FläktGroup

Air Shower

TECHNICAL DATA

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Introduction

Purpose and function

Air showers offer an efficient method of removing contamination from clothes of personnel or surfaces of materials entering or leaving a cleanroom. Decontamination is performed by clearing off dust and dirt particles from bodies of cleanroom personnel using a high-velocity turbulent jet of clean air.

Areas of application

Air showers are an integral part of cleanroom access control systems and ensure critical manufacturing conditions in such industries as microelectronics, life science, biomedical, aerospace and others. Air showers guarantee that factory equipment is protected from pollutants and contaminating agents.

Unit setup and components

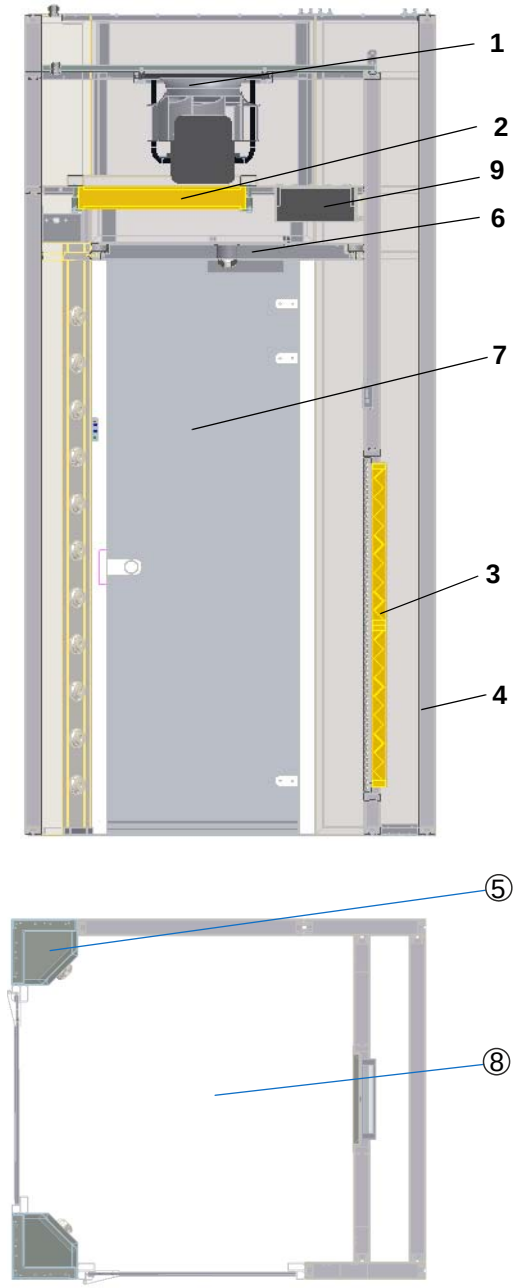


Fig. 1: Air shower side and top views

1: **Motor fan** is a radial fan with backward-curved blades, powered by an EC motor and equipped with constant-flow control; motor fans are installed and replaced from below after opening of the ceiling door and removing the HEPA filter. Parameters: U=3~VAC 380-480V, 50/60 Hz
Pmax =3 kW, Imax = 4.8 A, tmax 50 °C
Operating P=1.5 kW, I=1.0 A

2: **HEPA filter** class H13 (optionally higher) with a flat seal (optionally a fluid seal), clamped to a welded painted frame. The filter is replaced from below (from the shower cabinet) after opening of the ceiling door.

3: **Pre-filter** class G4 is protected by a magnetically secured grille made of perforated painted steel sheet.

4: **Cabinet** is assembled from R panels filled with mineral wool. The panels are performed in steel in the RAL9002 semi-matt shade (optionally in a different shade).

5: **Corner ducts with nozzles** are located in the corners of the cabinet; each duct contains eleven nozzles with a minimum internal diameter of 25 mm, through which air is blown at a mean axial velocity of 25 m/s towards a person standing in the centre of the cabinet.

6: **Ceiling door** opens with a special key. It has one nozzle and three LED lights. A PIR-motion sensor is located in the ceiling panel next to the door.

7: **Doors** are performed as a pair of single-leaf doors that cannot be opened at the same time, so that the air shower simultaneously acts as an air lock. The door has an aluminium frame with a polyester finish in the RAL9002 semi-matt shade (optionally a different RAL shade). The frame contains a reversible electronic contact lock to open the door and LUDS signal panels on each side. The all-glass door is made of 8 mm-thick tempered safety glass, secured on three hinges and is fitted with an automatic door seal and a self-closing mechanism. The door is equipped with a double-knob handle (all components are made by Dorma). Clear width is 700 mm, clear height 2100 mm.

8: **Floor** is performed as a stainless steel floor (can be used as an assembly template) . We recommend using special (self-adhesive) cleaning mats.

9: **Switch** box

Operating principle

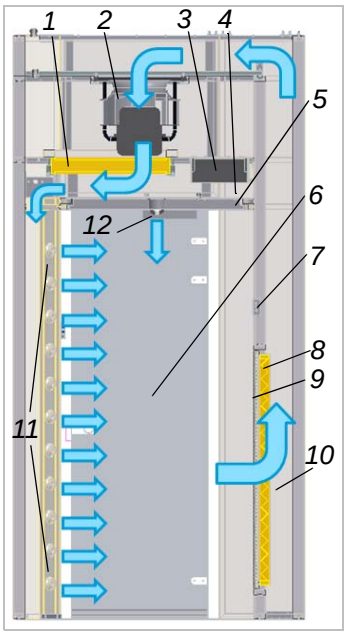


Fig. 2: Air shower operation

The basic air shower version is designed for one person. Air shower is equipped with an insulated chamber (6) with its own motor fan (2) in which air circulates through a HEPA (ULPA) filter (1) and is directed at high velocity via two rows of nozzles (11) and one nozzle on top (12) at a person in the chamber (6).

Air with particles freed from personnel body is drawn in through a pre-filter (8), protected by a suction grille (9), and guided through a duct (10) to the suction opening of the motor fan. Personnel can enter and leave air shower through a pair of doors that block each other.

The operation of air showers is controlled by software running on a PLC Siemens Logo! with display. The control panel (7) is located inside the air shower above the suction grille (9). The switch box (3) is located in the ceiling interspace (4) and is accessible after opening of ceiling panel (5).

Cleaning cycle

Cleaning sequence

The cleaning cycle is activated automatically when the door from a grey area opens and closes and a person is detected inside the chamber. The door to the cleanroom is blocked automatically when the grey area door opens.

Both doors are blocked during the cleaning cycle. In case of an emergency the cycle can be interrupted and the unit completely switched off using one of the emergency stop switches. The switch is located inside the chamber and in the cleanroom or is available as the main switch in the grey area.

There is a delay of 5 seconds between the end of the cleaning cycle and the door opening. The grey area door can be opened only when the cleanroom door closes and preset delay times elapses. After the person has left the air shower, the door closes and the shower is shortly purged at high speed. Alternatively, continuous purging at low airflow rates can be selected.

Air flow

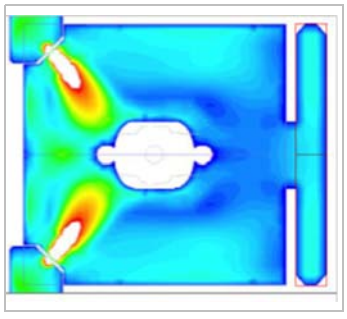


Fig. 3: Air shower flow simulation, top view

During the cleaning cycle nozzles discharge air at a velocity of min. 25 m/s to create a sufficiently turbulent airflow. The air velocity and distribution are indicated in Fig. 3 with the highest air velocity marked white and lower from red to blue color. The airflow rate is fixed and cannot be changed to avoid the reduction in the efficiency of the air shower.

Efficiency

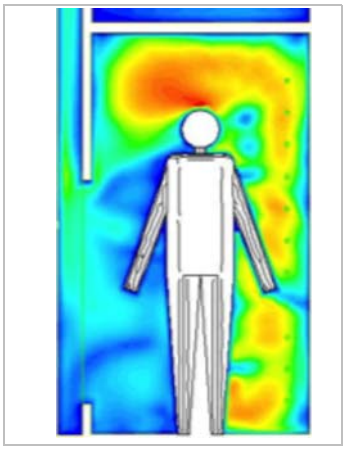


Fig. 4: Using air shower, side view

The efficiency of air showers depends on their correct use. As demonstrated in Fig. 4, staff must consider and observe the following instructions:

- Stand in the centre of the chamber marked for this purpose by a point.
- Turn around by 360° during complete cleaning cycle.
- Keep the hands on the head during the cleaning cycle.

Timing

The length of the cleaning cycle is considered the most important aspect of an air shower's efficiency. The recommended time period is at least 20 seconds. The pre-set interval is 30 seconds. This parameter can be changed on the control display between 10 and 60 seconds with a 5-second interval.

Control system

Siemens Logo! controller with display uses original software to control and monitor unit functions.

Flow and pressure control

The motor fan's PID controller with a pressure converter provides constant-flow control based on measuring pressure parameters at the fan's suction nozzle. The control unit monitors pressure drop at the HEPA filter and pre-filter. When the pressure drop limit is exceeded, the controller sends a message requesting filter replacement on the display of the control panel.

Control modes

Depending on the requirements, the PLC controller can be programmed for three different modes presented below:

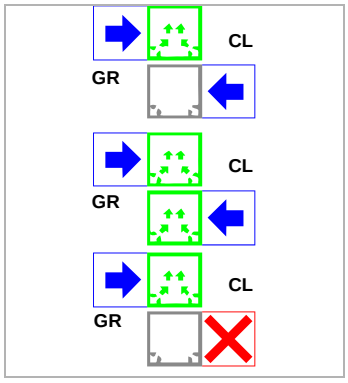


Fig. 5: Air shower control modes
GR - grey area
CR - clean room

Standard

Cleaning cycle runs when passing from grey to clean room. Moving from a clean room to a grey area does not start the cleaning cycle, only purging (regenerating) cycle.

Two-way

Cleaning cycle runs when passing from grey to clean room and also when leaving clean room.

One-way

Exit from clean room is not allowed through the Air Shower.

Sizes and dimensions

Showers are offered in two size versions.

– Low or standard version: 1300 x 1900 mm, height 2820 mm
– High version: 1300 x 1500 mm, height 3020 mm

Low/standard version

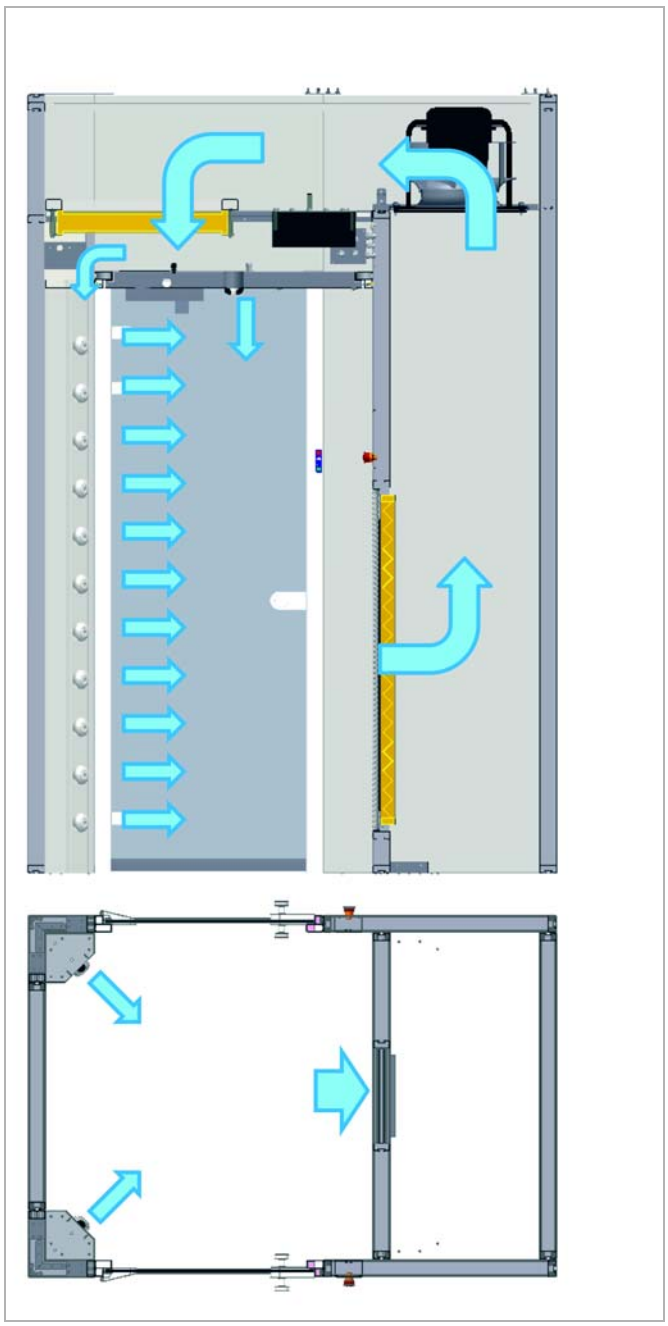
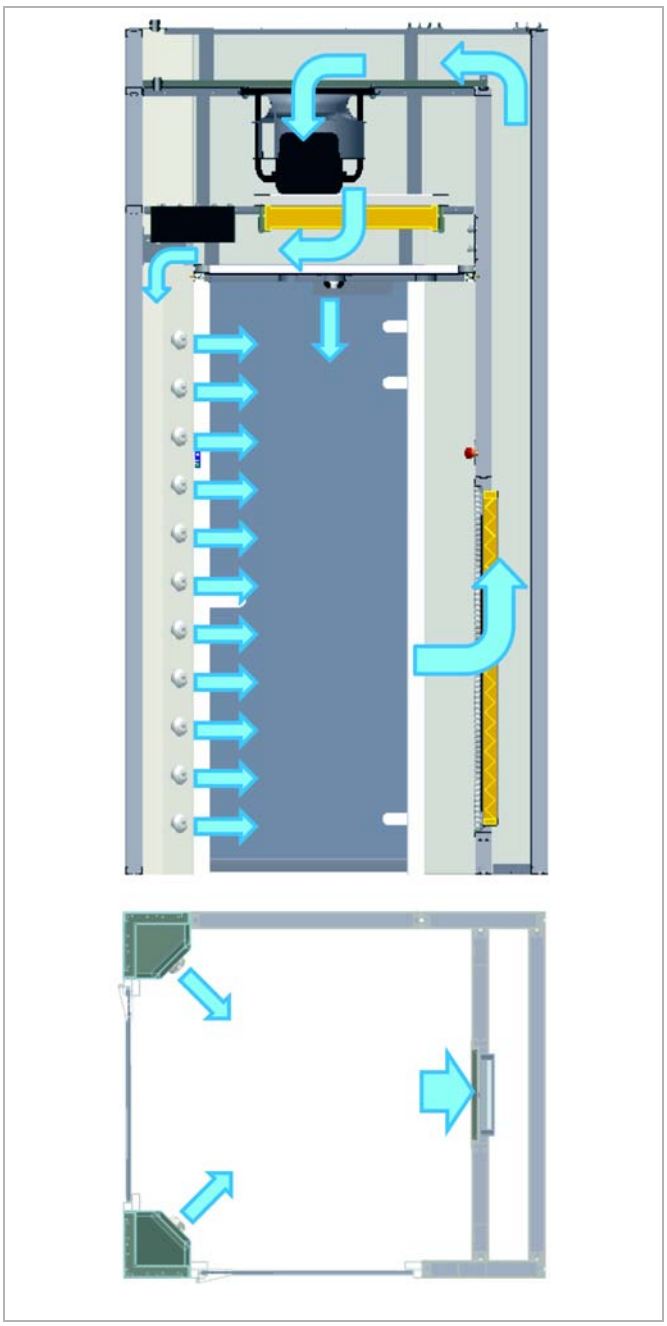


Fig. 6: Low/Standard model
cross sections with air-flow direction and footprints

High version



High model

Configuration of doors

Door variants

Air showers can be supplied in four configurations with different door positions:

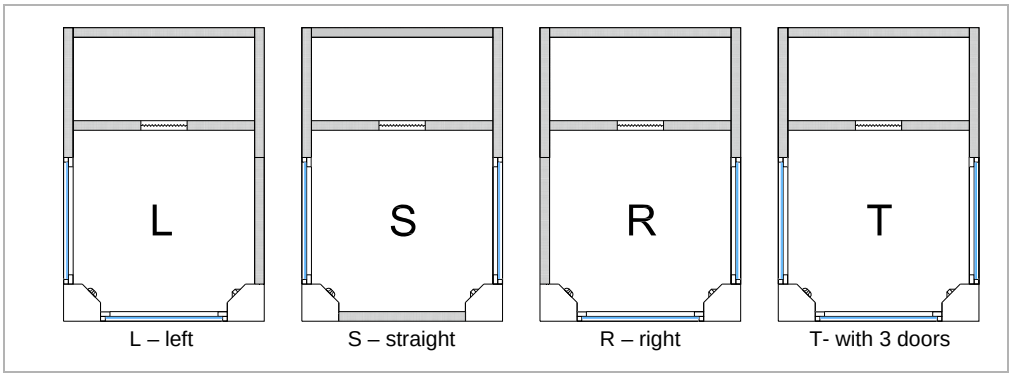
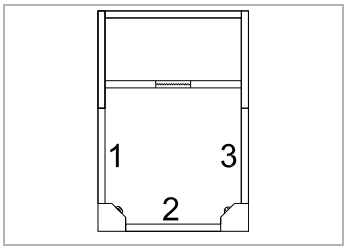


Fig. 7: Door configurations

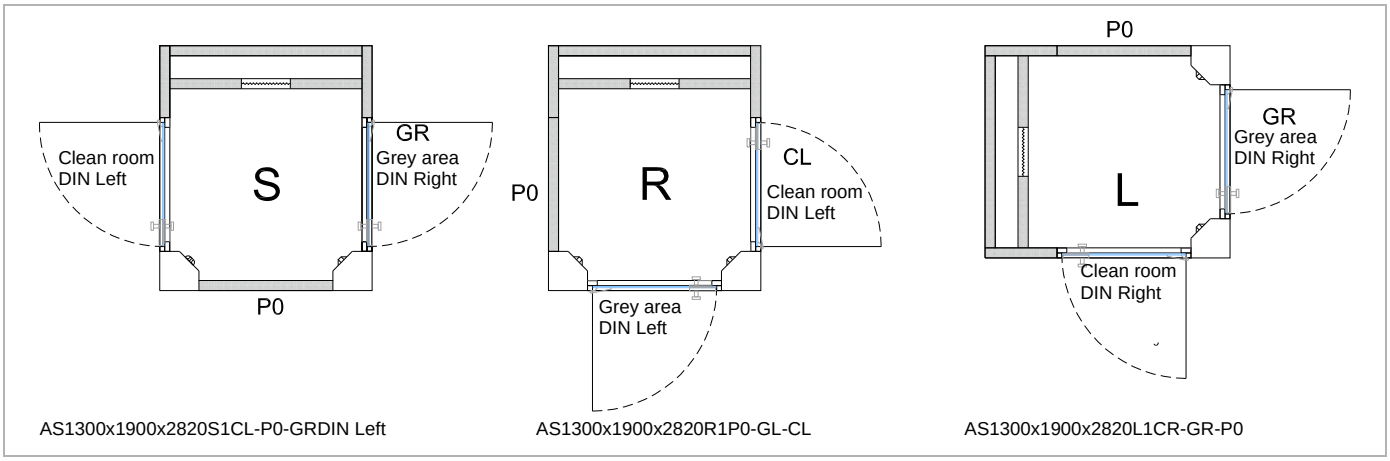
Designation of doors



The order / type code must identify the door from a grey area (G) and the door into a clean room (C), and the door alignment according to DIN – L = left, R = right. Doors always open outwards. Doors are identified according to the enclosed schema (aligned so the suction channel is always at the top) in order 1-2-3. If there is a panel on the position, it is marked as P0.

It is also necessary to indicate the requested colour shade of panels and door frames in the 18th position of code. Standard is polyester coating shade RAL9002 semi-gloss.

Examples



In case of atypical configuration request, e.g. air tunnel for applications where there are requirements for a higher pass-through rate of people:

- please contact FläktGroup for this special solution.

Technical data

Dimensions	Unit	High	Low (Standard)	Spare parts		Order Code / Specification
Internal length	mm	1176	1176	H13 HEPA filter		M13FS-2390/AU1BR3S 1010x610x78
Total length	mm	1500	1900	H14 HEPA filter		A14FS-2390/AU1BR3S 1010x610x78
Internal width	mm	1176	1176	Pre-filter		KS-W/48 G4 1180x285x48
Total width	mm	1300	1300			
Internal clear height	mm	2100	2100	Fan		Radial, backward curved blades
Total height	mm	3020	2820	Number of nozzles		23
Electrical data	3 phases VAC, 50/60Hz			**Air flow and weight**		
Voltage	V	380-480		Mean discharge speed	m/s	25
Max input	W	3000		Air volume flow	m^3/h	1220
Max current	A	4.6		Number of air exchanges	1/h	440
				Weight	kg	580

Testing, delivery and commissioning

Air showers are completely assembled and tested at FläktGroup which is documented by a test report. Air showers are supplied dismantled and installed and put into operation at the customer's site by installation firms trained by FläktGroup. A Factory Acceptance Test can be provided.

Warranty, maintenance and servicing

Except for the replacement of pre-filters and HEPA filters, air showers do not require any maintenance besides surface cleaning as specified by the user's internal regulations. In case of defects FläktGroup provides servicing support for a warranty period of 2 years.

Order code

AS	1300	x	1900	x	2820	S	1	C	L	-	P	0	-	G	L
Product	Dimensions					Configuration	Face material	Left side			Middle			Right side	

		B [mm]		L [mm]		H [mm]
AS	Air shower					
	Dimensions:	width		length		height
	Low (standard)	1300	x	1900	x	2820
	High	1300	x	1500	x	3020

S	Straight configuration	180°
L	Left configuration	90°
R	Right configuration	90°
T	with three doors	

	Front material
1	RAL9002 semi-gloss
2	RAL9010 semi-gloss

	Left side
P	Panel
C	Door to the clean room
G	Door to the grey room
0	(for panel)
L	DIN left
R	DIN right

	Middle
P	Panel
C	Door to the clean room
G	Door to the grey room
0	(for panel)
L	DIN left
R	DIN right

	Right side
P	Panel
C	Door to the clean room
G	Door to the grey room
0	(for panel)
L	DIN left
R	DIN right

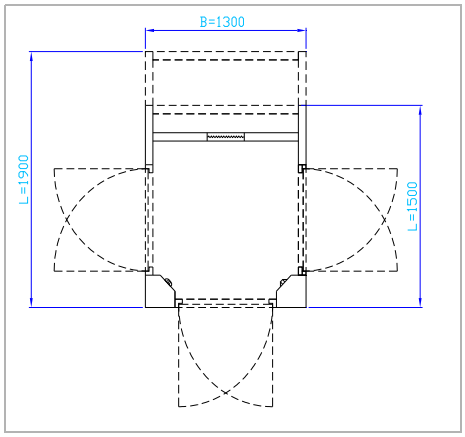
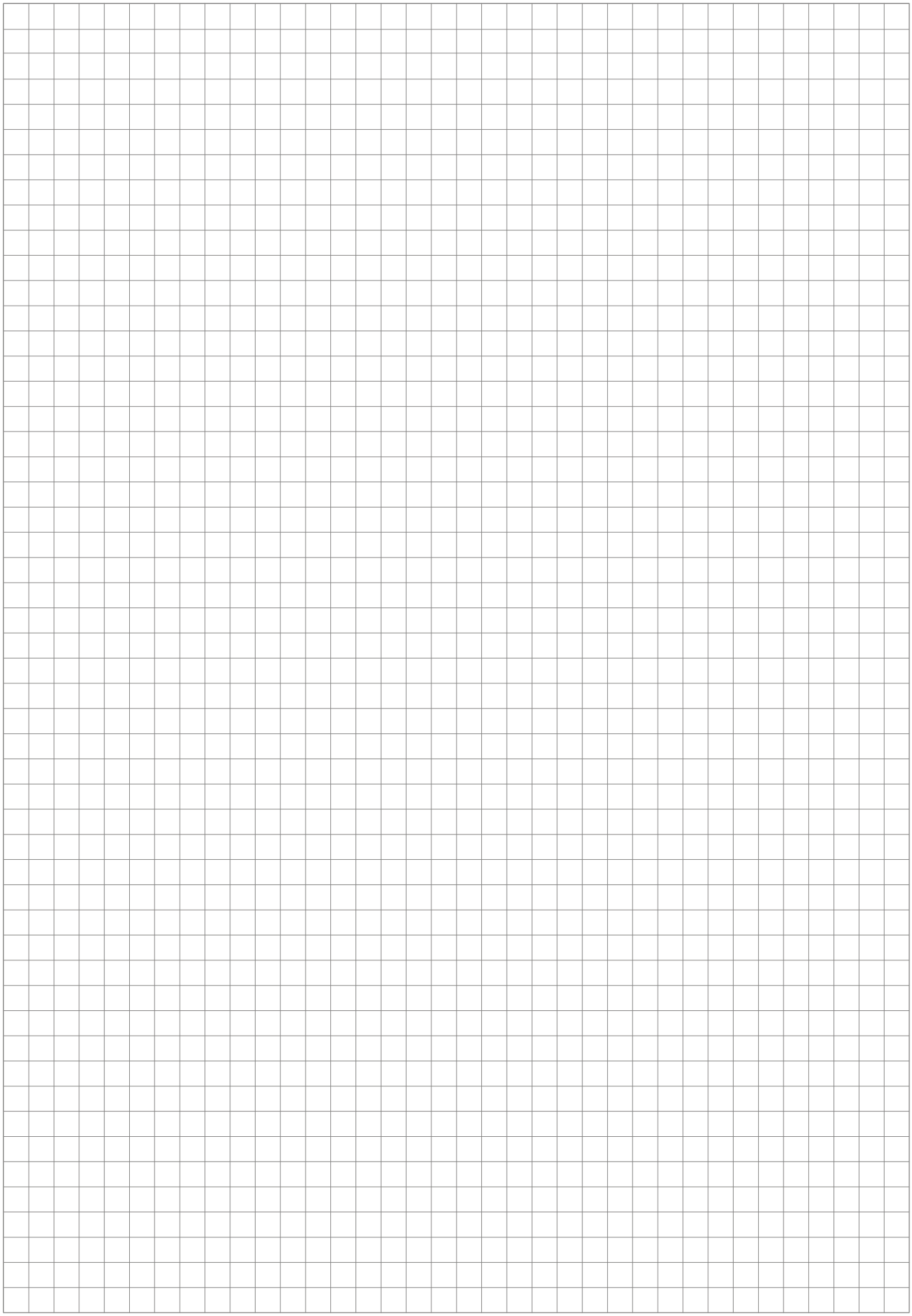


Fig. 8: Layout template



FläktGroup

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