

# iSWAY-FC®

## COMPACT PRESSURISATION UNIT



### Characteristics:

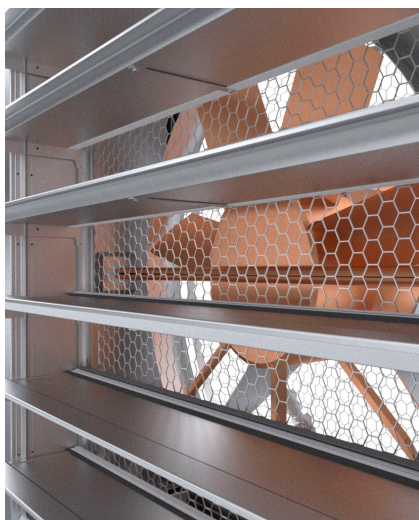
Set of products for pressure differentiation in smoke and heat control systems. Compact pressurisation unit with complete automation and accessories.

### Intended use

The iSWAY® sets of products are intended for overpressure protection against smoke of escape routes in buildings in case of fire. Examples of SAFETY WAY® system layouts both during evacuation and rescue and firefighting operations. Thanks to a wide range of variants and available accessories, even the most complex pressure differential systems can be built of iSWAY® devices to provide effective protection against smoke in evacuation routes in buildings of various purposes.

### Examples of using iSWAY® devices

Any pressure differential systems can be built using iSWAY® devices. The choice of the device type, its location, additional components and necessary accessories should be made by the designer, taking into account the height and architecture of the building, the evacuation scenario and detailed design assumptions.



### Examples of SAFETY WAY® system layouts

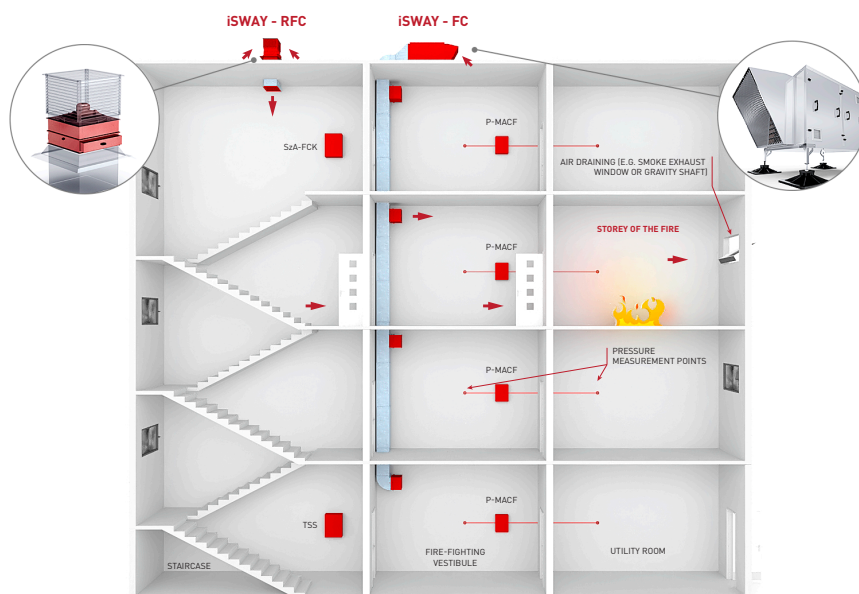


Figure 1. Aeration of the staircase with the use of multi-point ventilation and an iSWAY-FC® device..

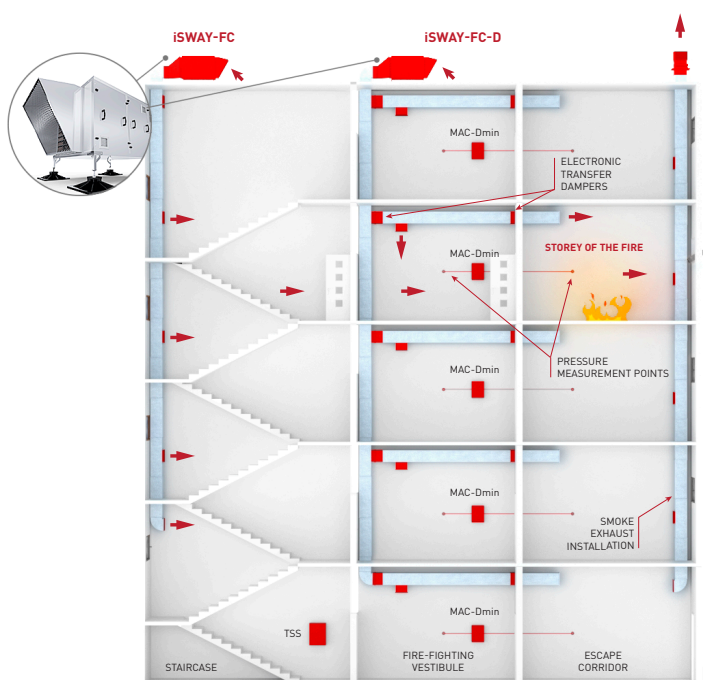
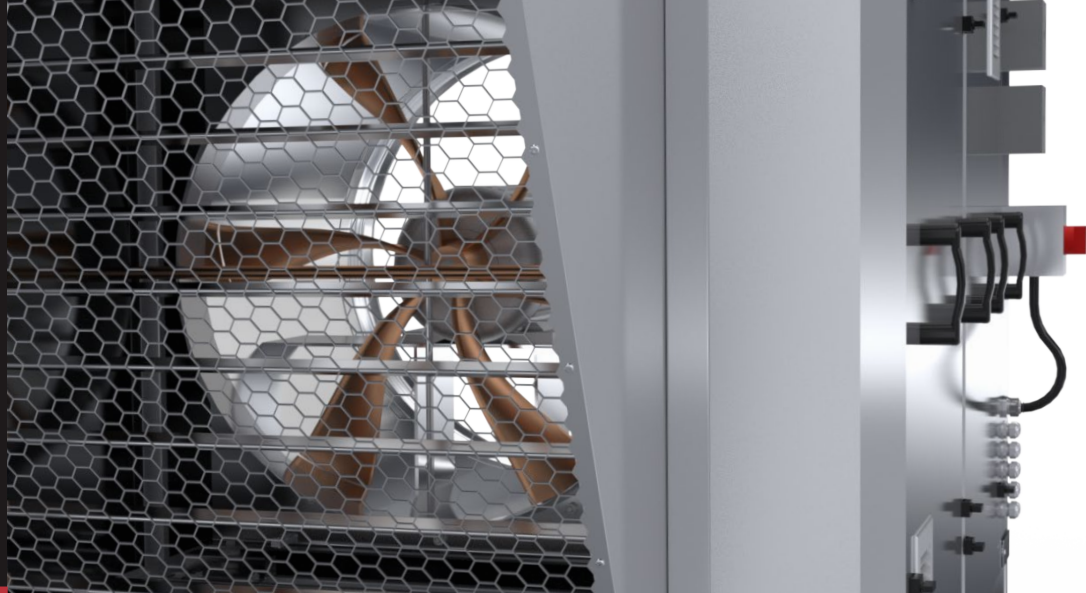


Figure 2. . Aeration of the staircase with the iSWAY-FC® device with multi-point airflow and the vestibules with the iSWAY-FC® device with electronic transfers ensuring compensation of smoke exhaust from corridors.

# FIRE VENTILATION ZONE

National Technical Assessment  
ITB-KOT-2018/0565



## Principle of operation

The creation and precise regulation of overpressure in protected spaces is carried out by changing the fan capacity based on measuring the pressure difference between the protected space and the reference (interior of the building or surroundings). The air stream supplied to the protected space is set automatically by changing the rotation speed of the fan equipped with a frequency converter (inverter). ISWAY® devices ensure that the escape routes are kept free of smoke, both during the pressure criterion (all doors closed) as well as during evacuation and rescue and fire-fighting operations (open doors in accordance with the adopted design assumptions). The sets of iSWAY-FC®, -RFC® and -WFC® devices provide continuous measurement and monitoring of overpressure in the protected space and an immediate response to its change by increasing or reducing the fan capacity without the need for mechanical overpressure dampers in staircases and standard transfer flaps in the atria.

## Advantages of using iSWAY® devices

- complete aerodynamic and electrical tests carried out by independent laboratories confirming the efficiency, reliability and durability of devices,
- meeting all the requirements of the European standard PN-EN 12101-6 and the draft European standard prEN 12101-13,
- a wide range of execution and dimensions variants enabling installation in virtually any space inside and outside the building,
- precise pressure regulation using an innovative prediction algorithm based on neural networks, ensuring automatic adaptation to changes in building characteristics, e.g. increased leakage of the protected space as a result of material aging,
- simplified hydraulic regulation and system calibration,
- no need for mechanical overpressure flaps to regulate pressure in staircases and transfer flaps in the atria,
- continuous monitoring of operating parameters of key device components,
- automatic self-test function every 24-hours, allowing to reduce the duration of periodic inspections and reduce operating costs,
- visualization of the architecture of the pressure differential system with the location of key components and indications of the measured pressure difference,
- Monitoring of Device Operating Conditions (MSPU) with a user-friendly All-in-One interface enabling rapid system diagnostics.

Table 1. Components of the iSWAY® devices.

NAme	Component appearance	Brief description
Control and Signalling Board <b>TSS</b>		indication of current value of overpressure in the protected space, monitoring of proper operation of iSWAY® type devices and possibility of manual control of the iSWAY® devices
Monitoring of Device Operating conditions <b>MSPU</b>		visualization of architecture and diagnostics of complex pressure differential systems of SAFETY WAY® type
Control Board <b>TS</b>		manual control of the iSWAY® devices (to be used along with MSPU)
Pressure sensor <b>P-MACF</b>		measuring the pressure difference between the protected space and the reference
Digital pressure controller <b>MAC-D-Min</b>		control of dampers to maintain the set overpressure value in protected spaces
connector box <b>PZ</b>		Connection of damper actuators with MAC-D-Min controllers
Temperature sensor <b>T-MACF</b>		measuring the temperature of inside and outside air. Using in reversible pressure differential system SAFETY WAY (R) to determine flow direction.
I/O card <b>MAC-LINK</b>		extension of the basic functionality of the pressure differential system in buildings by increasing the available number of digital and analog inputs/ outputs

## Communication and control

To ensure the highest level of reliability, loop-based architecture connections have been used in systems based on iSWAY® devices. Each device implements an individually programmed scenario, which means that there is no need to use a master controller. A dedicated two-way, ring-type fireBUS® bus has been used for communication and control. There are two types of fireBUS® loops:

- Global fireBUS® - a global loop connecting MAC-FC controllers in iSWAY automation cabinets and a Control and Signal Board (TSS) or Control Board (TS),
- Local fireBUS® - a local loop connecting MAC-FC controllers remote pressure difference sensors P-MACF, pressure regulators MAC-D-Min, temperature sensors T-MAC and MAC-LINK cards.

### Advantages of using the fireBUS:

- fast and stable data transmission ensuring quick response of the pressure differential system to changes in building conditions, e.g. door opening and closing,
- higher resistance to interference and damage compared to standard solutions used in pressure differential systems (a single break in any place does not reduce the functionality of the system, a double break results in a loss of communication between faults)
- a significant reduction in capital expenditure on wiring a pressure differential system by connecting devices in loops instead of separate lines.

## The SAFETY WAY® pressure differential system

The SAFETY WAY® pressure differential system is an innovative technical solution developed by SMAY Sp. z o.o. with a view to securing staircases and lift shafts in high-rise buildings. The application of the system allows obtaining stable overpressure in aerated spaces by limiting the influence of the chimney effect, wind effect and the piston effect. The SAFETY WAY® is the result of a research and implementation project lasting over two years, including real-scale experiments, laboratory tests and complex numerical analyzes (CFDs). With the use of this solution, you can secure the entire building or only selected spaces, e.g. staircases, in addition, the system can be integrated with all standard BMS solutions. Regardless of the option selected, the SAFETY WAY® system is equipped with complete factory automation including monitoring and visualization of the operating parameters of individual components in real time.

In the basic version, the system consists of three iSWAY -FC® devices. Two of them are iSWAY-FC-R devices equipped with reversible fans, whose task is to aerate and create a directed flow of air in the protected space. The third is a supply device of iSWAY-FC-D type, which compensates for the pressure drop resulting from leakage of the protected space. In the case of lift shafts, it is sufficient to use two devices of the iSWAY-FC-R type. The SAFETY WAY® system can be successfully used to aerate the shafts of high speed elevator cranes. The number of iSWAY® devices depends mainly on the height of the building and the method of supplying air to the staircase.

The principle of operation of the system consists essentially of using the flow resistance of a staircase or lift shaft to compensate for the pressure gradient caused by the chimney effect. The airflow direction is set automatically when the system is started, based on the measured temperature difference (T) of the indoor and outdoor air. The performance of individual sets is automatically regulated on the basis of a continuous measurement of the pressure difference (P) between the overpressure protected space, e.g.

staircase and reference. In order to become independent of the negative impact of wind pressure and suction, reference pressure measurement points are located on selected floors inside the building.

## The most important advantages of the SAFETY WAY® system:

- effectiveness confirmed in practice in a number of the tallest buildings in Poland, e.g. Warsaw Spire – 220 m;
- system built of certified sets of pressure differential devices;
- wiring in a fireBUS® loop system;
- transparent and repeatable architecture tailored to local requirements;
- the possibility of significant independence from variability in environmental parameters;
- no need to divide staircases into sections;
- no aeration shaft along the entire height of the staircase,
- possibility of stabilizing overpressure in high-speed elevator shafts

### Variants of iSWAY® type devices:

The iSWAY® devices are produced in three basic versions with different specifics, dimensions and fan characteristics. In addition, it is possible to configure the device individually depending on the adopted design assumptions and local restrictions in the building.

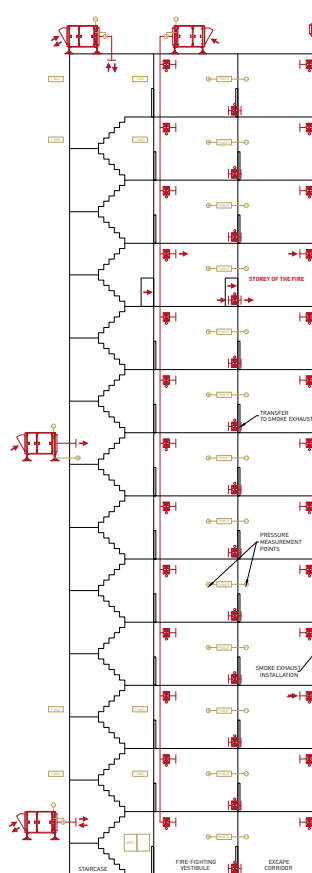


Figure 3. SAFETY WAY® flow pressure differential system for staircase aeration with iSWAY-FC-R® devices.

**Version 1 - iSWAY-FC®** compact device designed by default for installation anywhere in the building or outside the building. All elements of the set responsible for its functioning (except for field automation elements such as boards, pressure sensors, etc.) are mounted inside the casing.



Figure 4. iSWAY-FC® type device.

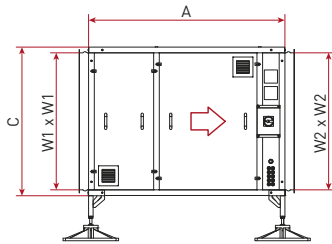


Figure 5. Dimensions of the iSWAY-FC® device.

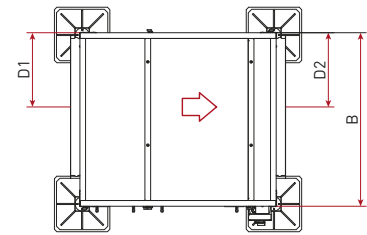


Tabela 2. Parameters of iSWAY-FC® devices.

Size	Active power	Supply voltage	Apparent power	Width	Height	Length	Connectors size	Distance	Weight FC(-D)''	Weight FC-R	Weight FC(-D)-J, FC-R-J''
	[kW]	[V]	[kVA]	B [mm]	C [mm]	A [mm]	W1, W2 [mm]	D1, D2 [mm]	m [kg]	m [kg]	m [kg]
0.3	3,38	3x400	3,45	1070	870	1520	770x770	435	219	-	203
0.12	5,47	3x400	5,57						232	-	229
1.17	5,26	3x400	5,36						320	351	309
1.20	6,96	3x400	7,10	1320	1100	1620	1000x1000	550	331	347	319
1.24	9,22	3x400	9,40						352	357	332
2.31	9,22	3x400	9,40						501	424	412
2.39	13,00	3x400	13,26	1520	1300	1720	1200x1200	650	527	489	487
2.47	17,40	3x400	17,75						571	503	515
2.75	21,26	3x400	21,34						-	-	565

The weights shown in Table 2 are for units in basic configuration (without optional accessories).

Table 3. Noise generated by iSWAY-FC® fans.

Size	Sound power level in frequency bands, L <sub>w</sub> [dB]								Sound power level, L <sub>wa</sub> [dB(A)]
	63	125	250	500	1 k	2 k	4 k	8 k	
0.3	89	96	95	94	92	89	88	84	97
0.12	92	91	91	91	92	90	91	87	98
1.17	90	91	91	92	91	88	88	84	96
1.20	92	90	92	90	89	88	88	84	95
1.24	93	90	92	90	89	89	88	84	96
2.31	91	90	90	90	90	89	91	88	97
2.39	94	94	92	93	92	92	92	89	99
2.47	71	78	83	87	89	89	87	79	95

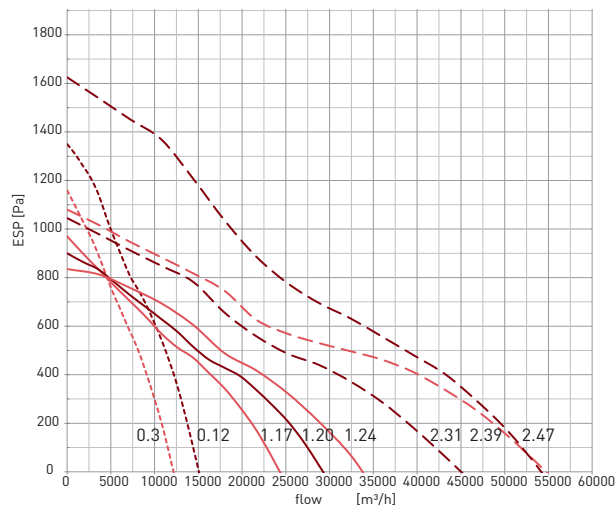


Chart 1. Characteristics of iSWAY-FC® and iSWAY-FC-D® in the standard variant.

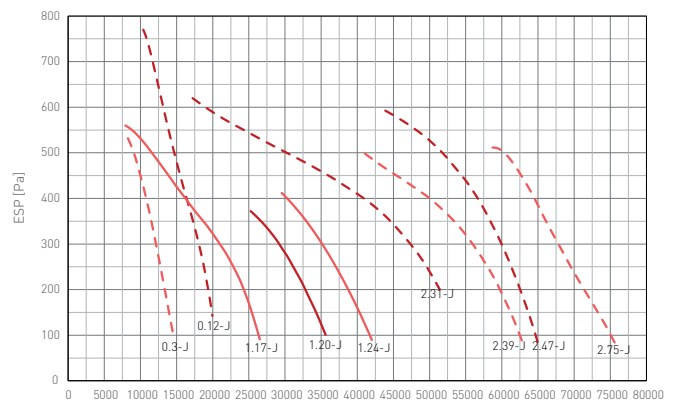


Chart 2. Characteristics of iSWAY-FC® and iSWAY-FC-D® with high airflow (symbol -J).

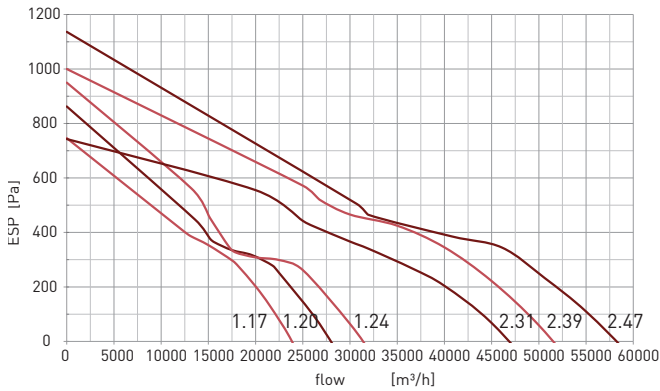


Chart 3. Characteristics of reversible iSWAY-FC-R® in the standard variant.

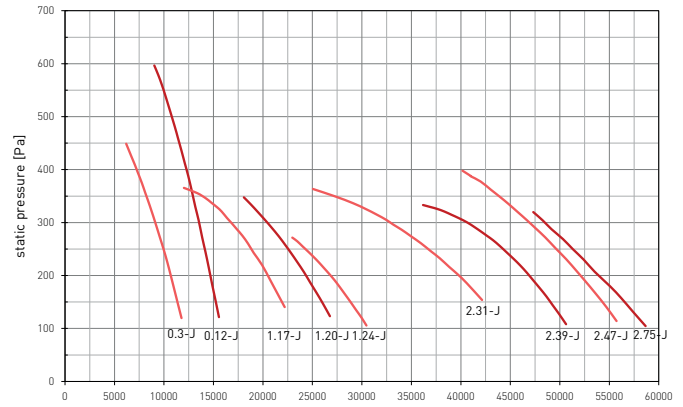


Chart 4. Characteristics of reversible iSWAY-FC-R® with high airflow (symbol -J).

Note: In range of type series, there is possibility of making a custom fan version with different characteristic,

### Components included in the iSWAY-FC® device:

- inverter controlled fan
- braking resistor
- automation cabinet (with frequency converter, regulator, 24 VDC power supply)
- shut-off damper with servomotor
- smoke detector
- housing insulated with sandwich slabs
- inspection panel
- main switch
- device performance measuring strips (optional element)
- infrared heater (optional element)
- air intake mounted on the device (optional)
- Big Foot support system (optional element)
- two throttle system (optional element)
- roof for external solution (optional element)



1. For simple pressure differential systems, use the Control and Signal Board (TSS) that supports a maximum of 6 iSWAY devices.
2. Complex pressurization systems shall be fitted with Operating Conditions Monitoring Device (MSPU) with Control Board (TS).
3. TSS or TS with MSPU should be located in a room accessible to rescue and firefighting teams, optimally at the entrance to the building or in the BMS room.
4. Maximum length of the pressure differential measurement tubes shall not exceed 12 m.
5. The maximum number of pressure difference sensors of P-MACF type or damper controllers of MAC-D-Min type on a single loop is 64.
6. In the event of a fire, the iSWAY-FC-D® device only works with one P-MACF or MAC D-Min sensor that has received a fire signal from the SSP.
7. Thanks to the use of MAC-D-Min regulators and control dampers, it is possible to individually control the overpressure simultaneously in several separate protected spaces, using a common iSway device, e.g. fire vestibules or elevator shafts.
8. iSWAY-D® devices are designed to work with remote pressure difference sensors P-MACF or MAC-DMin regulators.
9. The iSWAY-FC-R® devices are equipped with reversible fans and designed to operate in the SAFETY -WAY® flow differential pressure system.



Detailed technical parameters of the devices as well as guidelines for assembly and connection are given in the manufacturer's Operating and Maintenance Documentation.



SMAY Sp. z o. o. reserves the right to update and make changes to this catalog card without prior notice.

# Elements of iSWAY-FC® devices and system

## The UP double air intake dampers

In the event that the air intake is at roof level, two inlets (each capable of providing full efficiency) should be used, spaced apart to always provide a smoke-free air supply. The ducts for both inlets should be secured in a system of two dampers, controlled by automation and smoke detector of the iSway device.

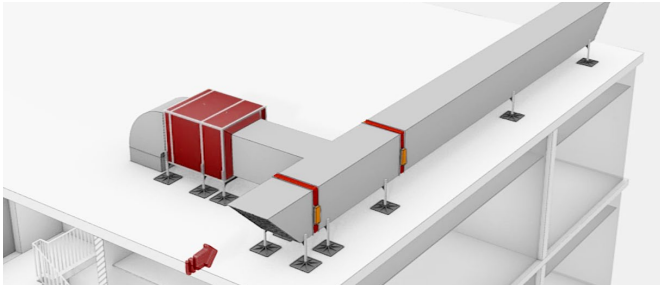


Figure 6. iSway-FC with 2 air intake system.

Double air intake dampers are ordered as iSway equipment.

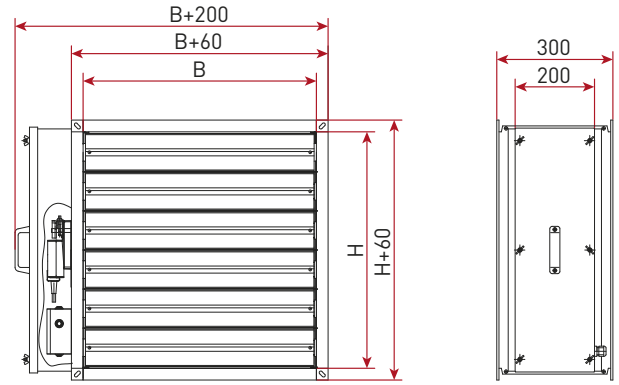


Figure 7. Dimensions of dampers in double air intake system.

Table 4. Dimensions of dampers in double air intake system.

Type	Size	BxH [mm]
iSWAY-FC	0	770x770
	1	1005x1005
	2	1205x1205

## SRC-W-R dampers of electronic transfer system

An innovative electronic transfer system has been created to provide compensation for smoke exhaust in corridors regardless of the opening of the vestibule door. The system consists of two dampers with fast actuators - one on the vestibule leg, the other on the corridor. When the door is opened, all air is directed to the vestibule ensuring the right speed at the door. After closing the door, the vestibule is aerated with a minimum effort to maintain overpressure, and all effort is directed directly to the corridor to provide compensation.

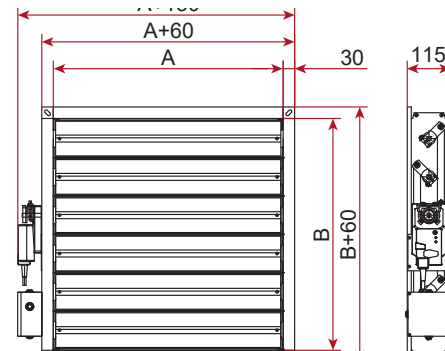


Figure 8. Dimensions of SRC-W-R dampers of electronic transfer.

Table 5. The number of actuators in electronic transfer dampers.

B - damper height	A - damper width											
	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
305	1	1	1	1	1	1	1	1	1	1	1	1
405	1	1	1	1	1	1	1	1	1	1	1	V2
505	1	1	1	1	1	1	1	1	1	1	V2	V2
605	1	1	1	1	1	1	1	1	1	V2	V2	V2
705	1	1	1	1	1	1	1	1	V2	V2	V2	V2
805	1	1	1	1	1	1	1	V2	V2	V2	V2	V2
905	H2	H2	H2	H2	H2	H2	H2	H2	H2	H2	H3	H3
1005	H2	H2	H2	H2	H2	H2	H2	H2	H2	H2	H3	HV4
1105	H2	H2	H2	H2	H2	H2	H2	H2	H2	H3	H3	HV4
1205	H2	H2	H2	H2	H2	H2	H2	H2	H2	H3	H3	HV4
1305	H2	H2	H2	H2	H2	H2	H2	H2	H3	H3	HV4	HV4
1405	H2	H2	H2	H2	H2	H2	H2	H2	H3	H3	HV4	HV4

where:

- digit** - number of actuators in a damper
- H** - horizontal damper division
- V** - vertical damper division



Figure 9. Electronic transfer.

## SRC-W-R - dampers of electronic transfer system

Upon placing an order the following information shall be provided:

**SRC-W-R-<A>x<B>-<P><RAL>**

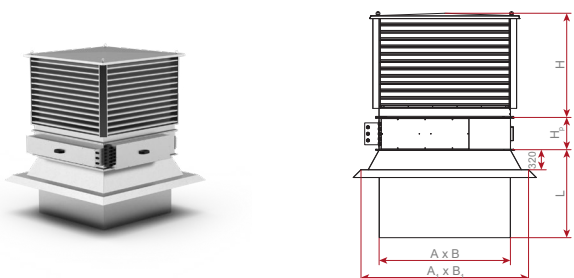
Where:

<b>A</b>	inside width of damper [mm]
<b>B</b>	inside height of damper [mm]
<b>P</b>	finishing
	SO - galvanized steel
	SL - powder coated steel
<b>RAL</b>	color according to RAL (for SL finishing)

Example of order: **SRC-W-R-400X405-S0**

### KWR compact exhaust vent

For some staircases in high-rise buildings, it is possible to use a one-way flow system with aeration with the iSWAY-FC® device and a compact KWR exhaust vent in the upper part of the staircase. KWR counteracts excessive pressure increase caused by chimney draft, preventing the door from being opened. The KWR exhaust vent consists of a roof base, SRC-Z-KWR damper with three Belimo NMQ24-A-SR actuators, MAC D-Min regulator with pressure sensors and a WPDB roof vent.



Rysunek 10. KWR exhaust vent.

Table 6. Dimensions of KWR vent.

Basic dimensions of KWR						
Size	A [mm]	B [mm]	A <sub>1</sub> [mm]	B <sub>1</sub> [mm]	H [mm]	H <sub>p</sub> [mm]
1205x1205	1205	1205	1605	1605	910	300

### KWR - compact exhaust vent

Upon placing an order the following information shall be provided:

**KWR-1205x1205-<L>-<P><RAL>**

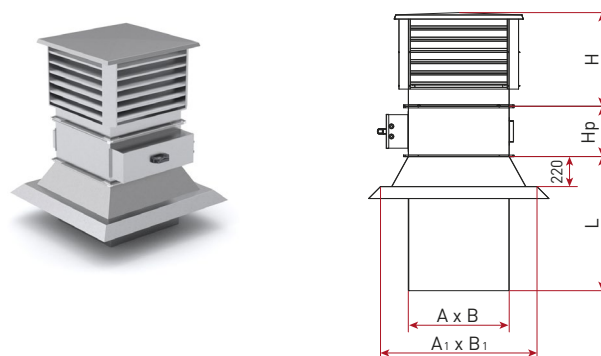
Where:

<b>L</b>	length of roof base
<b>P</b>	finishing
	SO - galvanized steel
	SL - powder coated steel
<b>RAL</b>	color according to RAL (for SL finishing)

Example of order: **KWR-1205x1205-500-S0**

### KSN compact permanent vent

If an additional unsealing of the staircase is necessary, a roof vent with an ON/OFF damper can be used. Its task is to unseal the protected space in order to minimize pressure surges. The compact permanent vent consists of a roof base, SRC-Z-KSN damper with Belimo BF24 actuator and WPDB roof vent.



Rysunek 11. Dimensions of KSN vent.

Table 7. Dimensions of KSN vent.

Basic dimensions of KSN						
Size	A [mm]	B [mm]	A <sub>1</sub> [mm]	B <sub>1</sub> [mm]	H [mm]	H <sub>p</sub> [mm]
605x605	605	605	901	901	530	300

### KSN - compact permanent vent

Upon placing an order the following information shall be provided:

**KSN-605x605-<L>-<P><RAL>**

Where:

<b>L</b>	length of roof base
<b>P</b>	finishing:*
	SO - galvanized steel
	SL - powder coated steel
<b>RAL</b>	color according to RAL (for SL finishing)

Example of order: **KSN-605x605-500-S0**

# iSWAY-FC<sup>®</sup> - Compact pressurisation unit

Upon placing an order for iSWAY-FC<sup>®</sup> type unit following information shall be provided:

**iSWAY- FC-<A>-<V>-<Q>-<H>-<DR>-<X>-<T>-<U>-<Y>-<ML>-<Dc>-<K>/<ADD>**

Where:

<b>A</b>	Control system*
	<b>none - standard control system</b>
	D - intended for local FireBus® loop
	R - for reversible system
<b>V</b>	size/type of the unit
	0.3 - max. capacity 14500 m <sup>3</sup> /h (depending on configuration)
	0.12 - max. capacity 20000 m <sup>3</sup> /h (depending on configuration)
	1.17 - max. capacity 27200 m <sup>3</sup> /h (depending on configuration)
	1.20 - max. capacity 35600 m <sup>3</sup> /h (depending on configuration)
	1.24 - max. capacity 42000 m <sup>3</sup> /h (depending on configuration)
	2.31 - max. capacity 56500 m <sup>3</sup> /h (depending on configuration)
	2.39 - max. capacity 61500 m <sup>3</sup> /h (depending on configuration)
	2.47 - max. capacity 65000 m <sup>3</sup> /h (depending on configuration)
	2.75 - max. capacity 78200 m <sup>3</sup> /h (depending on configuration) (only version <Q>=J)
<b>Q</b>	variant of the unit*
	<b>none - standard</b>
	J - high airflow
<b>H</b>	performance*
	<b>none - compact unit (with cover)</b>
	B - without cover and wires - this variant has separate data sheet and other example of order
<b>DR</b>	operating direction*
	<b>none - on the air supply</b>
	E - on the exhaust
<b>X</b>	operating side*
	<b>none - right side</b>
	L - left side
<b>T</b>	operating temperatures range *
	<b>none - from -5 to +55 °C</b>
	AF - from -25 to +55 °C - fitted with Anti Frost system
<b>U</b>	location of the device*
	<b>none - inside the building</b>
	Z - outside the building
<b>Y</b>	additional outputs 24V DC*
	<b>none - no additional outputs 24V DC</b>
	M - additional outputs 24V DC to power supply for TSS, KWR, KSN, PMAC-F or MAC-D-Min
<b>ML</b>	measuring strip module*
	<b>none - no measuring strip</b>
	LP - measuring strip
<b>Dc</b>	additional pressure sensor in device *
	<b>none - no additional pressure sensor</b>
	PF - PMAC-F standard pressure sensor ±500 Pa
<b>K</b>	automatic roof for vertical installation (only versions <V>=0.3 and <V>=0.12)*
	<b>none - no automatic roof</b>
	DA - automatic roof



**ADD** accessories (only for compact unit <H>=none):

- KE – flexible connector on the intake side
- CP – air intake
- UP – double air intake dampers
- DS – roof for housing version with operating side <X> left or right
- SS – installation on welded feet – horizontal assembly
- BF – installation on Big Foot - horizontal assembly
- KM – fixation with angle bars – horizontal assembly
- RS – installation on riveted frame – horizontal assembly
- PSW – installation on platform and levelling mount

\* optional values - default values will be used if optional values are not specified

Example of order: **iSWAY – FC – 1.20 / KE, KM**