ISQ-F

Exposed active supply air diffuser

Quick facts

- An active supply air diffuser and a complete unit for on-demand control of room climate in offices, care facilities, and schools
- Intended for visible mounting
- Installation efficient
  - Built-in room climate controller
  - Built-in motor-controlled air flow valve
  - Built-in and configured sensors
  - Easy and quick installation
- Exceptional sound and flow performance
- Allows for a both low and cold supply airflow without creating draft
- Adjustable air distribution pattern
- Network connection for communication and visualization
- Bluetooth® for easy local access via the LINDINSIDE app
- An environmental declaration for construction products, EPD, is registered since June 2022 at www.epdhub.com
- Designed for efficient transportation using a minimum of packaging material

Demand-controlled ventilation can reduce energy use 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® and ISQ-F?

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 data 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

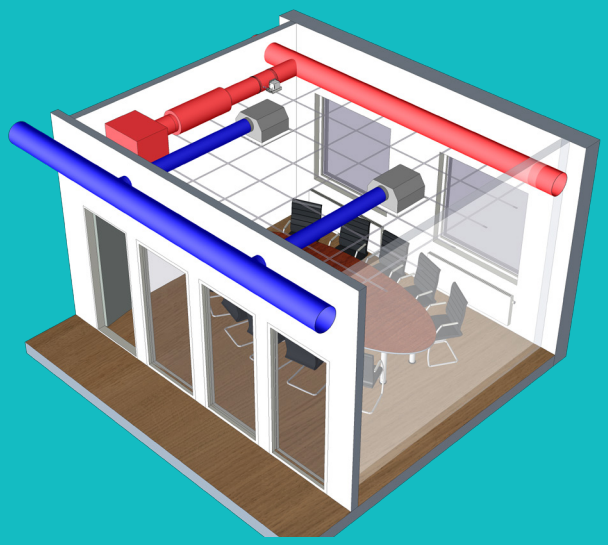
Solutions based on the INSQAIR product series might be the world's most versatile and thus useful systems for room climate control at workplaces. Consultants, installers, integrators, operating technicians, tenants, and property owners shall feel safe with their choice of system now and for future requirements.

conference room with ISQ

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

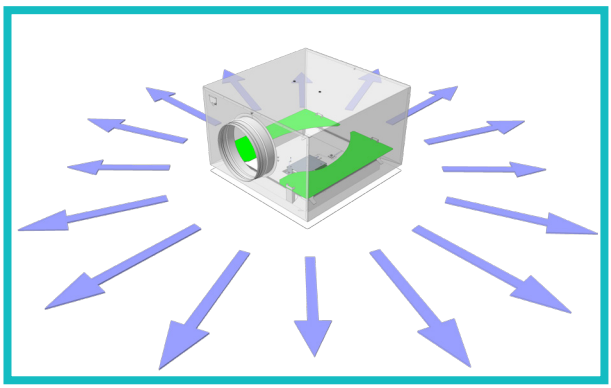
- 10 - 250 l/s (ISQ-F or ISQ-200)
- Silent regulation
- No additional dampers
- No wall mounted sensors

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.

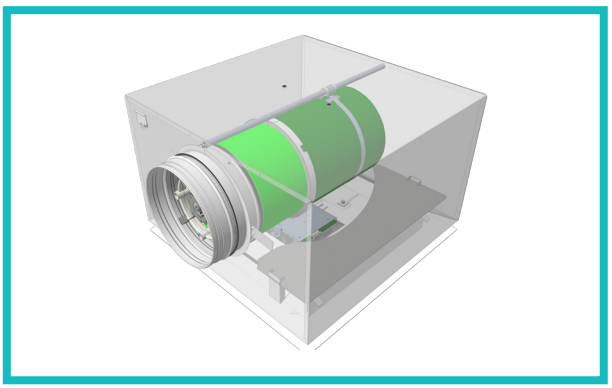


Konference room with active diffusers.

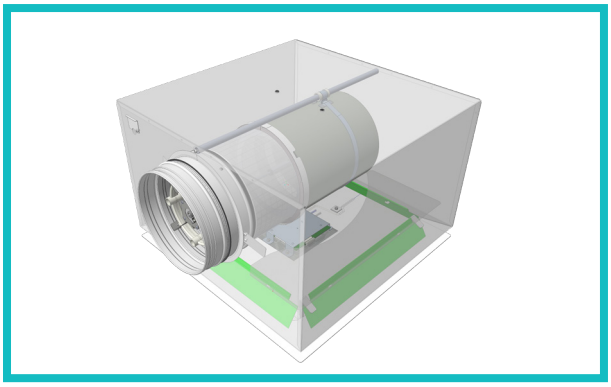
Construction parts



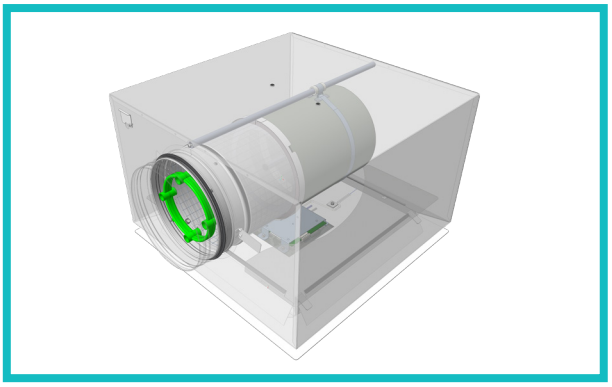
ISQ-F is a rectangular exposed supply air diffuser intended for horizontal mounting. Two air distributor plates provide a radial distribution pattern that mimics the distribution patterns from circular diffusers.



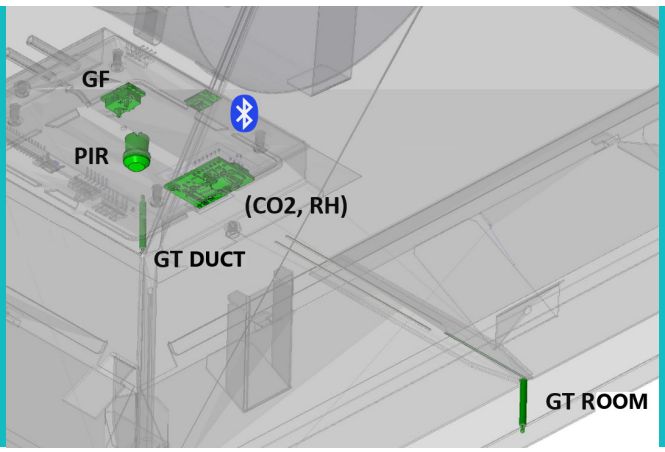
A patented motor controlled airflow valve designed for quiet regulation also at high airflow. The valve is built around a permeable fiber material.



Loosely hanging lamellas in the inlet to the diffuser part open or close at changes in airflow. This design means a high air velocity and thus high air mixing capacity is maintained over the entire flow range. The lamellas can be blocked for an adjustable air distribution pattern.



A patented flow measuring device reduces the need for a straight section before the measuring device. This enables mounting directly after a 90° bend.



The ISQ-F diffuser plate

- Removable plate with suspension device
- A room climate controller with compact sensors and Bluetooth® is mounted on the inside of the plate
- The plate, which diffuses the air horizontally, has centrally located openings for sensors
- The room temperature sensor (GT) is located at the edge of the diffuser plate

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.

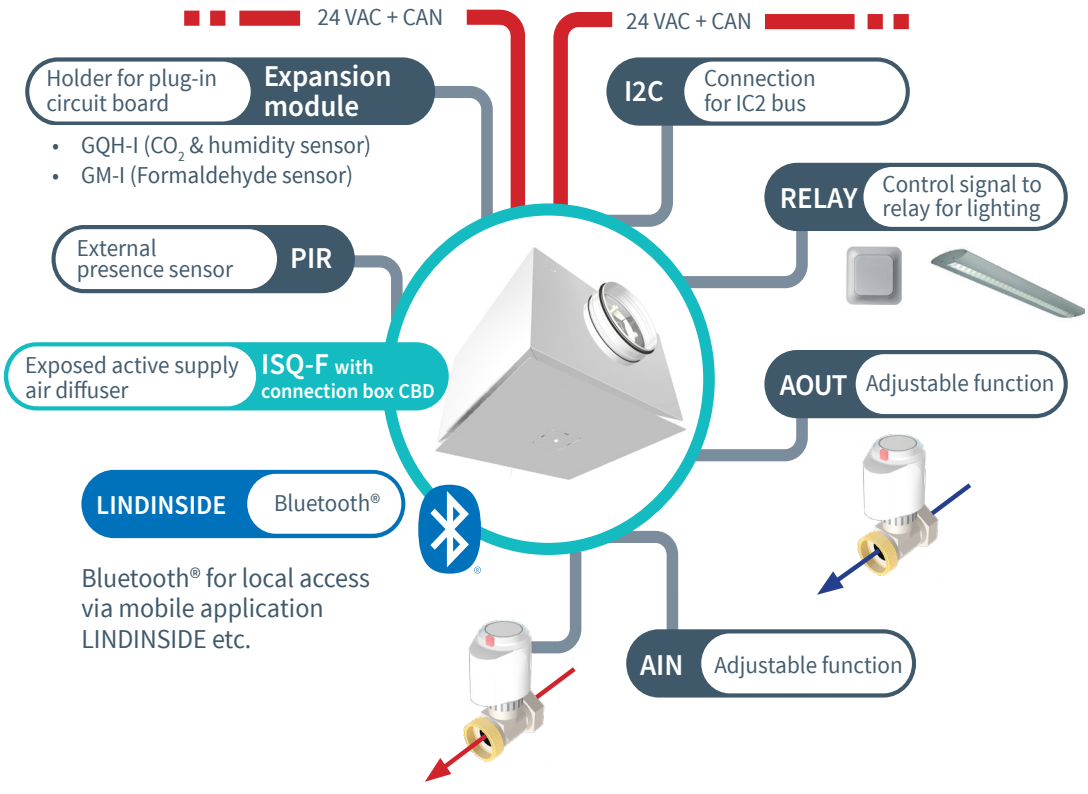
Temperature and air quality measurement
The diffuser is equipped with both a room- and a duct temperature sensor. A carbon dioxide- and humidity sensor is optional. The room temperature sensor is placed at the edge of the diffuser plate. The placement provides a more accurate and faster value than that 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.

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.

ISQ-F Connections



Accesories & extra functions

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

Carbon dioxide & humidity sensors (CO_2 + RH)
ISQ offers a built-in carbon dioxide and humidity sensor for air quality control. Can be retrofitted.

Lighting control
Lighting can be controlled via the occupancy detector in ISQ and/or via push button by connecting relay box CBR. See SBDb for DALI lighting control.

Radiator control
Valve actuators for radiators can be connected for sequential regulation of heating and cooling.

Electric radiator control
Heating batteries and electric radiators can be controlled via control box CBT.

Air fan cooling
Additional cooling is control using I/O-box CBF-E or CBF-S.

External presence detector
For an alternative placement of the built-in occupancy detector see GO-C or PD-2400.

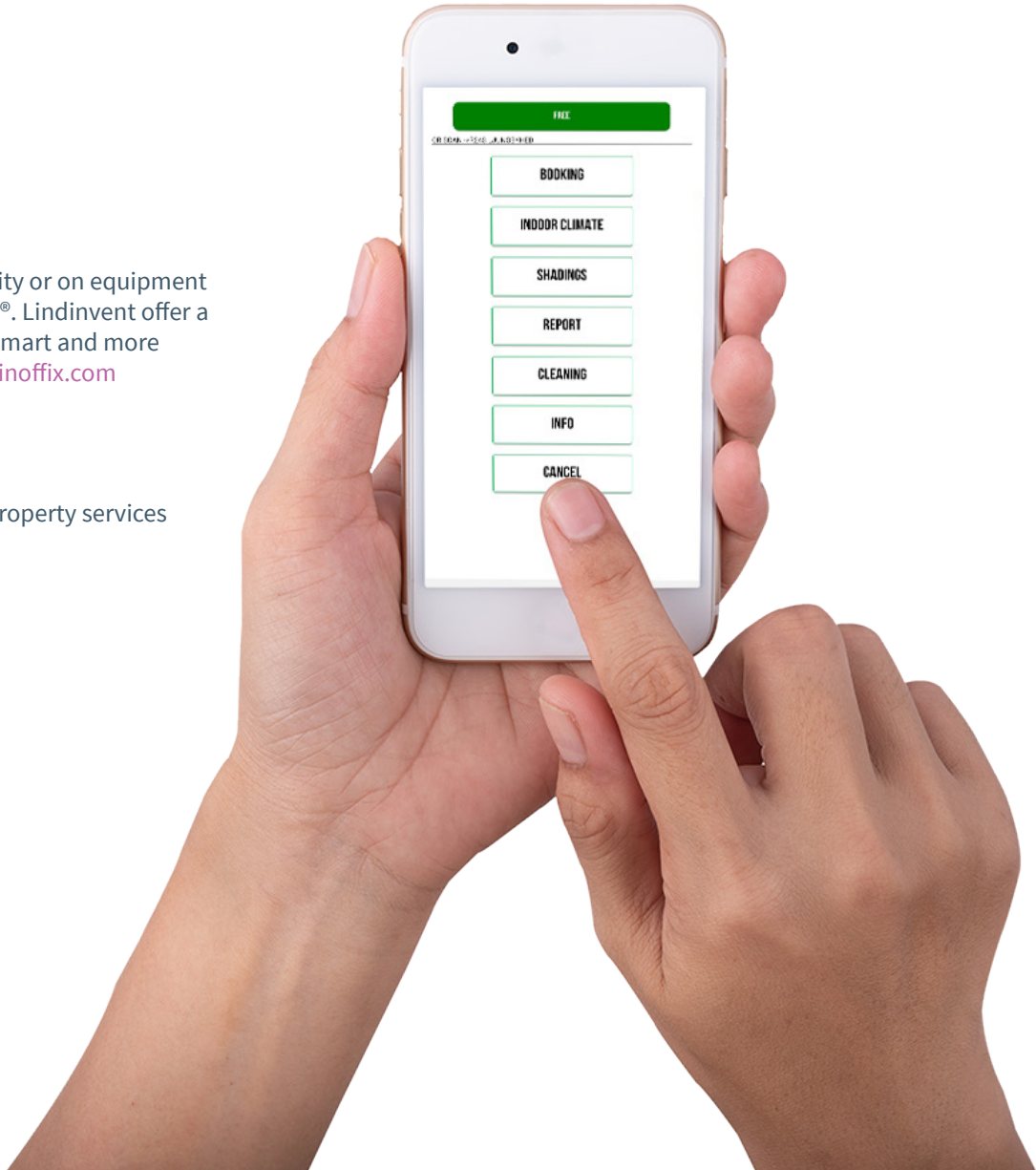
Setpoint switch panel
The wall-mounted panel DRP can be installed to adjust the room temperature setpoint or temporarily activate enforced ventilation. See also INOFFIX below.

Smart electrical outlets with power measurement
Via Bluetooth® and smartplug SPB, electricity use can be reduced through presence control of everything from workplace lighting, screens and adjustable desks. The product is under development.

INOFFIX®

Scan QR codes placed in the facility or on equipment with the smart phone app InOffix®. Lindinvent offer a number of smart solutions for a smart and more efficient property. Learn more at inoffix.com

Functions:
- Adjust temperature
- Adjust sunscreen
- Book rooms or order offered property services
- Put in a cleaning request
- Deviation rapport
- Surveys
- Check in/out
- Room info



Communication

The visualization tool LINDINSPECT®

LINDINSPECT® is a powerful web-based tool that enables a central and coordinated administration and visualization of control units. Everything from active devices to other control equipment for comfort and sustainable energy use is monitored and displayed on a plan view with its climate data. Deviating values are marked. Operating conditions for individual equipment can be graphically indicated.

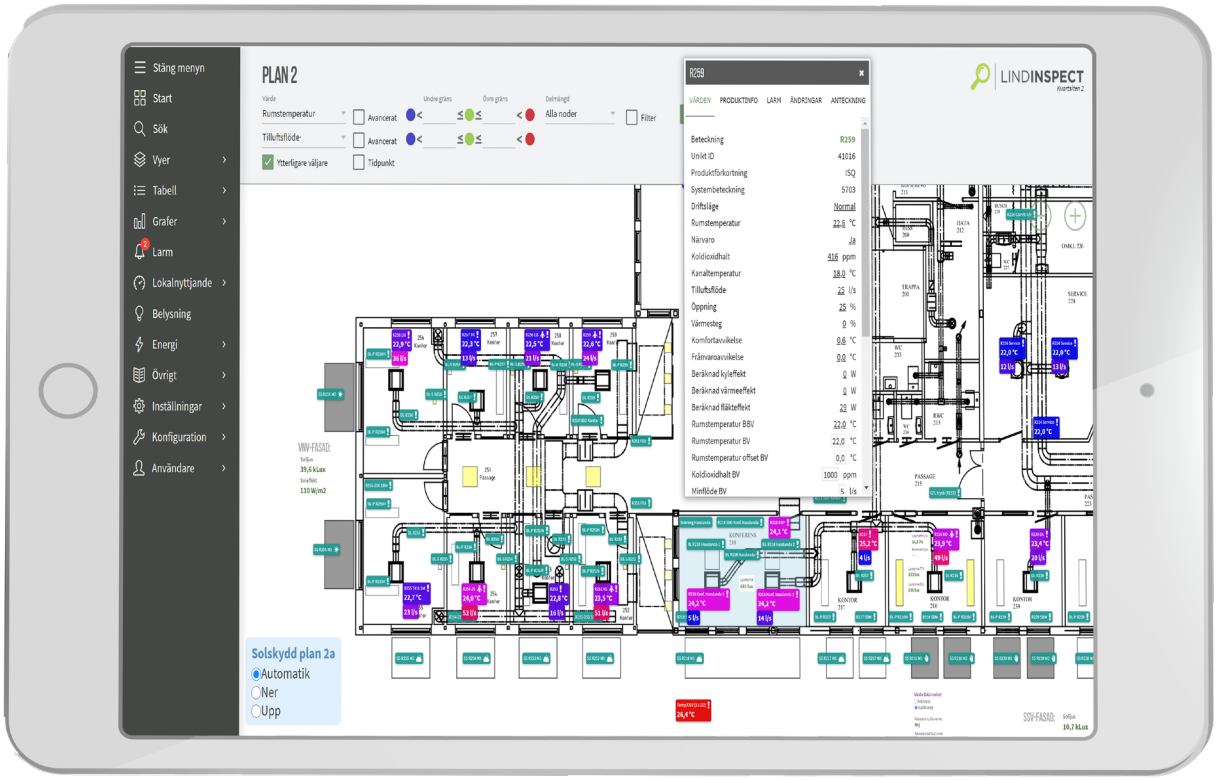
LINDINSPECT® requires a system build-up where Lindinvent's central unit is connected to all individual control units through Gateway NCE.

API

Lindinvent's REST-based API can be accessed for data that can be used by third-party applications. Lindinvent's app InOffix® uses this API.

Modbus TCP or Modbus RTU

Individual control units can also be accessed in a system setup without LINDINSPECT®. Connection to an external superior system is made via Gateway NCE and then always either via Modbus TCP or Modbus RTU.



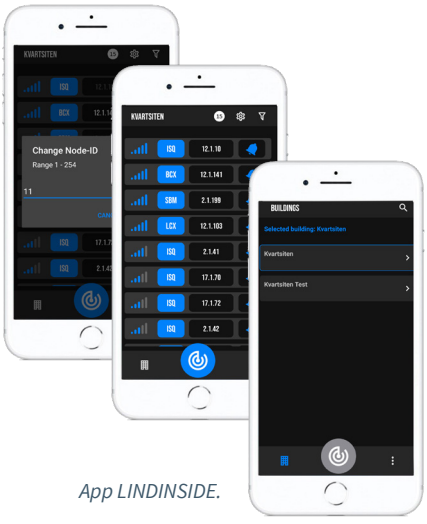
Plan view - LINDINSPECT®.

LINDINSIDE

The smart phone app LINDINSIDE allows connection via Bluetooth® directly to individual control units. Authorized personnel can identify other Bluetoth® units to easily make settings or read values using a smartphone. Data is stored in the cloud for easy access.

Bluetooth®

Additional communication possibilities are created via Bluetooth®.



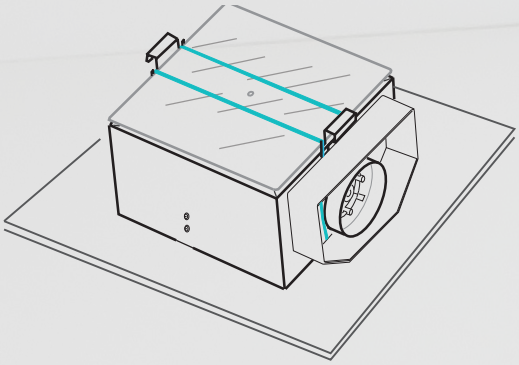
App LINDINSIDE.

Easy and fast installation

A complete unit
The diffuser is delivered including the plenum box as one unit. This contributes to a whole set of logistical advantages also in connection with installation.

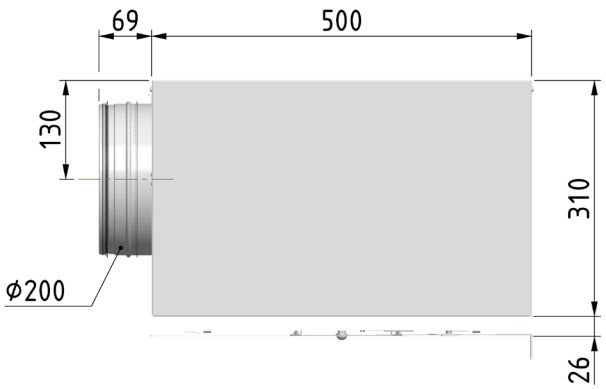
Mounting rods for suspension
The unit is attached to the ceiling structure via the supplied flat mounting arms or via a threaded rod. Once the choosen suspension device is firmly secured in the roof structure: Grab the mounting handles and lift the diffusers into position. The handles are removed after the diffuser is secured in its correct position.

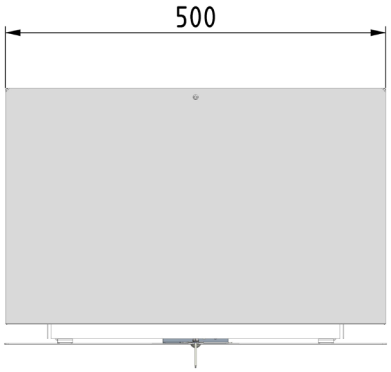
Connection box CBD
All wiring to ISQ-F is done via connection box CBD. The box is delivered connected to the diffuser. CBD is used both for connecting accessories and for connecting the diffuser to a CAN-loop with the voltage supply.

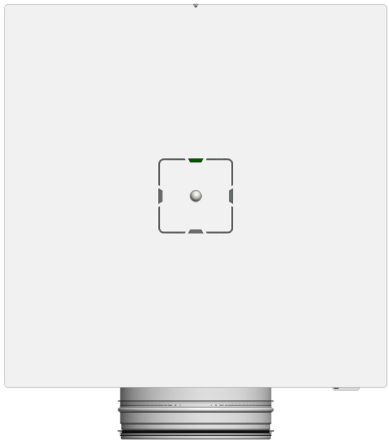


The unpacked device. The tension band that holds the mounting handles is removed when the device is lifted up and anchored to the ceiling. Protective cardboard is left until it is time for commissioning.

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.
Flow valve (housing): Aluminum
Flow sensor and discs in the diffuser section: Thermoplastic
Other: Electronics and electric motor
Construction product declaration can be downloaded at lindinvent.com
Net weight ISQ-F: 11 kg

Color
RAL 9003 (Gloss 30) in standard version.
Special colors are available. Name the 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: -20oC to 50oC; <90% RF

Cable (16-conductor)
ISQ-F is delivered with an attached cable to the control unit. The length of the cable (max. 10 meters) is stated when placing the order.

Electrical system
Supply voltage: 24 VAC

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

Communication
Serial communication in the power supply cable (shielded FLAQQBR: 2x1 + 1x2x0.22)

Radio communication
BLE module: Bluetooth® 2.4 GHz
Listen mode only for calls from the app or similar.
Beacon functionality etc requires transmission.

IP class
IP class: 22

CE marking
Complies with EMC and low voltage directive.
Certificates are available at lindinvent.com

Presence detector
PIR: Passive IR detector with 200 zones
Detection range: 107° x 107°

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

Duct temperature measurement
Temperature sensor of the type NTC.
Accuracy temperature: ± 0.5 K

Carbon dioxide measurement
Measuring range: 400 - 10,000 ppm
Accuracy: ± (30 ppm + 3%) with background calibration

Humidity measurement
Measuring range (at 25° C)
Relative humidity: 0 - 100% RH
Accuracy (at 25° C and 50% RH):
Relative humidity: ± 5% RH
Absolute humidity: ± 1g / kg
Dew point: ± 1 K

Flow- control & measurement
ISQ-F is equipped with a flow sensor.
Flow range: 5 - 125 l/s with sound level <30dB (A)
Tolerance: ± 5% or at least ± 2 l / s
Straight distance after 90° bend: No need
Straight distance after T-piece: 400 mm
Straight distance when changing dimensions in front of ballast: 200 mm
Run time: Maximum change regulated within about 2 min

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 a minimum rate of air flow at 10 l/s)
Pressure range: 10 - 200 Pa

Expansion module
The control unit, located on the inside of the removable diffuser plate, has room for an expansion module. The expansion module with a CO2-sensor is connected here.

Connection box CBD

- Connected to ISQ-F on delivery
- Bottom magnets for easy mounting
- 2 terminals for connection of ISQ-F to 24 VAC + comm
- 1 pc 0–10 VDC analog in for ISQ-F equipment
- 1 terminal block for lighting control with relay box CBR
- 1 pc 0–10 VDC analog out for peripherals to ISQ-F
- 1 pc 24 VAC, TRIAC - for control of valve actuators
- Maximum load TRIAC: 10 thermal actuators of 1 W
- Terminal for I2C bus for extra sensor

Pressure, flow & sound 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

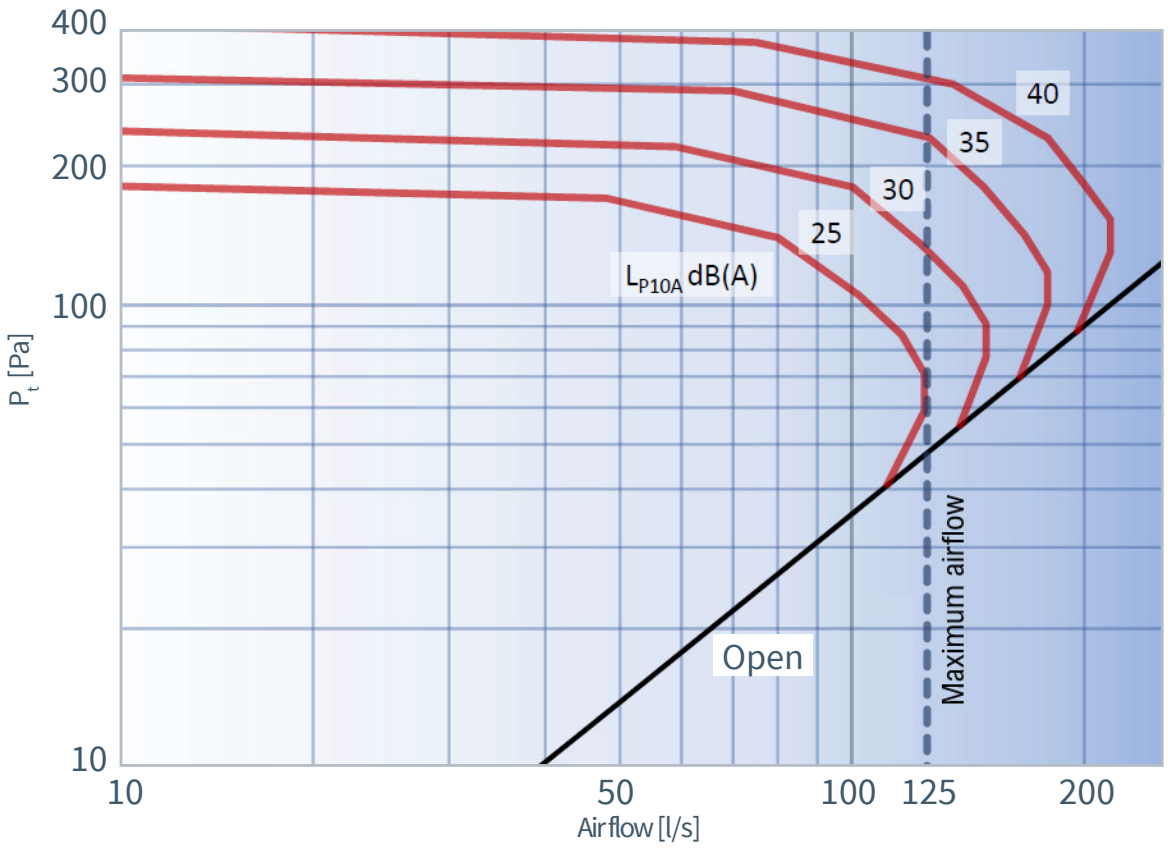
Self attenuation [dB]

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)



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.
End-user info	A brief introduction to Lindinvent's system for smart ventilation.
Modbuslista	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