air supply fans for positive pressure via signals from the fire alarm control panel (FACP),
- power supply, control and monitoring of the air control and shut-off dampers, unit maintain dampers power supply
- power supply and operation of the duct smoke detector (used optionally).
- power supply, control and monitoring of dampers used in differential pressure system.

The control unit is supplied with 3 x 400 V. The control unit is powered by an incoming panel for fire protection equipment, which is not being disconnected with a fire switch or is equipped with an automatic reserve power switch (ARPS) in buildings, where no incoming panel for fire protection equipment is available in the main switchboard.

mcr Omega control unit is delivered in powder coated on stainless steel enclosure with front door and IP55 protection rating (external and internal version available). The door is fitted with a gasket, lock or rotary lock with a key. Depending on its version, a cover with cable glands is available at the top or at the bottom of the device. The number and location of cable glands depend on the system size and the number of controlled and supplied external devices. The device dimensions vary from 300 x 200 x 150 mm to 1200 x 2000 x 300 mm depending on the number of controlled devices and the complexity of operations and switching program. A visualization panel with FACP power supply, alarm and failure indicators is mounted on the door.

**Table 1.** mcr Omega control unit specifications

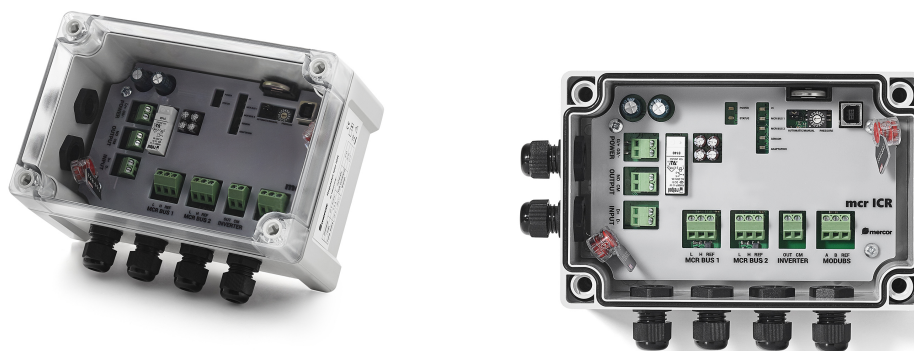
<b>Main supply voltage:</b>	400 V AC +10%. -15%, 50 Hz
<b>Reserve power supply*</b>	Emergency power supply in the building Certified fire protection power supplies Internal ATS (optional).
<b>Backup power:</b>	Lead-acid batteries, AGM
<b>Battery capacity:</b>	2,2Ah-40Ah
<b>Reserve power supply time:</b>	72h
<b>Alarm configuration:</b>	Single stage (2nd stage)
<b>Enclosure protection rating:</b>	IP 54
<b>Environmental class:</b>	III (with temperature extension up to -25°C)
<b>Operating temperature range:</b>	-25°C +75°C
<b>Unit working voltage:</b>	22.5 V ..... 32 V AC (24 V at 20°C)
<b>Enclosure material:</b>	Powder coated or stainless steel
<b>Dimensions (L x W x H)</b>	Type series: from 300x200x150 up to 1200x2000x300
<b>Environmental conditions:</b>	- temperature range from -25°C up to +75°C (-25°C with heating, +75°C with internal ventilation) - relative humidity:90% - protection (e.g. by roofing) against precipitation and solar radiation is required in external use
* power supply and control of smoke control devices and fire divisions which require auxiliary power supply as per relevant regulations	

Control unit components depending on the system size:

- automatics and control block with advanced microprocessor monitoring and control modules (mcr MMS) and intelligent mcr ICR positive pressure regulator module,
- power supply block (power supply with batteries),
- frequency converter (inverter),
- overcurrent protection and three-phase contactors,
- mcr ICR positive pressure regulator (compatible with mcr ICS)

The unit monitors fan supply line continuity also at standstills, interruptions or short-circuit.

**mcr ICR positive pressure regulator** controls fan speed via a three-phase inverter to maintain set positive pressure (20 – 80 Pa) in the protected area. Measured pressure signal is transmitted from the differential pressure sensor to the regulator via a distributed network. To determine the building model, the regulator uses special algorithm for precision control in the environment with unknown or impossible to determine characteristics.



**Fig. 7.** mcr ICR pressure regulator - general view

The following lights indicate pressure regulator failures and alarms:

- MCR BUS 1,
- MCR BUS 2,
- ADAPTATION,
- IN,
- SENSOR.

The alarm light goes on when a failure is detected. Light off indicates correct operation. MCR BUS 1 and MCR BUS 2 indicate failure of the communication bus connecting the system components. Both lights ON indicate major failure of the communication bus. ADAPTATION indicates incorrect pressure regulator adaptation, and if ON, the pressure regulator requires adaptation. IN indicates discontinuity of the alarm line connected to DI+ and DI-. SENSOR indicates failure of one of the system sensors.

Detailed information on detected failures are available via a built-in service interface.

Other errors can be indicated by short-circuiting O and CM terminals (relay output). The terminals are short-circuited when an error is detected.

The following lights indicate regulator status:

- POWER,
- STATUS.

POWER is always on when the power is supplied to the device.

STATUS is always on in standby mode (awaiting an event) or flashing to indicate fire.

Emergency control procedure is activated by FACP signal input with specific parameters. Omega CU requires FACP signal as a voltage free NC switch contact (contact state for operation in standby mode). The contact should be bridged with the end of line resistor to ensure line continuity monitoring. At standby, MMS controller awaiting for FACP signal reads zero resistance at its input and treats it as no alarm. If the contact is opened, the controller reads the resistor resistance and executes a program stored in its memory. If the resistance at the controller input increases to infinity, the unit treats it as a failure, indicates the status with controller lights and transmits a signal.

**After installing and checking the correct operation of all system components, the system starts the adaptation procedure. Pressure regulator operation parameters and adaptation procedure are performed by „MERCOR” or an authorized service centre.**

The control unit cooperates with the fire control panels as per the following procedure: receive signal to activate the fire program (hardwired signal), transmit control unit failure signal to FACP (hardwired signal), confirm control procedure of connected devices by the control unit to FACP (hardwired signal).

Unit inputs and outputs (all lines) are continuously monitored by the end of line resistors for interruptions, short-circuit and time parameters of activation of all connected devices.

The unit door is fitted with a visualization panel with lights indicating:

- power supply status (green light on - power supply on);
- failure/error (yellow light off - correct unit operation);
- FACP alarm (red light off - no FACP alarm);
- "Reset" button (alarm reset), press and hold for approx. 5 seconds to return to the unit's initial state (standby). No FACP signal can be present at the alarm input(s).

All units have a "Test" button. During the test, the unit executes alarm procedure stored in its modules/controllers for a specific fire scenario. After the test, the unit waits for 10 seconds, and irrespective of the results sets its outputs to initial state to set the external devices in alarm standby mode. Check each signal individually if there are several FACP alarms and related TEST buttons.

**NOTE**

The method of mcr Omega unit operation depends on the diagram and program for controlled devices. Detailed wiring diagrams, dimensions, number and type of components used result from the design requirements for a specific building and are included as annexes to this Operation and Maintenance Manual.

Power supply lines of the electric actuators connected to the control supply unit, alarm signal lines from FACP unit are continuously monitored by the unit. The lines for feedback transmitted by the unit to other systems should be monitored by those systems.

**4.2. mcr EXi-F air supply units**

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mcr EXi-F air supply units include the following components:

- a) axial fan in a box type housing with optional accessories;

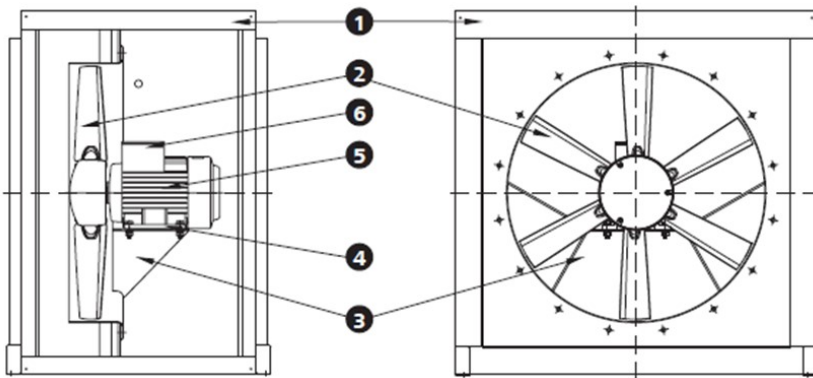
mcr EXi-F air supply unit

- a) multi-blade damper with BLF/BF/BFL/BFN, BLE/BE, NMQ/LMQ/SMQ, NF/SF or MF/MLF series actuator;
- b) duct smoke detector (optional);
- c) mcr LAM exhaust vent (vertical installation of fans in box housing, converging pipe with flange, beveled duct with grille).

mcr EXi-F air supply units include mcr Monsun E1 series axial fans in a box type housing. Air supply fans are characterized by high efficiency at low pressures. The task of the fans is to transport the appropriate amount of air to ensure that the design requirements are met.

The fans can be installed indoors and outdoors in horizontal or vertical position.

mcr Monsun E1 series air supply fans are made in a box casing with an internal mineral wool insulation layer. The box is equipped with connection flanges. A service switch is installed on the casing of the mcr Monsun E1 fan, to which electric cables from the engine are connected.



**Fig. 8.** mcr Monsun E1 fan in box type housing

(1 - box housing with acoustic insulation, 2 – axial impeller, 3 - motor base bracket, 4 – motor base 5 - motor, 6 – junction box)

To reduce noise resulting from operation of the fan may be used noise suppressor. Suppressor's casing is made of galvanized steel sheet, while the suppressor's core is made of perforated galvanized steel sheet, with filling (insulation) made of acoustic mineral wool. Flexible connections are used to eliminate vibrations transmitted by the fan to the ventilation system. For improved system operation safety, it is recommended to protect the flexible connections (for outdoors installations) against birds with a grille or a one-sided metal plate.

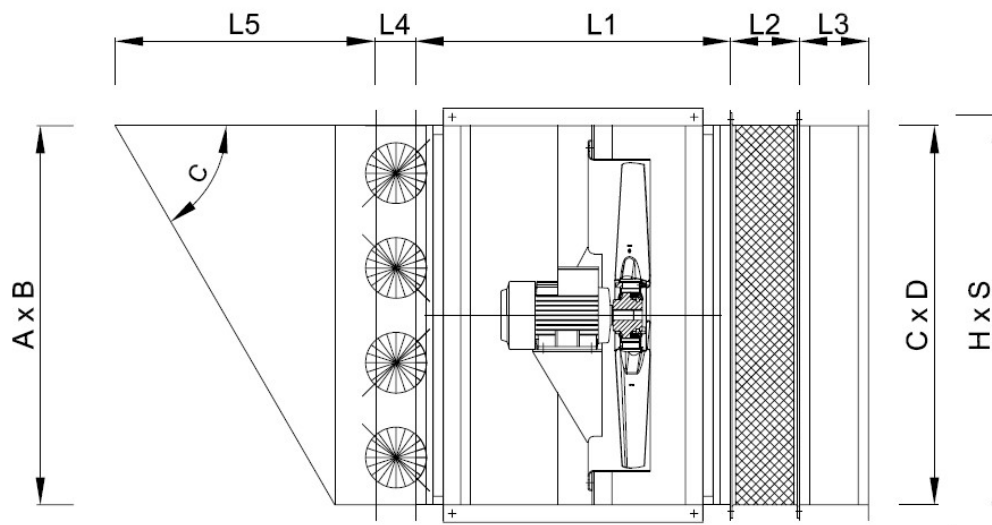
For vertical installation of the air supply unit outdoors, the unit is placed on the base/roof curb, and the discharge side is connected to the air supply system. The suction side is protected against weather conditions with mcr LAM louver vents (Fig. 13). The declared properties and features of LAM vent (e.g. snow load SL 1300, wind load WL 1500) guarantee operation in extreme weather conditions.

For vertical installation indoors, the unit is mounted on the supporting structure and connected to the air supply system in accordance with the design requirements.

mcr EXi-F air supply units include multi-blade dampers with actuator. The rotary mechanism of the damper include gears and bearings or steel rods.

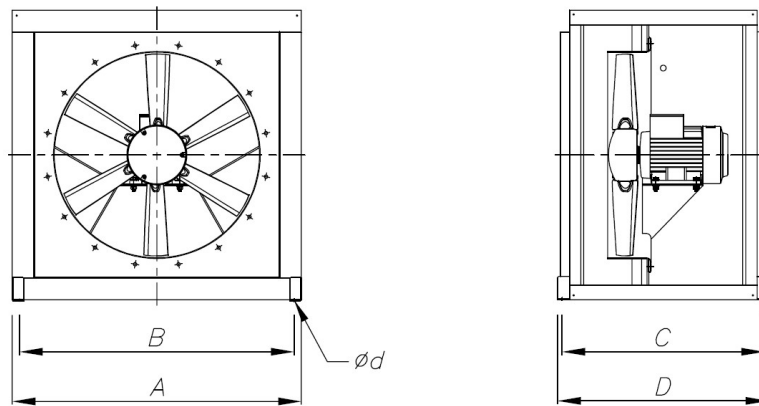
**Table 2.** mcr EXi-F air supply units - Hydraulic parameters

System type	Fan type	Power (kW)	Speed (rpm)	Nominal output (m <sup>3</sup> /h)	External static pressure (Pa)
mcr EXi-F 100-1S	mcr Monsun E 100-4T-20	15	1500	64500	200
mcr EXi-F 100-2S	mcr Monsun E1 100-4T-15	11	1500	60000	200
mcr EXi-F 90-1S	mcr Monsun E 90-4T-10	7.5	1500	45900	200
mcr EXi-F 90-2S	mcr Monsun E1 90-4T-7,5	5,5	1500	40200	200
mcr EXi-F 80-1S	mcr Monsun E 80-4T-5,5	4	1500	30500	200
mcr EXi-F 71-1S	mcr Monsun E1 71-4T-4	3	1500	22000	200
mcr EXi-F 71-2S	mcr Monsun E1 71-4T-1,5	1,1	1500	11500	200
mcr EXi-F 63-1S	mcr Monsun E 63-4T-1,5	1.1	1500	9200	250



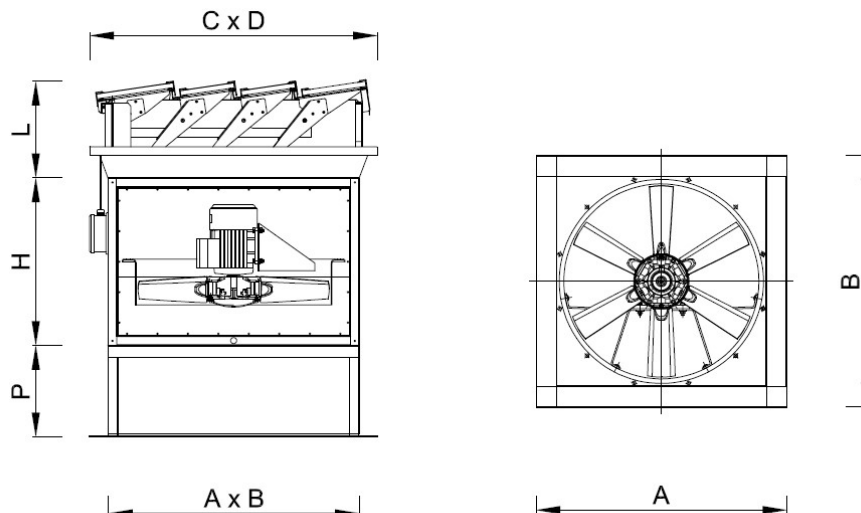
# mcr<sup>®</sup> EXi-F positive pressure smoke control system

Item	System type	H [mm]	S [mm]	A [mm]	B [mm]	L1 [mm]	~L2 [mm]	L3 [mm]	L4 [mm]	~L5 [mm]	C [°]	weight [kg]
1	mcr EXi-F 100-1S	1200	1200	1100	1100	910	130	200	115	755	60	289
2	mcr EXi-F 100-2S	1200	1200	1100	1100	910	130	200	115	755	60	289
3	mcr EXi-F 90-1S	1200	1200	1100	1100	910	130	200	115	755	60	238
4	mcr EXi-F 90-2S	1200	1200	1100	1100	910	130	200	115	755	60	238
5	mcr EXi-F 80-1S	1000	1000	900	900	810	130	200	115	640	60	156
6	mcr EXi-F 71-1S	1000	1000	900	900	810	130	200	115	640	60	156
7	mcr EXi-F 71-2S	1000	1000	900	900	810	130	200	115	640	60	156
8	mcr EXi-F 63-1S	825	825	700	700	710	130	200	115	525	60	101



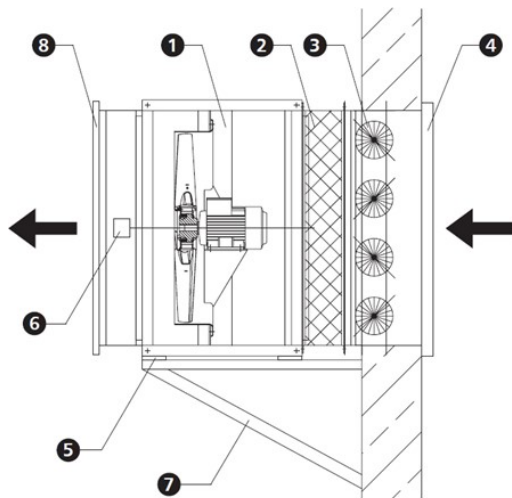
Item	System type	A [mm]	B [mm]	C [mm]	D [mm]	d [mm]
1	mcr EXi-F 100-1S	1200	1150	860	884	13
2	mcr EXi-F 100-2S	1200	1150	860	884	13
3	mcr EXi-F 90-1S	1200	1150	860	884	13
4	mcr EXi-F 90-2S	1200	1150	860	884	13
5	mcr EXi-F 80-1S	1000	950	760	784	13
6	mcr EXi-F 71-1S	1000	950	760	784	13
7	mcr EXi-F 71-2S	1000	950	760	784	13
8	mcr EXi-F 63-1S	825	775	660	684	13

Fig. 9. Dimensions and weights of mcr EXi-F air supply kit with fan in box housing



Item	System type	A [mm]	B [mm]	~C [mm]	~D [mm]	P [mm]	H [mm]	~L [mm]	Weight [kg]
1	mcr EXi-F 100-1S-H	1200	1200	1300	1300	300	750	320	376
2	mcr EXi-F 100-2S-H	1200	1200	1300	1300	300	750	320	376
3	mcr EXi-F 90-1S-H	1200	1200	1300	1300	300	750	320	326
4	mcr EXi-F 90-2S-H	1200	1200	1300	1300	300	750	320	326
5	mcr EXi-F 80-1S-H	1000	1000	1100	1100	300	650	320	228
6	mcr EXi-F 71-1S-H	1000	1000	1100	1100	300	650	320	228
7	mcr EXi-F 71-2S-H	1000	1000	1100	1100	300	650	320	228
8	mcr EXi-F 63-1S-H	825	825	945	945	300	550	320	157

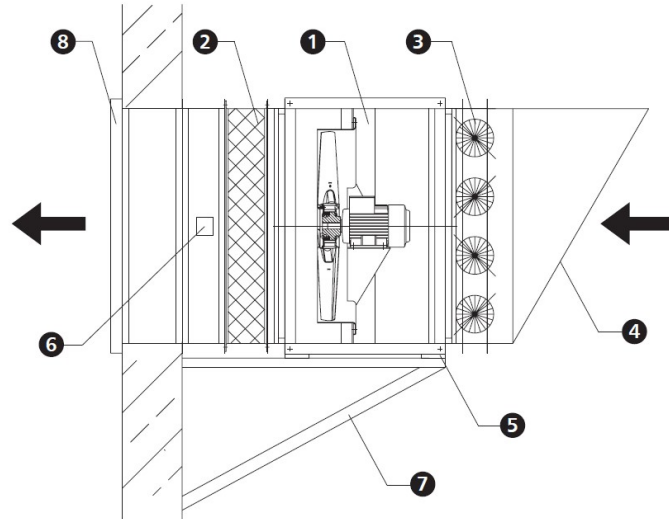
**Fig. 10.** Dimensions and weights of mcr EXi-F air supply kit with fan in box housing



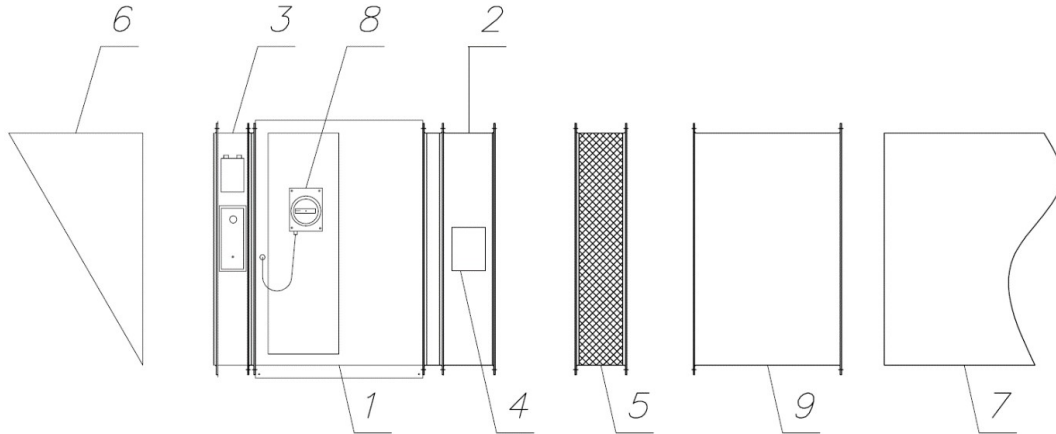
**Fig. 11.** Example mcr EXi-F air supply unit in wall-mounted version (installation indoors)

(1 - fan in a box housing, 2 - flexible connection, 3 - damper with actuator, 4 - air intake, 5 - vibro-isolating pad or shock absorbers, 6 - smoke detector, 7 - supporting structure, 8 - protective mesh)





**Fig. 12.** Example mcr EXi-F air supply unit in wall-mounted version (installation outdoors)  
 (1 - fan in a box housing, 2 - flexible connection, 3 - damper with actuator, 4 - air intake, 5 - vibro-isolating pad or shock absorbers, 6 - smoke detector, 7 - supporting structure, 8 - protective mesh)



**Fig. 13.** Example horizontal installation of mcr EXi-F air supply unit  
 (1 - fan in box housing, 2 – ventilation duct, 3 – damper,  
 4 – duct smoke detector, 5 – flexible connector, 6 – fan inlet protection, 7 – junction box, 9 – noise suppressor)

## 4.2. Differential pressure transmitter

### 4.2.1. mcr ICS digital differential pressure transmitter

The device measures differential pressure in a protected area at increase pressure (staircases, lift shafts, protected lobbies, exit access corridors). The device should be connected to two pressure line. The measurement results are transmitted in real time via a digital interface to the regulator controlling fan operation (via an inverter).



**Fig. 14.** mcr ICS digital pressure transmitter - general view

mcr ICR pressure regulator can be connected to 24 mcr ICS digital pressure transmitters. The system components communicate via mcr BUS with high throughput and providing the highest safety level. mcr BUS is a multi-master type bus where the data can be transmitted anytime by any device connected to the bus, and each transmitter may immediately notify the pressure regulator on any failure or alarm signal.

The components are connected in a loop to guarantee efficient operation of the entire system in case of a single communication cable failure.

The line continuity is continuously monitored. The pressure converters send periodical status information to the regulator to ensure continuous monitoring of the system status and detection of the following failures:

- line discontinuity,
- mcr ICS digital pressure transmitter removed or faulty
- alarm input discontinuity for mcr ICS,
- digital pressure transmitter failure for mcr ICS.

The pressure source is connected via a flexible 8 mm dia. pressure line (5 m pressure line included with the pressure transmitter).

**Table 3.** mcr ICS pressure transmitter specification

Power supply	24±15% [V], AC/DC
Protection	Internal safety fuse, 140 [mA]
Operating temperature	-25÷55 [C]
Enclosure protection rating	IP44
Dimensions	135 mm x 135 mm x 65 mm
Installation	To flat surface with 2 screws
Cable grommets	Grommets - 4 PG11 cable glands with seal.
Electrical connection	Maximum wire diameter 2.5 [mm <sup>2</sup> ], max. 1 wire per terminal
Pressure connection	Pressure line connectors. Connectors outside the enclosure, dia. 6 (mm)
Output	Differential interface, distributed system, galvanic separation mcr BUS driver
Sensor range	Pressure -500 ÷ +500 (Pa)

# mcr® EXi-F positive pressure smoke control system

Maximum allowable positive pressure	100 [kPa]
Measurement error	+/-1.5 [%]

The following lights indicate the pressure transmitter alarms and failures:

- MCR BUS,
- PRESSURE,
- IN.

MCR BUS indicates the communication bus failure. PRESSURE indicates the pressure sensor failure. IN indicates discontinuity of the alarm line connected to DI+ and DI-.

The following lights indicate the pressure transmitter status:

- POWER,
- STATUS.

POWER is always on when the power is supplied to the device. STATUS is always on when awaiting an event or flashing when indicating fire.

## 4.3. Auxiliary components of mcr EXi-F system

### 4.3.1. Intake vent switching system

If the air inlets are at the roof level, two air inlets are required, distant from each other and facing different direction to avoid leeward position in relation to the smoke source. Each inlet should provide full air supply required by the system. All inlets should be protected by an independent system of smoke control dampers (when one damper closes due to the smoke, another inlet will supply air required by the system). The smoke is detected by the smoke detectors upstream of each damper.

An intake vent switching system with two opposed dampers and Belimo B(L)E actuators is used.

Item	System type	Air damper			weight [kg]
		a [mm]	b [mm]	c [mm]	
1	mcr EXi-F 100-1S	1100	1100	115	18.5
2	mcr EXi-F 100-2S	1100	1100	115	18.5
3	mcr EXi-F 90-1S	1100	1100	115	18.5
4	mcr EXi-F 90-2S	1100	1100	115	18.5
5	mcr EXi-F 80-1S	900	900	115	14
6	mcr EXi-F 71-1S	700	700	115	10
7	mcr EXi-F 71-2S	700	700	115	10
8	mcr EXi-F 63-1S	700	700	115	10

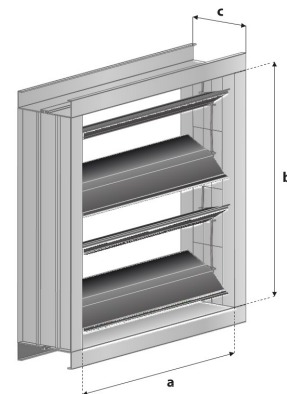
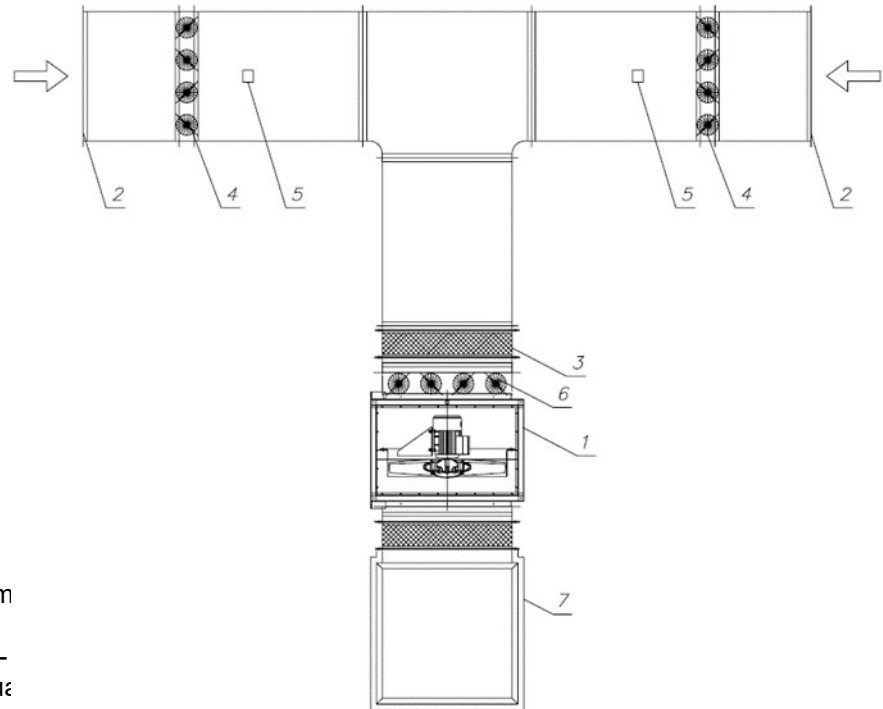


Fig. 15. Basic dimensions of the air dampers used in two damper configuration



**Fig. 16.** Exam

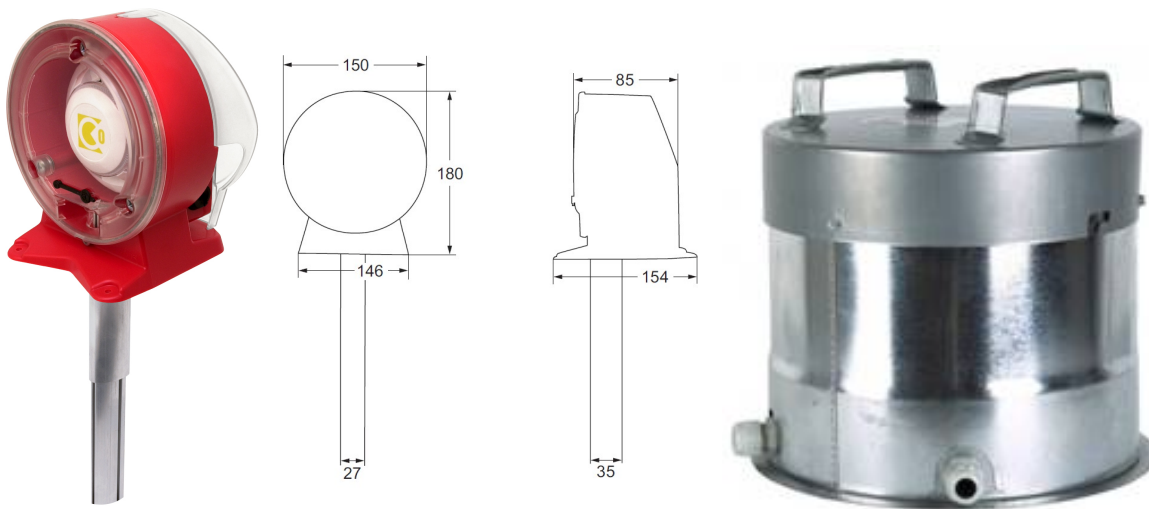
(1 -  
4 – dampers with actuators

version)

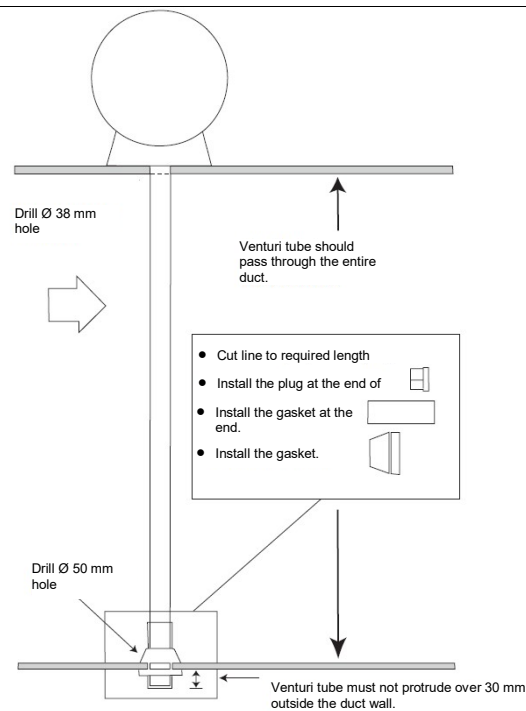
**4.3.2. Duct smoke detector UG-3-A4**

If the air inlet is not at the roof level, in the inlet duct or directly near the air supply ducts, a smoke detector for automatic deactivation of the pressure differential system should be provided in case when large volumes of smoke are present in the supplied air.

If the air inlets are at the roof level, two air inlets are required (two intake vents configuration). Each inlet must be protected by an independent damper system with a duct smoke detector installed upstream.



**Fig. 17.** Duct smoke detector (from left): general view, dimensions, UG Cover (for built-in installation)

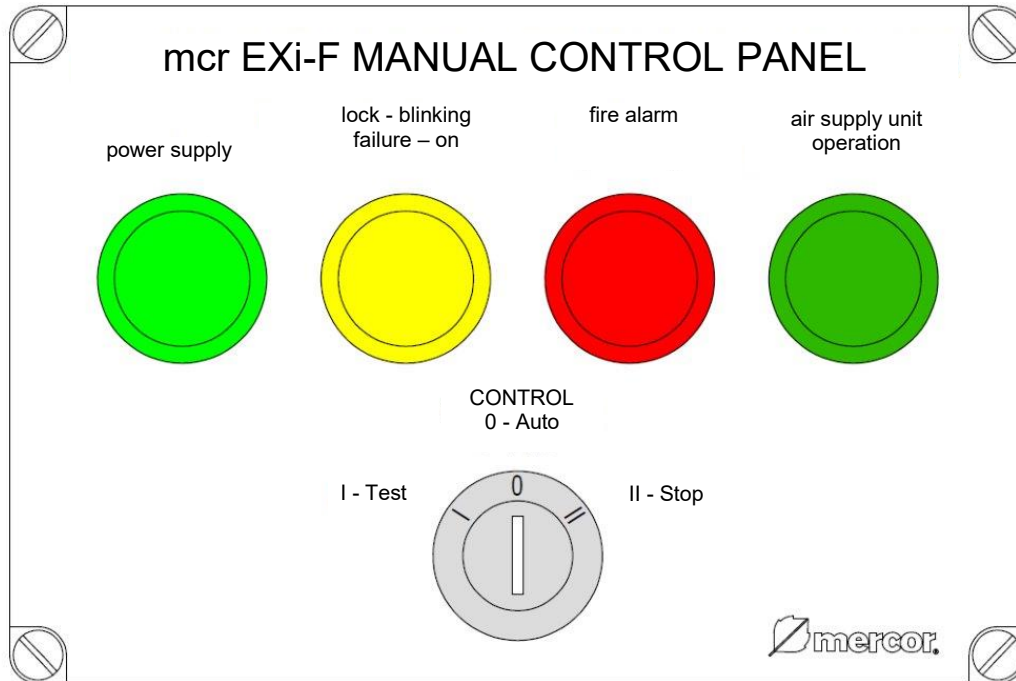


**Fig. 18.** Duct smoke detector installation in the air supply duct

#### 4.3.3. Manual control panel (MCP)-

Manual control panel for remote system control using a switch located in a key-locked cabinet. The panel allows manual air supply system activation and deactivation by a fire-fighter during any fire-fighting operations. The panel should be located near the fire exits and easily accessible to the rescuers. The panel indicates unit operation status:

- power supply – green light ON indicates correct system operation,
- failure – yellow light ON indicates system failure,
- alarm – red light ON indicates alarm,
- lock – blinking yellow light indicates manual lock,
- air inlet fan operation - green light ON indicates air supply unit operation



**Fig. 19.** Example manual control panel view.

## 5. WIRING SYSTEM

### 5.1. mcr Omega control supply unit

The control unit is used for controlling and monitoring mcr EXi-F pressure differential system components.

Main automatics system tasks:

- power supply, control and monitoring of the air supply fans for positive pressure via signals from the fire alarm control panel (FACP),
- power supply, control and monitoring of the air control and shut-off dampers,
- power supply and operation of the duct smoke detector,
- power supply, control and monitoring of dampers used in differential pressure system.

The control unit is supplied with 3 x 400 V. The control supply unit is powered by an incoming panel for fire protection equipment, which is not disconnected with a fire switch or is equipped with an automatic reserve power switch (ARPS) in buildings, where no incoming panel for fire protection equipment is available in the main switchboard.

**Detailed wiring diagrams, dimensions, number and type of components used result from the design requirements for a specific building and are included as annexes to this Operation and Maintenance Manual.**

**Table 4.** List of recommended power cable types for mcr EXi-F air supply units.

Air supply unit	Fan type	Omega CU power supply	Recommended cable diameters NHXCH FE 180 PH90/E90 0.6/1 kV*
mcr EXi-F 100-1S	mcr Monsun E1 100-4T-20	mcr OMEGA 100.15	4x10
mcr EXi-F 100-2S	mcr Monsun E1 100-4T-15	mcr OMEGA 100.11	4x10
mcr EXi-F 90-1S	mcr Monsun E1 90-4T-10	mcr OMEGA 90.7	4x6
mcr EXi-F 90-2S	mcr Monsun E1 90-4T-7,5	mcr OMEGA 90.5	4x4
mcr EXi-F 80-1S	mcr Monsun E1 80-4T-5,5	mcr OMEGA 80.4	4x4
mcr EXi-F 71-1S	mcr Monsun E1 71-4T-4	mcr OMEGA 71.3	4x2,5
mcr EXi-F 71-2S	mcr Monsun E1 71-4T-1,5	mcr OMEGA 71.1	4x1,5
mcr EXi-F 63-1S	mcr Monsun E1 63-4T-1,5	mcr OMEGA 63.1	4x1,5

*recommended cross-sections calculated for the distance between the control devices and Omega unit up to 50 m*

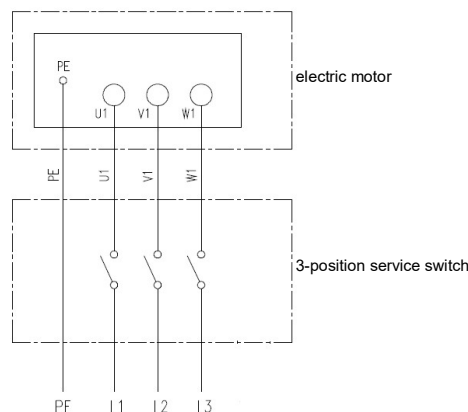
**Table 5.** List of recommended power cable types for mcr EXi-F auxiliary devices.

Device name	Power supply	Recommended cable*
BE, BLE actuator	mcr Omega unit...	HDGs FE 180 PH90/E90 3x1,5
BLF/BF/BFL/BFN, NF/SF, MF/MLF actuator	mcr Omega unit...	YdY 2x1, YnTKSY 2x2x1
NMQ/LMQ/SMQ actuator	mcr Omega unit...	HTKSH FE180 PH90 2x2x1
duct smoke detector	mcr Omega unit...	HTKSH FE180 PH90 3x2x1
mcr ICS pressure transmitter	mcr Omega unit ... (mcr ICR positive pressure regulator);	HTKSH FE180 PH90 ekw 2x2x1, HTKSH FE180 PH90 1x2x1
pressure switch (auxiliary system)	mcr Omega unit...	HTKSH FE180 PH90 2x2x1
manual control panel	mcr Omega unit...	HTKSH FE180 PH90 4x2x1
mcr ICS (protected lobby)	SSP system, control module	YnTKSY 1x2x1

*recommended cross-sections calculated for the distance between the control devices and Omega unit up to 50 m*

## 5.2. mcr EXi-F air supply units

mcr EXi-F air supply units can be fitted with service switches for cutting off fan power supply before inspection or maintenance.



**Fig. 20.** Wiring diagram for the service switch for mcr EXi-F air supply unit

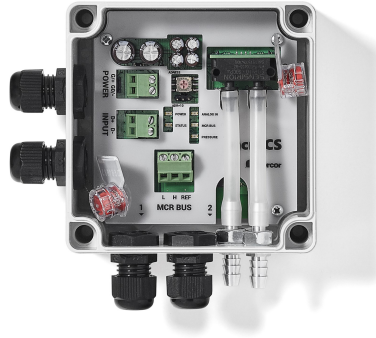
**Note:**

Do not use the service switch during air supply unit operation.  
Using the service switch during air supply unit operation will damage the speed regulator of the Omega control supply unit.

## 5.3. mcr ICS pressure transmitters

### 5.3.1 mcr ICS digital pressure transmitter

The pressure source is connected via a flexible 8 mm dia. pressure line (2 m pressure line included with the pressure transmitter), power supply 24 [V], AC/DC (connected to mcr ICR installed on mcr Omega unit). Data transmitted via mcr BUS protocol. Number and type of cables required for mcr ICS connection, see Table 6.



**Fig. 21.** mcr ICS transmitter terminals view

#### **Protected lobby protection.**

mcr ICS digital pressure transmitters connected to mcr Omega control supply unit are installed in the protected lobbies. A fire signal for a specific floor is provided for each controller. In case of a fire, mcr ICS assigned to a specific floor is activated. The pressure is adjusted based on the read-outs from the activated mcr ICS pressure transmitter.

**Note:**

Pressure line connection polarity does not affect measurement accuracy, since each regulator responds to the absolute measurements.

Pressure system outside the building should be made with silicone pressure lines (resistant to low temperature). Protect the ends of the hydraulic lines against accidental blocking. Use outlet boxes included with mcr ICS pressure transmitter.

Follow the instructions for installation of pressure lines. The pressure lines must be installed with a gradient from mcr ICS pressure transmitter to the outlet box, avoiding flow restrictions. Use fittings and lead the pressure line in the RL type conduits, flush or surface-mounted, as an additional protection against mechanical damage.

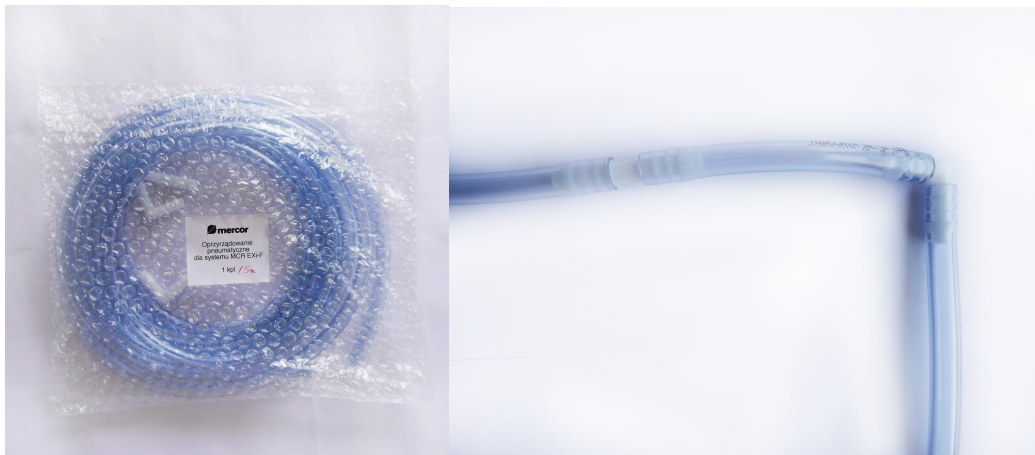




**Fig. 22.** Pressure line installation guide.

If the pressure measurement points are at a large distance from the pressure transmitter, additional set of pressure lines (5 m long and 8 mm diameter) can be used (maximum total pressure line length should not exceed 12 m).

Additional set of pressure lines include 4 fittings (2 elbows and 2 straight connectors).

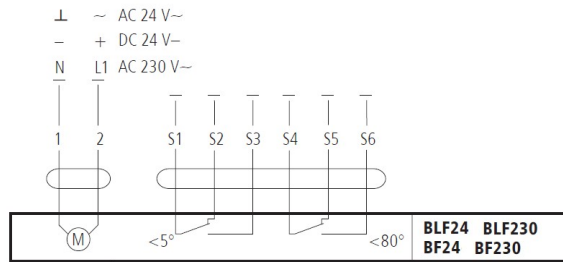


**Fig. 23.** Additional pressure line set with accessories.

Pressure system outside the building should be made with silicone pressure lines (resistant to low temperature). Protect the ends of the hydraulic lines against accidental blocking. Use back boxes with pre-drilled holes in the cover.

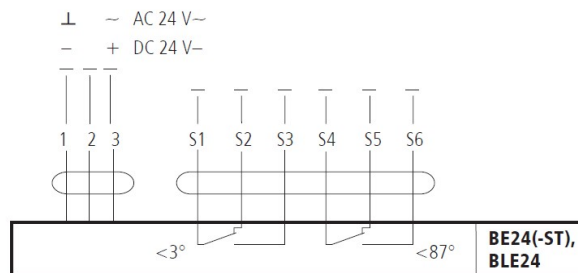
#### **5.4. Damper actuators**

mcr EXi-F air supply units are also available with multi-blade dampers with Belimo BLF/BF/BFL/BFN, BLE/BE, NMQ/LMQ/SMQ, NF/SF or Mercor MF/MLF



**Fig. 24.** Wiring diagram for Belimo BLF/BF/BFL/BFN, MF/MLF, NF/SF actuator (shut-off damper for mcr EXi-F air supply units)

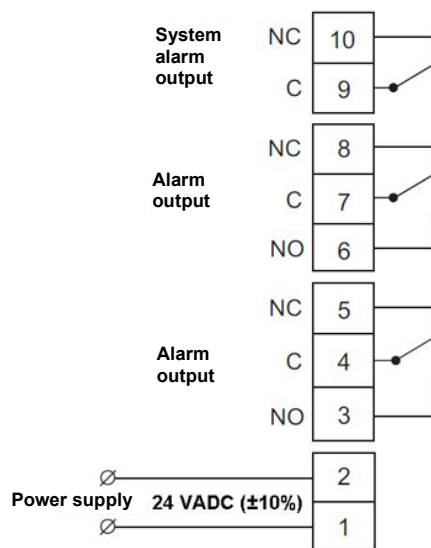
Belimo BE actuators (no spring return) are used in dampers in the intake vent switching system



**Fig. 25.** Wiring diagram for Belimo BE/BLE actuator in two-intake vent switching system

### 5.5. Duct smoke detector

The duct smoke detector features relay outputs indicating alarm (smoke detecting) and technical alarm (service).



**Fig. 26.** Duct smoke detector wiring diagram

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## 6. TRANSPORT AND STORAGE

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mcr Omega control unit with the differential pressure transmitter (mcr ICS or Beck 485M) is packed individually in a carton box and secured against mechanical damage. The carton box for large units is fixed to the wooden pallet. The unit can be transported by any means provided that it is protected against weather conditions. During transport, the unit is placed on the base plate (do not lean on optical indicators or control fittings). Check the device for damage during transport. Store indoors protected against weather conditions. Insulate the device when possible.

The air supply units with auxiliary components (duct smoke detectors, shut-off dampers) for mcr EXi-F system (for transport and storage) are delivered on pallets.

Do not throw or tilt the packaging during transport and handling. The fans can be transported by any means provided that they are protected against weather conditions. Protect the fans against shifting in transport. Check the fan for damage during transport.

Store indoors:

- no dust, corrosive vapours and gases or other aggressive chemical fumes which may damage the insulation or structural components of the motor or fan;
- maximum relative humidity up to 80% at + 20°C;
- ambient temperature –20°C to +40°C;
- no vibrations.

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## 7. MAINTENANCE AND SERVICING

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„MERCOR” S.A. products require periodical inspections and maintenance at least every 12 months throughout its operating period, i.e. warranty and post-warranty period. Inspections and maintenance must be carried out by the device manufacturer or a service centre authorized by „MERCOR” S.A.

The service inspections of fire protection devices are required by the § 3 sec. 3 of the Regulation of the Minister of Interior and Administration of 7 June 2010 on fire protection of buildings, other construction facilities and sites (Journal of Laws Dz. U. 2010 no. 109, item 719).

The following are recommended between inspections:

- Check electrical connections for mechanical damage.
- Check if the supply voltage for the devices is within the following tolerances:
  - 24 V±10% for electric actuators
  - 24 V±2% for electromagnetic releases
  - 230 V ±10% for electrical actuators
  - 24 V±2% for electromagnetic releases
- Check device bodies for mechanical damage.
- Check for obstacles which may affect correct operation of the devices.

To enable inspections, servicing and warranty related operations, including checks and repairs, User must provide access to the device by removing thermal insulation, suspended ceilings and any other systems preventing access to the device etc.

Install cleanout, e.g. mcr KRW for all duct-mounted devices.

Provide access to the roof (ladder or lift) for all roof-mounted devices.

For any issues regarding inspections, maintenance and servicing please contact „MERCOR” S.A. Service Department at [serwis@mercor.com.pl](mailto:serwis@mercor.com.pl), phone 058/ 341 42 45 ext. 170 or fax 058/ 341 39 85 office hours 8 – 16 (Mon-Fri).

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## 8. WARRANTY TERMS AND CONDITIONS

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1. „MERCOR” S.A. provides a 12-month quality guarantee for all its products from the date of purchase, unless otherwise stated in the purchase contract.
2. „MERCOR” S.A. shall repair any product defects identified within the warranty period within 21 days from a written notification and after providing a proof of purchase or purchase contract, subject to par. 6.

3. „MERCOR” S.A. reserves the right to extend the repair period for complex repairs or repairs which require purchase of non-standard components or spare parts.
4. This warranty covers inherent defects only.
5. For any defects due to the misuse or any reasons detailed in par. 5, the Purchaser/Warranty Beneficiary will be charged any expenses incurred for their repair.
6. Warranty does not cover:
  - damage or failure due to the misuse, user interference, failure to inspect or maintain the device as laid down in "SERVICING AND MAINTENANCE" of this Operation and Maintenance Manual;
  - device damage, other than caused by „MERCOR” S.A., in particular caused by random events, e.g. driving rain, flood, hurricane, flooding, lightning strike, mains overvoltage, explosion, hail, airplane crash, fire, avalanche, soil creep and secondary damage due to those events. Driving rain has a run-off coefficient of at least 4, as defined by the Institute of Meteorology and Water Management. If the run-off coefficient cannot be determined, the factual circumstances and actual damage on site will be considered, indicating driving rain. Hurricane has a wind speed of at least 17.5 m/s (damage is considered as being caused by the hurricane, if the hurricane was identified in the nearest vicinity);
  - damage due to the failure to notify about any identified defect;
  - coating quality deterioration due to the natural ageing;
  - defects due to the use of abrasive or aggressive cleaning agents;
  - damage due to the aggressive external factors, in particular, chemical and biological factors arising from the production processes and activities on site or in the vicinity of the device;
  - natural wear and tear (e.g. gaskets), unless an inherent defect was identified;
  - damage due to the incorrect transport, unloading and storage;
  - damage due to the failure to follow the installation instruction in the Operation and Maintenance Manual and good practices;
  - devices or their components if the data plate or any warranty seals are removed or broken.
7. Warranty claims should be made to „MERCOR” S.A. within 7 days from the date the defect was identified.
8. Warranty claims can be made at: phone: 58/341-42-45, fax: 58/341-39-85, e-mail: [reklamacje@mercor.com.pl](mailto:reklamacje@mercor.com.pl) or: „MERCOR” S.A., ul. Grzegorza z Sanoka 2, 80-408 Gdańsk.
9. Purchaser/Warranty Beneficiary must operate the device in a correct manner, inspect and maintain the device in accordance with this Operation and Maintenance Manual as laid down in section "SERVICING AND MAINTENANCE".
10. The warranty is voided immediately in case of:
  - Structural modifications of the device by the Purchaser/Warranty Beneficiary without „MERCOR” S.A. approval, failure to carry out periodical inspections and maintenance as scheduled, by unauthorized personnel or by a service centre not authorized by „MERCOR” S.A. or device misuse and modifications by unauthorized personnel other than required in normal device operation.
11. The warranty guarantee of „MERCOR” S.A. does not apply in the cases specified in section 10.
12. A precondition for the repair is to provide access, in particular access to the room the devices are installed in and all the cleanouts, remove thermal insulation, suspended ceilings and other systems preventing access to the device etc.

*To all matters not settled herein provisions of the Civil Code shall apply.*