ISQ-F

Exposed Active Air Supply Diffuser

Quick Facts

- Part of Lindinvents' system for smart workplace climate control
- A supply air diffuser designed for reduced energy utilization in offices, healthcare facilities and schools
- Cost saving installation
  - Built-in room climate controller
  - Built-in motorized airflow valve
  - Built-in and configured sensors
- Exceptional sound performance
- Draft-free and adjustable air distribution
- Network connection for visualisation and administration via LINDINSPECT®
- Bluetooth® for access via LINDINSIDE
- Registered EPD (Environmental declaration)
- Design for efficient transportation with a minimum of packaging material

Demand-controlled ventilation can reduce energy utilization by creating an optimal indoor climate when and where it is needed. With INSQAIR®, a series of smart supply air diffusers, the focus has been taken on simplicity, maximum flexibility and digitization.

Performance, a careful choice of materials, pre-mounted sensors, Bluetooth® and network connection makes ISQ-F a quiet and smart supply air solution also for the future.

LINDINVENT®

Why INSQAIR®?

INSQAIR® = INnovative Smart Quiet AIR
INSQAIR is a series of supply air diffusers from Lindinvent that share solutions to achieve an installation-efficient and high-performance climate control. Several technical solutions have resulted in international patents.

Simplicity and Performance
A unique technical performance. Easy planning, easy installation, easy commissioning, and easy user interface makes the INSQAIR product series optimal for cost-effective and sustainable indoor climate control.

Lowest Life Cycle Cost (LCC)
A system based on demand-controlled ventilation and under-tempered supply air has the lowest investment and life cycle cost according to several surveys.

Increased Productivity and Efficiency
Cooling with air leads to increased air volumes compared to a solution based on cooling baffle. With increased air volumes, staff efficiency increases by up to 8 % according to the Harvard study *"Economic, Environmental and Health Implications of Enhanced Ventilation in Office Buildings"*.

Maximum Digitization
The starting point is an architecture for wired network communication (CAN) where control units are equipped with Bluetooth®. Measurement data is accessed via API, Modbus, HTTP, and a smartphone app. The platform makes real estate data meaningful, enabling digitization and cloud solutions.

Sustainable Design
All products in the INSQAIR series have been designed with sustainability and good environmental choices in mind. The design has also been optimized to be able to ship the products efficiently and with a minimum of packaging.

Environmental Product Declaration - EPD
All supply air diffusers in the INSQAIR product series have EPDs. Ours can be downloaded via www.epdhub.com which is one of the international systems for third party verified EPDs. An EPD is based on the ISO 14025 method for Life Cycle Assessment of a product's environmental impact. Suppliers contribute to improved environmental declaration of buildings by providing EPDs.

Extreme Flexibility
With Lindinvent's supply air diffusers, an attractive indoor climate can be achieved without installing water-borne cooling. This leads to increased flexibility when remodeling is needed. The active diffuser's integrated sensors minimize the need for cabling. In many cases, walls can be erected or moved without having to reroute cables. Remodeling projects are also simplified by the fact that active devices in a flow area can be served from different supply air ducts.

Content

Quick facts ISQ-F

- Recommended flow range: Between 5 and 125 l/s
- Sound performance: Below 30 dB(A) up to 125 l/s at 100 Pa
- Height: 336 mm

System Requirements

Presence and Level of Activity

Home office, sick leave, holidays, and external assignments are all reasons that contribute to variations in the degree of presence. To limit energy use, a function must ensure that the total airflow is always adapted to the actual need. This minimizes the energy required to drive the air and reduces the amount of air that needs to be heated or cooled to maintain the correct room temperature.

Free Cooling Without Cold Draft

To minimize the need for, and thus the cost of, added cooling, the highest possible cooling effect should be obtained from under-tempered supply air. This requires a diffuser that provides good mixing with room air even at low supply air flows. The risk of cold draft prevents many systems from being able to reduce air flows and at the same time work with strongly under-tempered supply air. With good heat exchange, a heating battery is rarely needed. From Stockholm and southwards, it is almost 8000 h/year when no added cooling is needed. In Lulea, there are only about 250 h/year when outdoor air for free cooling is not available.

Right Pressure and Right Temperature

Duct pressures, airflows, and temperatures must be continuously optimized to achieve the lowest possible energy use.

Simplicity and Collaboration

Smart climate control should be easy to design, install, commission, and maintain. Systems for lighting control and sunscreen control must be able to operate in collaboration with other installations for climate control.

Versatility and Performance

Room climate control should be part of a system solution that efficiently and sustainably delivers a good indoor climate when and where it is demanded.

- Large flow range (Supply and extract air)
- Low noise level even with high airflow and high duct pressure
- Draft-free environment even with severely under-tempered supply air and a low airflow
- A compact design that simplifies installation work
- Easy integration and deployment of accessories
- Diffusers with an adjustable air distribution pattern
- Smart local control and optimization functions
- Parent functions for optimization and debugging
- Robust and reliable communication between devices
- Multiple and intuitive user interfaces
- Commissioning via app and Bluetooth®
- Good environmental choice in all aspects

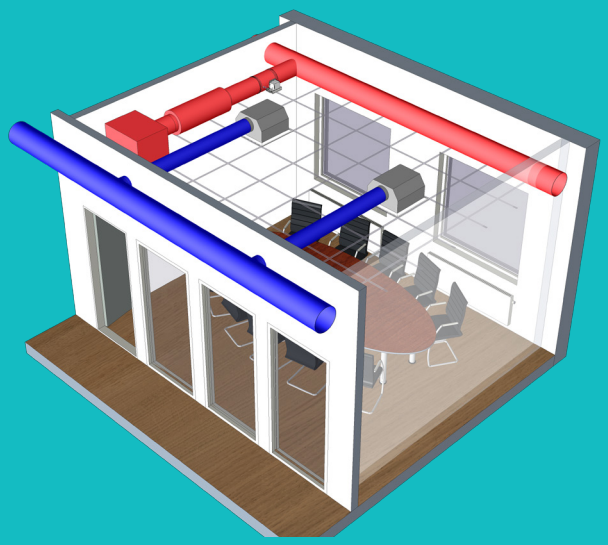
Solutions based on the INSQAIR product series might be the world's most versatile and thus useful systems for room climate control at workplaces. Consultants, installers, integrators, operating technicians, tenants, and property owners shall feel safe with their choice of system now and for future requirements.

Conference Room with ISQ

Room climate control based on temperature, presence detection and carbon dioxide content.

- 10 - 250 l/s (ISQ-F or ISQ-200)
- Silent regulation
- No additional dampers
- No wall mounted sensors

The CO2 sensor is retrofitted, as an accessory, in one of the diffusers without additional cabling and costly integration. The sensor is used for air quality control but also to analyze the presence level. Via the content of carbon dioxide, the number of people in a room can be calculated. Integration with room booking systems enables the release of "non-shows" for new bookings.



Konference room with active diffusers.

Functions

Airflow Control
The airflow is regulated by the motor-controlled air flow valve. A high air velocity from the diffuser is maintained also at low airflow by a self-acting gap opening. Air distributor plates in the diffuser provide an air pattern that mimics circular diffusers. The air distribution pattern is adjustable. Airflow is measured via the built-in flow sensor.

Room Climate Control
The built-in room climate controller continuously controls the room for optimal function. This applies to air volumes but also additional heating or cooling. In the event of absence, the diffuser works towards an operating mode that allows greater temperature fluctuations and the use of stored energy in the building's frame structure. ISQ-F delivers the desired room climate by itself or in collaboration with several diffusers.

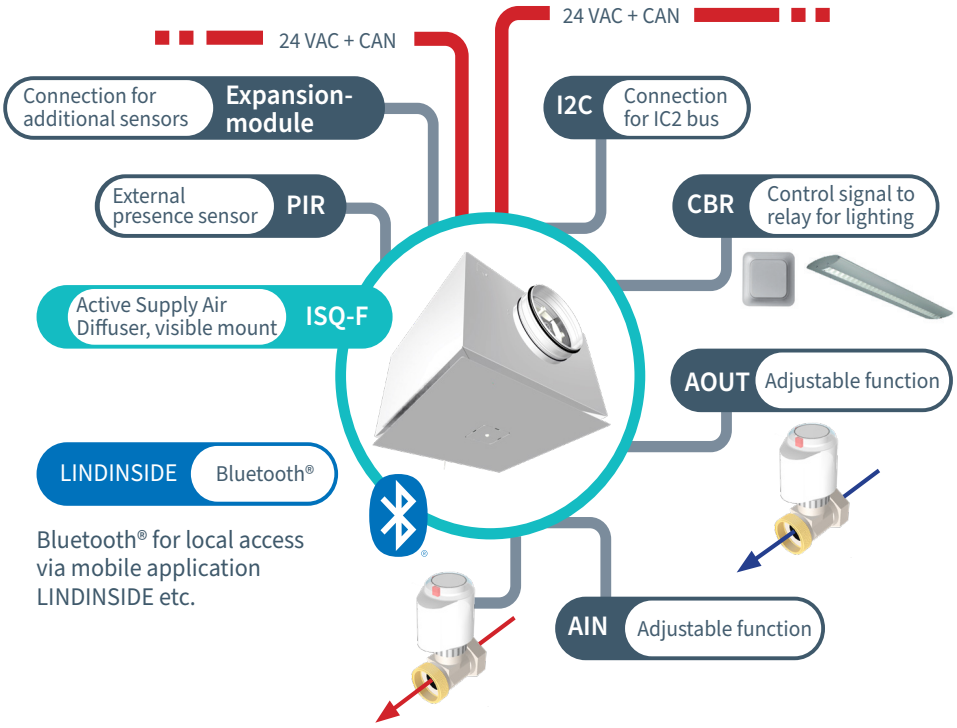
Temperature and Air Quality Measurement
The diffuser is equipped with both a room- and a duct temperature sensor. A carbon dioxide- and humidity sensor is optional. The room temperature sensor is placed at the edge of the diffuser plate. The placement provides a more accurate and faster value than that from a separate wall-mounted sensor.

Presence Detection
Presence flow, economy, and comfort mode as well as lighting control are functions supported by the integrated occupancy detector with 200 detection zones. Presence detection can be used to control air handling units.

LINDINSIDE and Bluetooth®
The diffuser is equipped with Bluetooth® for communication via Lindinvent's mobile application LINDINSIDE. Via the app, operating values can be read and set points can be changed. Bluetooth® also enables connection to other external devices.

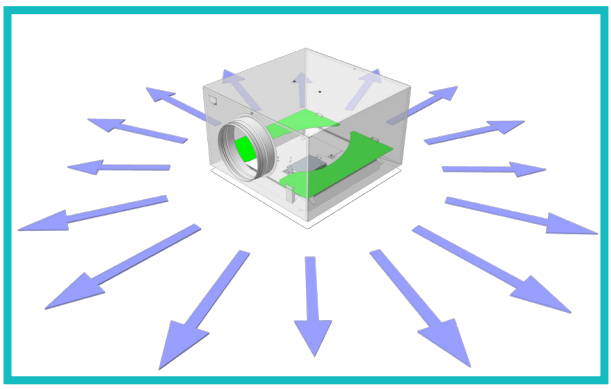
Network Communication
Active diffusers are connected to other controllers to form a local area network (a CAN loop). All devices are addressed with a unique node ID. The CAN loop is in turn connected to Gateway NCE for communication with Lindinvent's central unit or another parent system.

Connection diagram

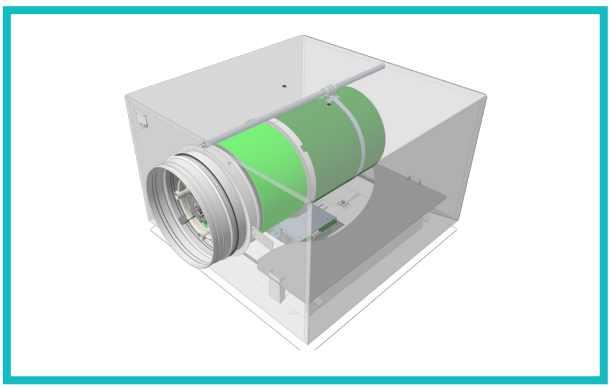


Connection diagram for ISQ-F. CAN and power supply are connected via the supplied CBD connection box.

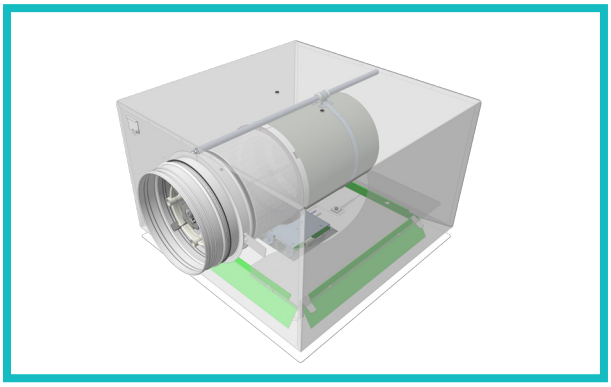
Construction Parts



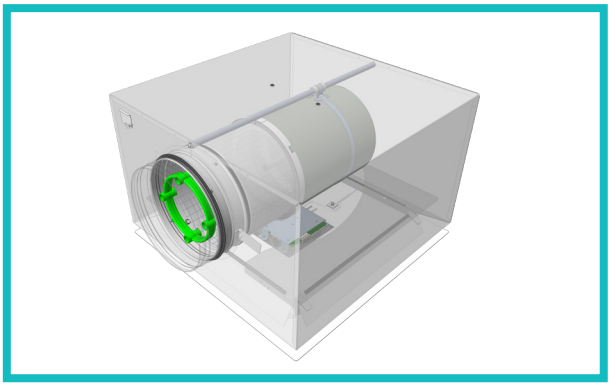
ISQ-F is intended for horizontal mounting. Two air distributor plates provide a radial distribution pattern that mimics the distribution patterns from circular diffusers.



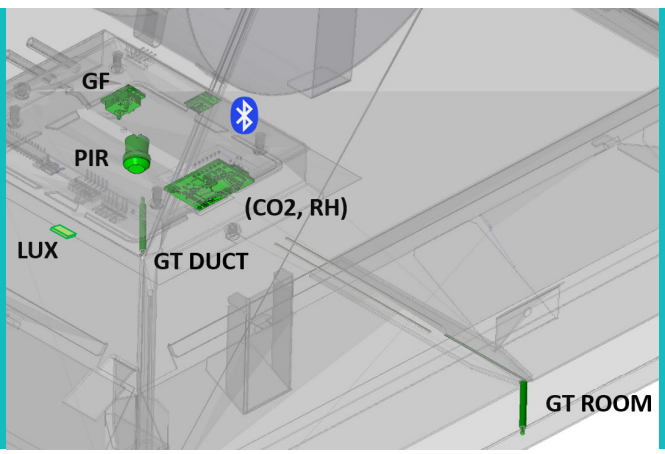
The patented motorised airflow valve is built using a permeable fibrous material to achieve silent regulation even at high duct pressures and airflows.



Suspended and movable discs in the inlet to the diffuser section provide high outlet velocity even at low airflow. The discs open or close in response to changes in airflow and can be blocked individually, allowing for adjustable air distribution.



The flow meter is designed for flow measurement within a wide flow range. Its design reduces the need for a straight section in front of the device, so it can, for example, be mounted directly after a 90° bend.



Diffuser Plate with Control Unit

- Removable plate with suspension device
- Bracket for room climate controller with sensors and Bluetooth®
- Openings for sensor detection
- Holder for room temperature sensor

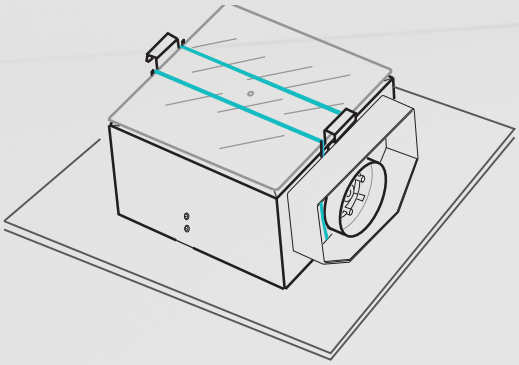
Easy and Fast Installation

A Complete Unit
ISQ-F, which includes the plenum box, is delivered and installed complete as a unit.

Suspension
ISQ-F is delivered with two suspension arms. The maximum length of the arms is customizable upon order. The top side of the diffuser is equipped with a blind rivet nut for suspension using a threaded rod.

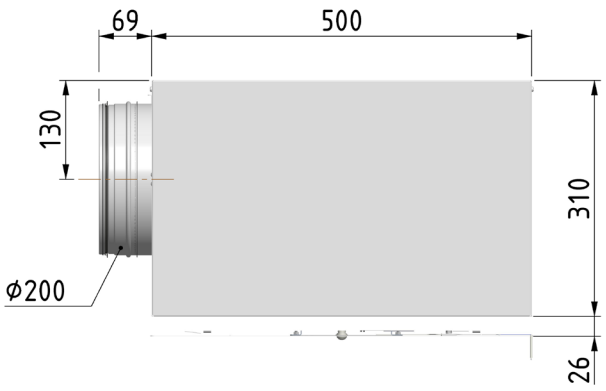
Mounting Handles
The diffuser is lifted and mounted with cardboard protection, cover profiles, and mounting handles robustly attached. Handles and protection are not removed until the unit is correctly fitted into the ceiling structure.

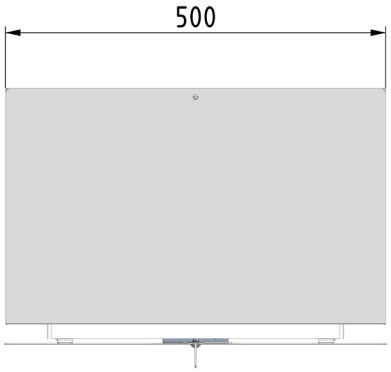
Connection Box CBD
All wiring to ISQ-F is done via connection box CBD. The box is delivered connected to the diffuser. CBD is used both for connecting accessories and for connecting the diffuser to a CAN-loop with the voltage supply.

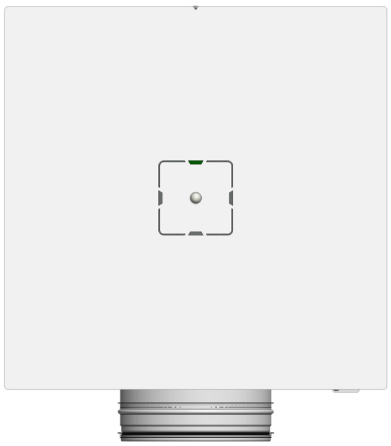


The tension strap, which holds the mounting handles and protective cardboard with cover strips in place, is only removed when the unit is lifted and anchored to the ceiling. Protective carton is left until it is time for commissioning.

Dimensions (mm)







Technical Specifications

Material
Diffuser part and plenum box: Powder-coated steel sheet as standard. The unit can also be ordered in an electro-galvanized version. This surface treatment is not homogeneous, sanding marks may appear.
Airflow valve (housing), distributor plates, flow meter, and discs: Thermoplastics (PS, PP)
See the product's chemical content assessment (Bygg-varubedömningen) for a report on constituent materials.
Net weight ISQ-F: 11 kg

Paint Colour
RAL 9003. Other colours may be ordered;
please state RAL number.

Duct Connection
Duct socket: Ø 200 mm
Notice: Connection via a flexible aluminum hose or push nipple is recommended.

Temperature Limits
Operation: 10°C to 40°C; <85% RF
Storage: -20°C to 50°C; <90% RF

Cable (16-conductor)
ISQ-F is delivered with an attached cable to connection box CBD. The standard length is 1 m. Maximum length at 5 m.

Electrical System
Supply voltage: 24 VAC

Effect
Stand by mode 2 VA
Control mode: 4 VA (approx. 200–300 h/year)

Network connection
CAN communication via signal cable with conductors also for voltage supply (shielded FLAQQBR: 2x1+1x2x0.22)

Radio Communication
Bluetooth® 2.4 GHz
Listen mode only for calls from app or similar.
Beacon functionality etc requires transmission.

IP-Class
Complies with IP 22

CE-Marking
Complies with EMC and the low voltage directive.
A certificate of compliance is available at lindinvent.com

Presence Detection
PIR: Passiv IR-detector with 200 zones
Detecting area: 107° x 107°

Room Temperature Measurement
Temperature sensor of the type NTC.
Accuracy temperature: ± 0.5 K

Supply Air Temperature Measurement
Temperature sensor of the type NTC.
Accuracy temperature: ± 0.5 K

Carbon Dioxide Measurement
(option, expansion module)
Card slot at the control unit for easy retrofitting.
Automatic Background Calibrating sensor
Measuring range: 400 - 10 000 ppm
Accuracy: ± (30 ppm + 3%)

Relative Humidity Measurements
(option, expansion module)
Card slot at the control unit for easy retrofitting.
Measuring range: 0 - 100 % RH
Accuracy (at 25°C and 50% RH):
Relative humidity: ± 5% RH
Absolute humidity: ± 1g/kg
Condensing point: ± 1 K

Air Flow Measurement and Adjustment
ISQ-F is equipped with an airflow sensor.
Measuring intervall: 5 - 125 l/s; sound level in dB (A) according to the sound pressure level diagram for ISQ-F
Accuracy: ± 5% or minimum ± 2 l/s
Minimum straight duct section in front of the diffuser:
- after 90° bend: 0 mm / no straight section required
- after T-piece: 400 mm
- at one-step dimensional change: minimum 200 mm
- at two or more steps of dimensional change: minimum 400 mm

Pressure Measurement
Duct pressure is calculated based on the air flow and the degree of valve opening.
Accuracy: ± 10 Pa (minimum valve opening at 20% and minimum airflow at 10 l/s); Pressure range: 10 - 200 Pa

Connection box CBD

- Magnets on casing for easy and flexible mounting
- Terminal for the 16-pin ISQ cable
- Terminals for 24 VAC + CAN (CAN loop connection)
- 1 x AIN1 (general, 0 to 10 VDC)
- 1 x AOUT1 (general, 0 to 10 VDC)
- 1 x DIN1 with PULL-UP function [+5] ON/OFF
- Terminal for lighting control with relay box CBR
- Terminal for 24 VAC & TRIAC (On/Off control of radiator valve actuators) Max load TRIAC: 6 valve actuators at 1 W
- AUX socket for generic power supply (+5V)
- Terminal for I2C bus

Pressure, Flow & Noice Levels

The sound pressure levels LPA in the diagram corresponds to A-weighted sound level in the reverberation zone with 10 m² equivalent sound absorption area. This corresponds to 4 dB acoustic attenuation in a normally damped room with 25 m³ room volume. See the table with correction factors depending on type of room. For throw lengths, see the design instructions for INSQAIR®.

- Sound power level per octave band (Lw) = L_{P10A} + K_0 [dB]
- L_{P10A} = Sound pressure level [dB (A)] from diagram
- K_0 = Correction factor/octave band [dB] from table
- p_t = Total pressure drop
- Self attenuation factor from table

Measurements of sound pressure and sound power have been carried out according to ISO 3741 and ISO 5135. Measurements of intrinsic sound attenuation have been carried out according to SS-EN ISO 7235:2009.

Sound Level Correction for Room Type [dB]

Room volume	Room type	Correction
25 m³	hard	+2 dB
25 m³	normal	0 dB
25 m³	subdued	–2 dB
150 m³	hard	–3 dB
150 m³	normal	–5 dB
150 m³	subdued	–7 dB

Correction Factor, K0 [dB]

ISQ-F	Octave band [Hz]							
	63	125	250	500	1K	2K	4K	8K
200	6	9	8	1	-4	-9	-10	-7

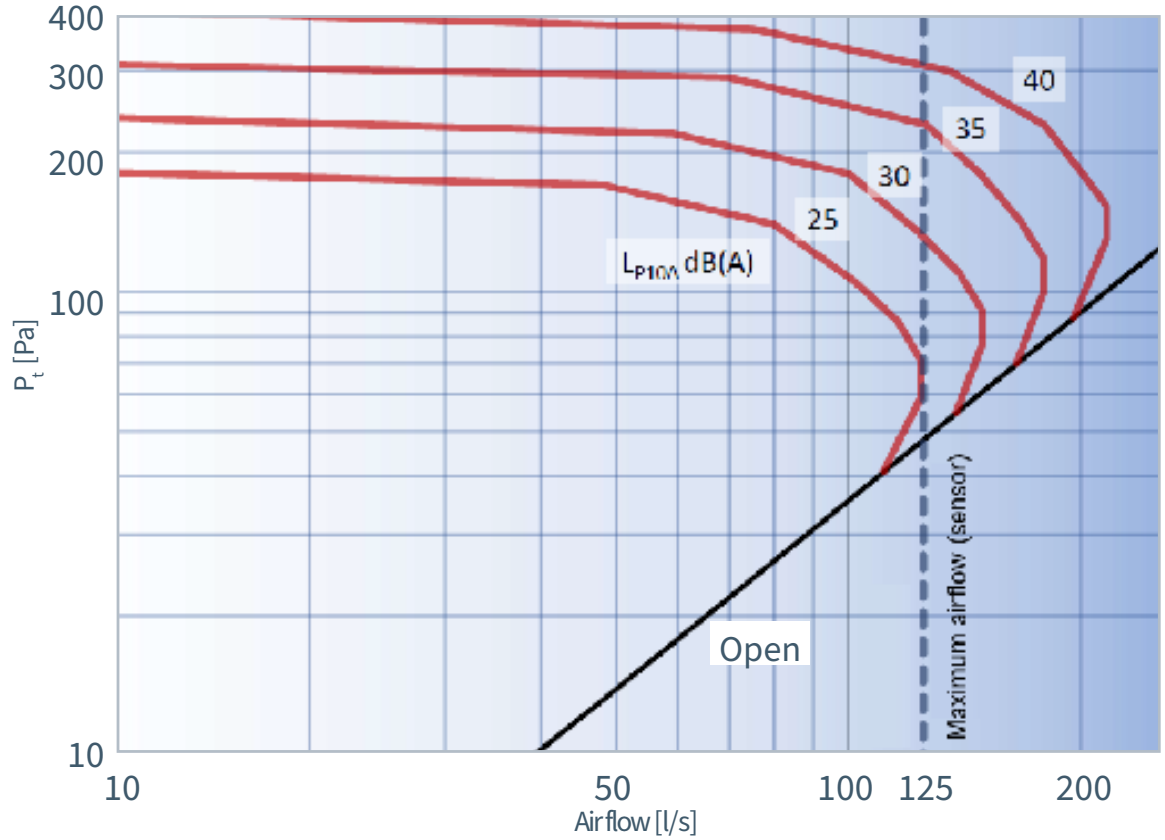
Self Attenuation [dB]

ISQ-F	Octave band [Hz]							
Opening	63	125	250	500	1K	2K	4K	8K
20%	16	12	19	22	23	20	22	25
100%	11	7	14	17	18	15	17	20

Tolerance [dB]

ISQ-F ± [dB]	Octave band [Hz]							
	63	125	250	500	1K	2K	4K	8K
200	3	3	2	2	2	2	2	2

Diagram ISQ-F, Sound pressure level L_{P10A} dB(A)



Accessories

Flow Balancing
Airflow control unit DCV-BLb is used for extract air balancing.

Carbon Dioxide & Humidity Sensor
The expansion card GQH-I or one of Lindinvent's other carbon dioxide sensors is easily mounted afterward.

Lighting Control
Relay box CBR enables double relay control via a push button, presence detection, and a selected lighting function. See SBDb for DALI control.

Valve Actuator Control
Valve actuator A40405(NC) or A41405(NO) for control of additional heat from radiators.

Valve and Surface Temperature Control
Sensor unit GT-S for radiator valve actuator control with radiator temperature measurement.

Electric Radiator Control
Control box CBT for additional heating via heating batteries or electric radiators.

Air Fan Cooling
Additional cooling is regulated via control box CBF-E or CBF-S.

External Presence Detector
Presence detector GO-C or PD-2400 provides options regarding placement for the desired coverage.

Setpoint Adjuster
CAN-connected user panel for wall mounting DRP. The panel can be configured to adjust the setpoint for room temperature or temporarily activate forced ventilation in the room. See also INOFFIX ®.

Additional Product Documentation for ISQ-F

Download available in ISQ-F product page at lindinvent.com

Documents	Comments
Installation Instruction	Note: Only intended for horizontal installation. Instructions with assembly steps.
Start-up Instruction	A guide on how to use the app LINDINSIDE to start-up commisioning of ISQ(-F/-160/-200/-V).
Maintenance Instruction	Regarded as maintenance-free.
External Connection Diagram	ISQ(-F/-160/-200/-V) and connection box CBD.
Building Material Declaration	Environmental Product Declaration registered. Material declaration assessed by Byggvarubedömningen in Sweden.
End-user Info	A brief introduction to Lindinvent's system for smart ventilation.
Modbuslist	The latest modbus list for ISQ (-F/-160/-200/-V).
AMA-Text	Descriptive text according to AMA standard.
Design Instructions	For the INSQAIR® product series on flows, air distribution patterns, CFD and type room solutions.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