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 a cost-effective and sustainable indoor climate.

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

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

System Requirements

Occupancy Rate and Activity Level

Work from home, sick leave, vacations, and external assignments contribute to variations in the occupancy rate. To limit energy consumption, a function must ensure that the total air flow is always adjusted 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 Drafts

To minimize the need for and cost of added cooling, the maximum cooling effect should be obtained from sub-cooled supply air. This requires units that provide good mixing with room air even at a low supply air flow. The risk of cold drafts prevents many systems from reducing air flows while using highly sub-cooled supply air. With good heat exchange, reheat coils are rarely needed.

Optimal Duct Pressure and Temperature

Air pressure/air volume and temperatures should be continuously optimized to achieve the lowest possible energy consumption in the current operating conditions and according to set target values.

Simplicity and Integration

A smart climate control system should be simple to design, install, commission, and maintain. Systems for lighting control and sun shading should easily integrate with other climate control equipment.

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
- 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

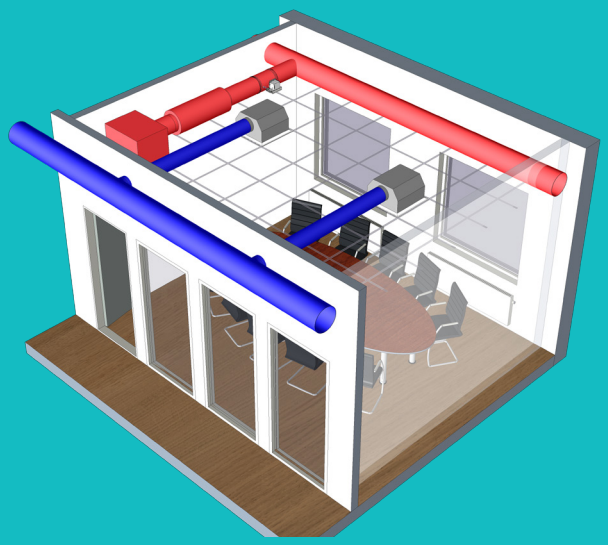
With the INSQAIR product series, we have developed unique, quiet, versatile and smart supply air diffusers that meet the requirements for room climate control in various environments.

Conference Room with ISQ

Room climate control based on temperature, occupancy detection, and carbon dioxide levels.

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

The CO_2 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.



Conference room with active diffusers.

Functionality

Airflow Control
The airflow is continuously measured and regulated by the motor-controlled airflow damper with a measuring unit. A self-acting mechanism in the diffuser section provides high outlet velocity even at low airflows. The diffuser's spread pattern can be adjusted.

Room Climate Control
The built-in room climate controller measures and regulates the room temperature and air flow according to set values. The built-in presence sensor can set the room to economy mode when you are not there. The unit also has a duct temperature sensor for system control.

The unit can optionally be equipped with built-in sensors for regulating carbon dioxide and humidity levels. Equipment for additional heating and cooling is controlled in sequence.

Lighting control
Lighting rules can be created to control DALI luminaires through the built-in presence sensor and LUX sensor.

LINDINSIDE and Bluetooth®
The device is equipped with Bluetooth® for communication via Lindinvent's mobile application, LINDINSIDE. The app allows users to read operating values and change setpoints. Bluetooth® also enables connection to other external devices.

Network connection
Active control units are connected to a local wired network (a CAN loop). Control units can be distributed over several CAN loops. A CAN loop is connected via Gateway NCE to Lindinvent's central unit or other systems.

Example of system functionality
Like Lindinvent's other room climate controllers, active diffusers support multiple zone affiliations, such as Flow zone, Actual value zone and Light zone. Zone affiliation allows multiple diffusers to interact to obtain higher-level functionality.

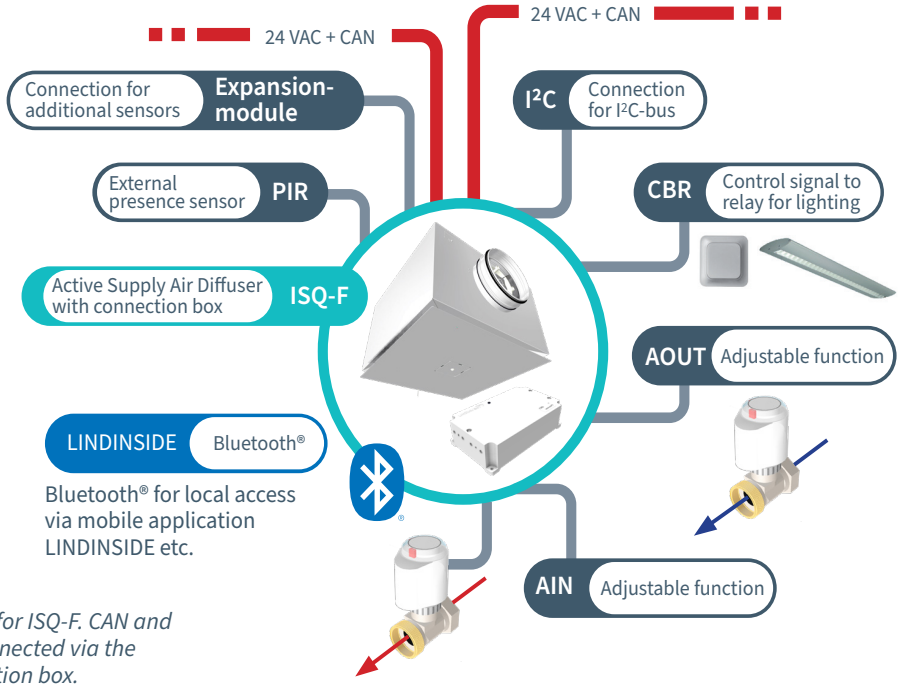
Operating modes with current or historical values are graphically visualised in the web-based interface LINDINSPECT.

Diffusers can be connected to different sun zones via Lindinvent's sun shading system, LINDINSHADE. Sun protection is adapted to achieve the best possible energy efficiency.

A diffuser is included in Lindinvent's DALI solution for lighting control via the lighting module INCONTROL.

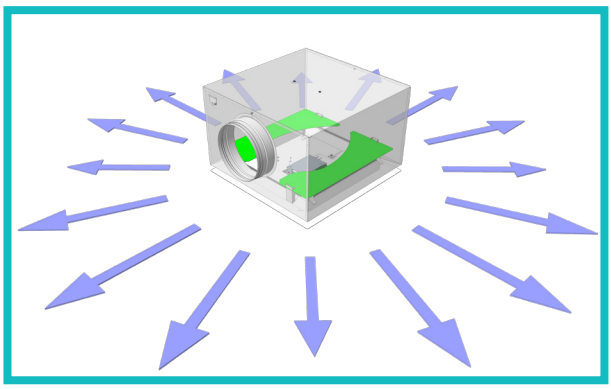
Diffusers can be assigned a system affiliation to optimise the air handling unit's pressure and temperature setpoint.

Connection diagram

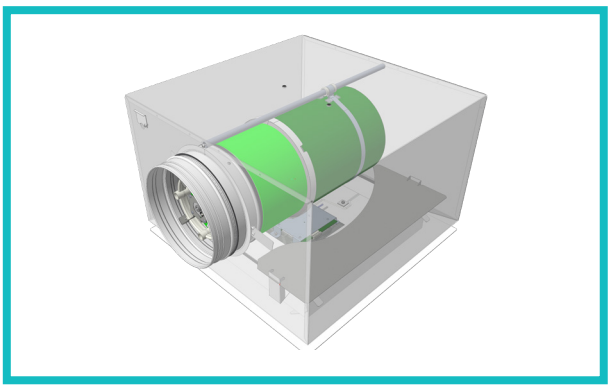


Connection diagram for ISQ-F. CAN and power supply are connected via the supplied CBD connection box.

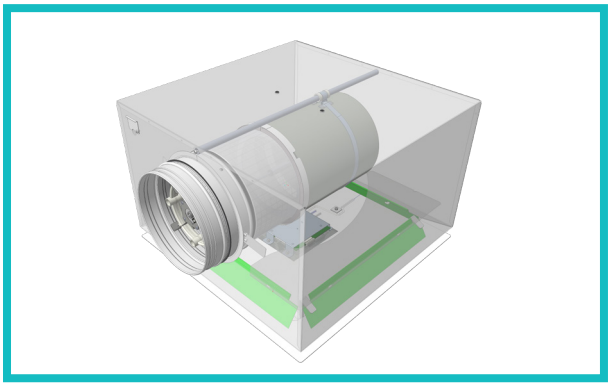
Construction Parts



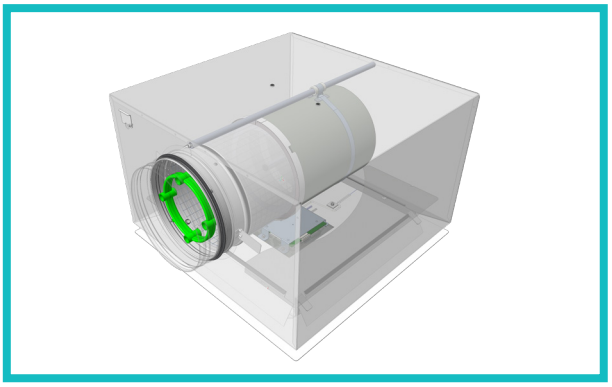
ISQ-F is intended for horizontal mounting. Two air distributor plates provide a radial distribution pattern that mimics the distribution patterns from circular diffusers.



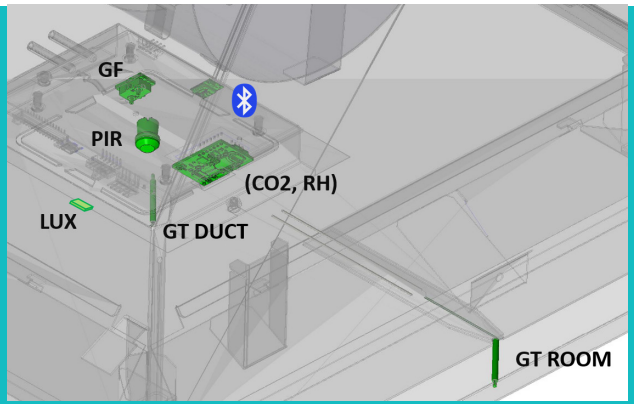
The diffuser includes a patented motor-controlled air damper made from permeable fibre material, designed for quiet regulation even at high duct pressures and air volumes.



Self-acting openings in the inlet to the spreader part opens or closes when the air volume changes. The design ensures a high outlet velocity and a long throw. The solution allows the device to work with significantly under-temperature, draft-free supply air even at low air flows.



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



Built-in sensors

The room climate controller, equipped with sensors, is centrally located on the inside of the removable diffuser plate.

- GF for flow measurement and duct pressure calculation
- PIR for presence detection
- LUX för for light level sensor
- CO2, RH for carbon dioxide and humidity measurement
- GT DUCT for duct temperature measurement
- GT ROOM for room temperature measurement

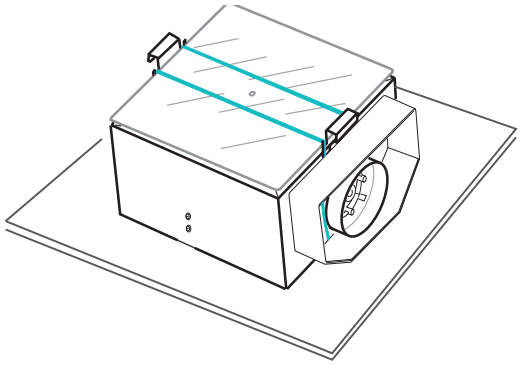
Installation

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

Suspension
ISQ-F is delivered with two suspension arms. The maximum length of the arms can be customised on request at the time of order. Alternatively, a threaded rod can be used. The top of the diffuser has a blind rivet for attaching the rod.

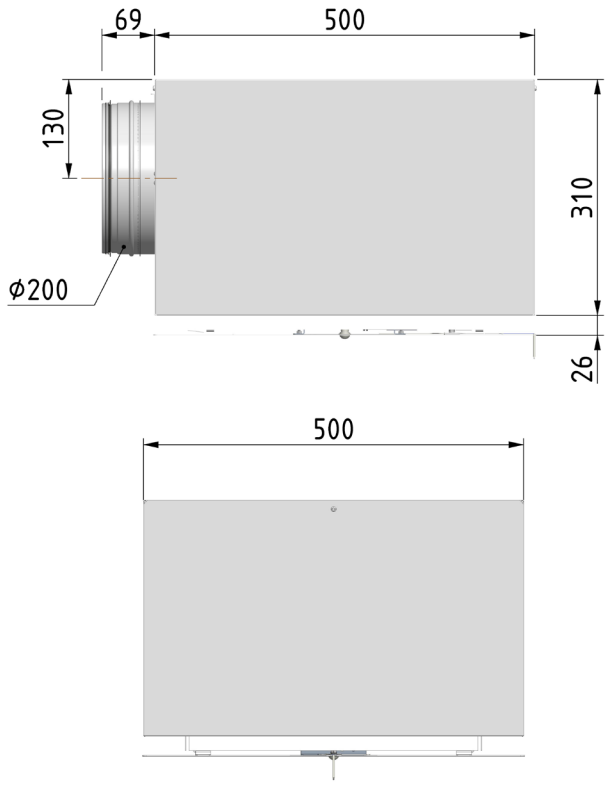
Mounting Handles
The diffuser is lifted and installed completely, as delivered, with its cardboard protection, cover profiles, and mounting handles, firmly in place. The handles and protections are not to be removed until the unit is correctly installed in the ceiling structure.

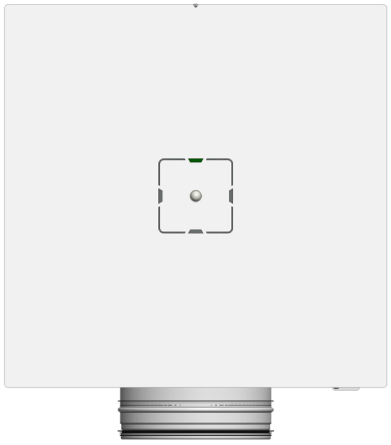
Connection Box CBD
All wiring to ISQ-F is done via connection box CBD. The box is delivered connected to the diffuser. CBD is used both for connecting accessories and for connecting the diffuser to a CAN-loop with the voltage supply.



The strap, which holds the mounting handle and protective cardboard (with cover profiles) in place, is only removed when the unit is lifted and anchored to the ceiling. The protective cardboard is left in place 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 damper (housing), distribution plates, measuring unit, and self-acting 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

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
Not continuous function. It listens to calls from an app or similar. Beacon functionality can be activated.

IP-Class
Complies with IP 22

CE Marking
Complies with EMC and Low Voltage Directive. *Certificate available at lindinvent.se*

Light level Measurement
LUX sensor

Presence Detection
PIR: Passive IR detector with 200 zones (socket in diffuser plate). Detection area: 107° x 107°

Room and Duct temperature Measurement
Temperature Sensors, NTC type.
Temperature accuracy: ±0.5 K.

Carbon Dioxide Measurement
(option, expansion module with sensor)
Automatic Background Calibrating sensor
Measuring range: 400 - 10 000 ppm
Accuracy: ± (30 ppm + 3%)

Relative Humidity Measurement
(option, expansion module with sensor)
Measuring range: 0 - 100 % RH
Accuracy (at 25°C and 50% RH):
Relative humidity: ± 5% RH
Absolute humidity: ± 1g/kg
Condensing point: ± 1 K

Airflow Measurement and Control
The diffuser features a built-in airflow sensor that controls the supply air volume through a motor-controlled air damper equipped with a measuring unit.
Working range: 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

Duct pressure Measurement
Calculated using measured air supply and the supply air damper opening degree.
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.

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

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

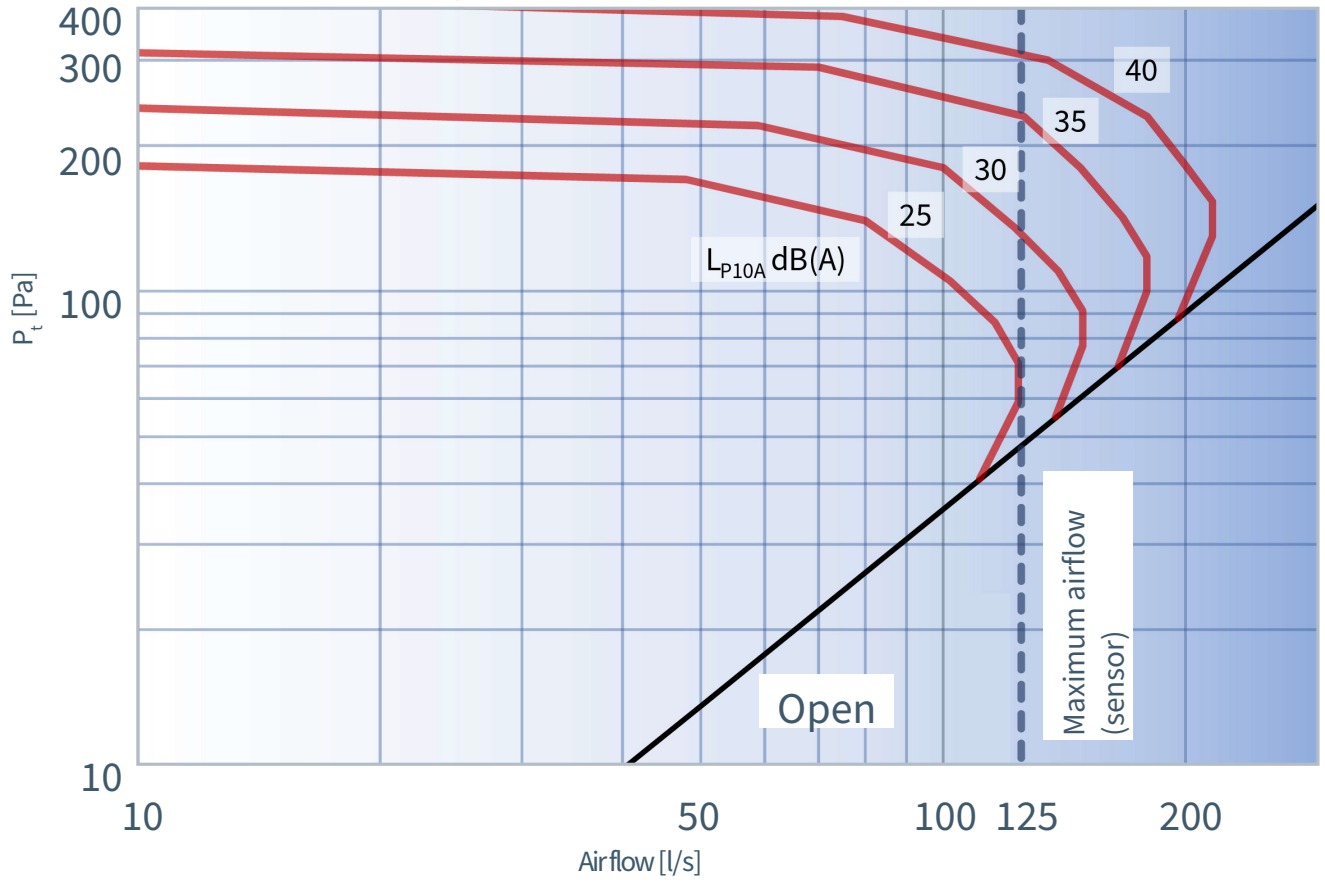
Correction Factor, K0 [dB]

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

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



Accessories

Flow Balancing
For balancing extract air, use the flow control DCV-BLb.

Safety grille
The diffuser section of the supply air diffuser can be equipped with Safety Grille SHG to protect it from damage.

Carbon Dioxide and Humidity Sensors
GQH-I: Card slot on the diffuser's control board for easy retrofitting
Lindivent's external carbon dioxide sensors: Connection via the diffuser's connection box, CBD

Other sensors
It is possible to equip the device with sensors for TVOC and formaldehyde via an expansion card.

Lighting Control
Relay box CBR enables dual relay control via a push button, occupancy detection, and a selected lighting function. For DALI control, refer to SBDb.

Radiator Control
Valve actuators A40405(NC) or A41405(NO) for sequential control of heating and cooling.

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 coils or electric radiators.

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

External Occupancy Sensor
Occupancy sensors GO-C or PD-2400 provide alternative placement options for desired coverage.

Setpoint Adjuster
CAN-connected user panel for wall mounting DRP. The panel can be configured to allow users to temporarily adjust the room temperature setpoint and 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.


LINDINVENT®
INDOOR SPACES SMARTER