ISQ

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 concealed installation with the diffuser part almost flush with and as an integral part of the suspended ceiling
- 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 make ISQ a quiet and smart supply air solution also for the future.

LINDINVENT®

Why INSQAIR® and ISQ?

INSQAIR® = INnovative Smart Quiet AIR
ISQ is part of INSQAIR, a series of products that share a range of technical solutions that resulted in international patents.

Simplicity and performance
ISQ delivers comfort and efficient operation as a result of a unique technical performance. Solutions are developed for simplicity at all levels. Easy planning, easy installation, and easy commissioning. Simple user interfaces provide accessibility and overview.

Lowest Life Cycle Cost (LCC)
Lindinvent develops systems for compliant and efficient climate control based on under-tempered supply air and on-demand control. As a rule, the system solution provides the lowest investment and life cycle costs.

Increased productivity and efficiency
Primarily cooling via the supply air results in increased air volumes. With increased air volumes, staff efficiency increases by up to 8% according to the study *"Economic, Environmental and Health Implications of Enhanced Ventilation in Office Buildings"* published in November 2015.

Maximum digitization
The starting point is an architecture for stable network communication between control units that also are equipped with Bluetooth®. Measurement data is accessed via API, Modbus, HTTP, and app. The platform makes indoor climate data meaningful and creates room for maximum digitization.

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-160
- Recommended flow range: Between 4 and 60 l/s
- Sound performance: Below 30 dB(A) up to 50 l/s at 100 Pa
- Height: 256 mm

Quick data ISQ-200
- Rekommended 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

Occupancy rate and levels of activity

Home office, sick leave, holidays, or external assignments are all reasons that contribute to variations in the degree of attendance. To limit energy use, a function must ensure that the total air flow 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 pressure/air flows 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 solar shading 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

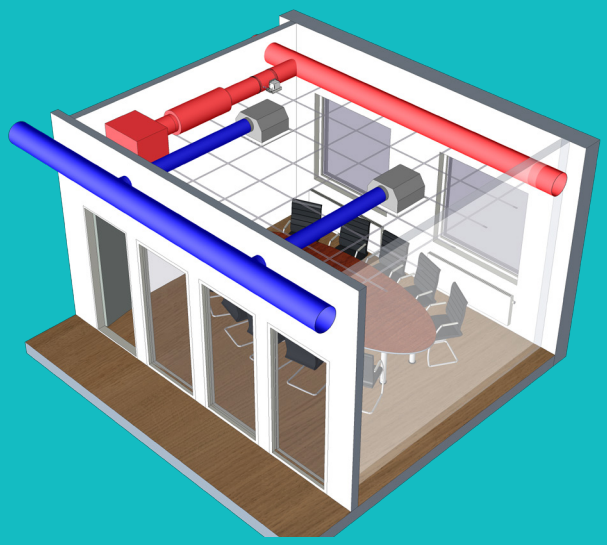
Solutions based on the INSQAIR product series might be the world's most versatile and thus useful systems for room climate control at workplaces. Consultants, installers, integrators, operating technicians, tenants, and property owners shall feel safe with their choice of system now and for future requirements.

ISQ in a conference room

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

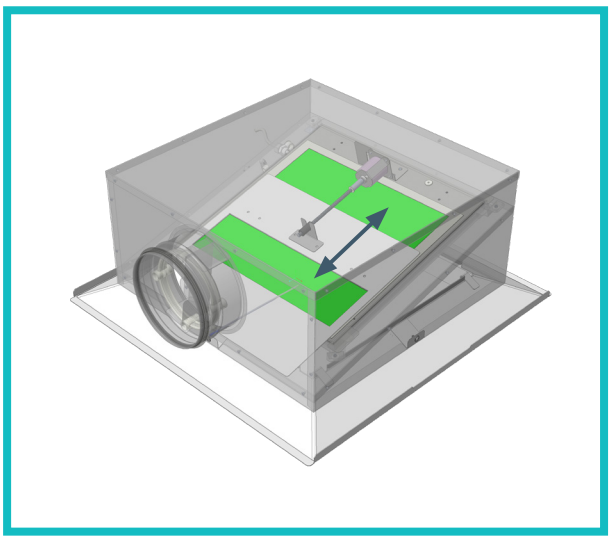
- 10 - 250 l/s (ISQ-200)
- Silent regulation
- No additional dampers
- No wall mounted sensors

The CO2 sensor is retrofitted, as an accessory, in one of the diffusers without additional cabling and costly integration. The sensor is used to adapt the air flow according to the carbon dioxide content 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.

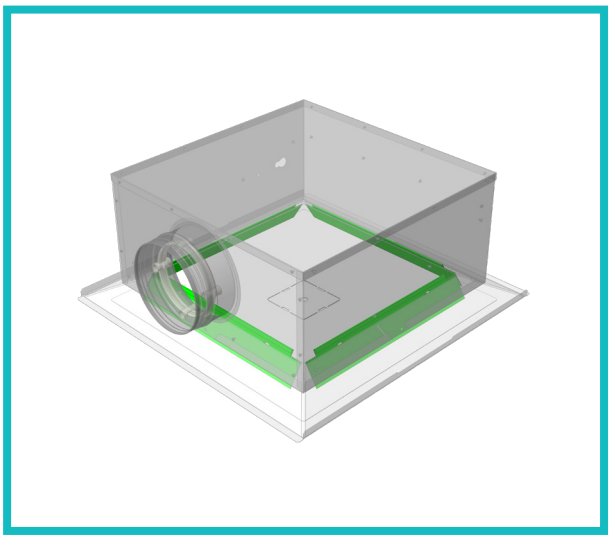


Konference room with active diffusers.

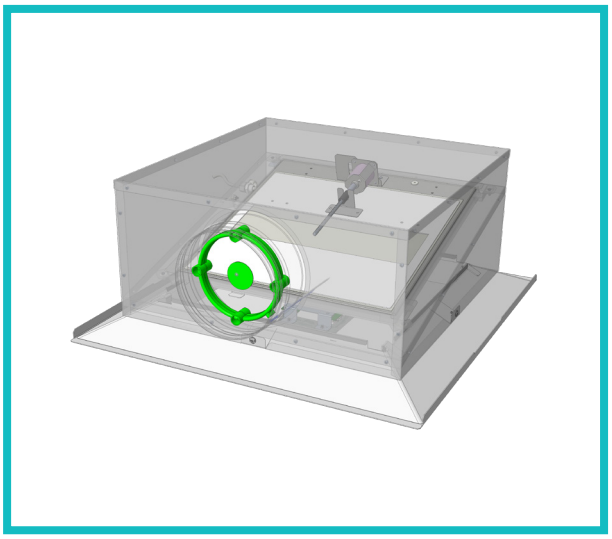
Construction parts: ISQ-160



A patented motor controlled airflow valve designed for quiet regulation also at high airflow. The valve consists of a disc which via motor control allows a varying degree of air flow through a permeable fiber material.

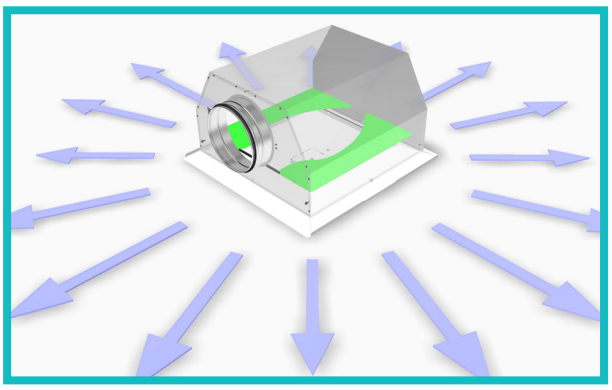


Loosly hanging lamellas in the diffuser part maintains a high air velocity even at a low airflow. The lamellas open or close at changes in airflow. The lamellas can be blocked for an adjustable air distribution pattern.

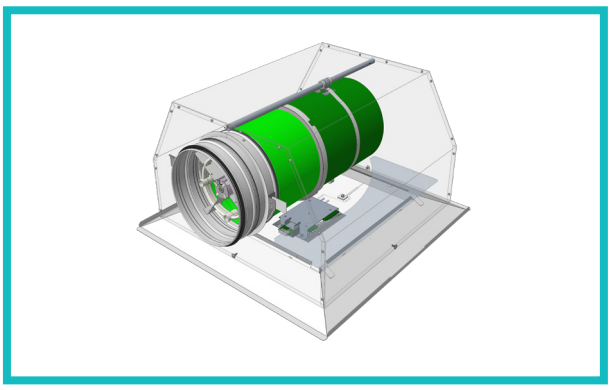


A patented flow measuring device reduces the need for a straight section before the measuring device. This enables mounting directly after a 90° bend.

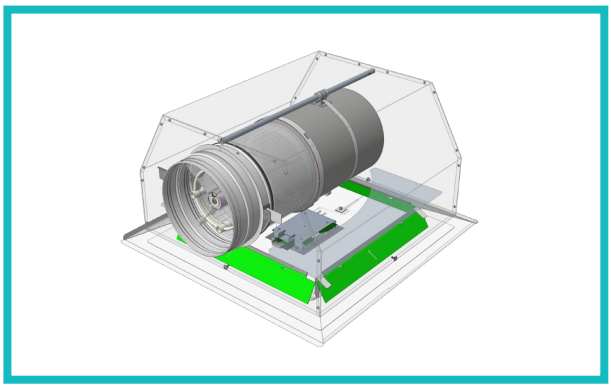
Construction parts: ISQ-200



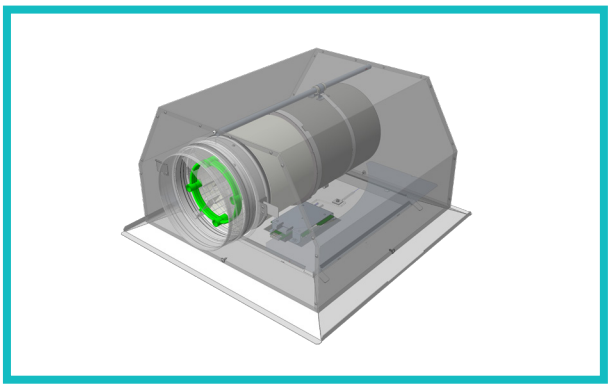
ISQ-200 is a rectangular supply air diffuser intended for horizontal installation in suspended ceilings. Air distributors in the plenum box provide a radial distribution pattern that mimics a circular diffuser.



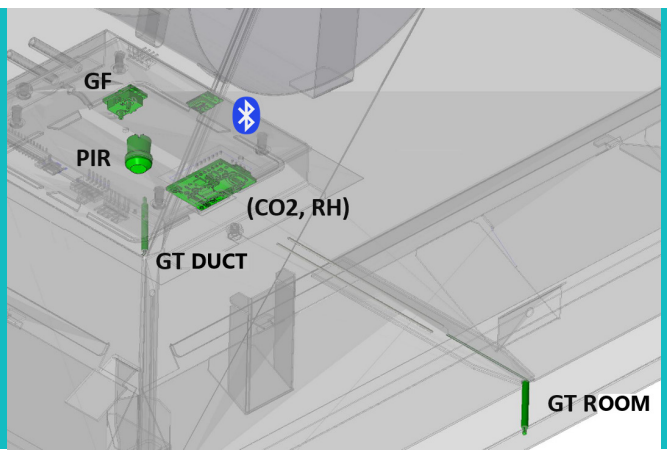
A patented motor controlled airflow valve is designed for quiet regulation also at high airflow. The valve is built around a permeable fiber material.



Loosly hanging lamellas in the diffuser part maintains a high air velocity even at a low airflow. The lamellas open or close at changes in the airflow. 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 diffuser plate

(both for ISQ-160 & ISQ-200)

- 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 plate

Function

Airflow control
The air flow is regulated by the motor controlled air flow valve. A high air velocity from the diffuser is maintained also at low air flow 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. Air flow 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 device works towards an operating mode that allows greater temperature fluctuations and the use of stored energy in the building's frame structure. ISQ delivers the desired room climate by itself or in collaboration with several diffusers.

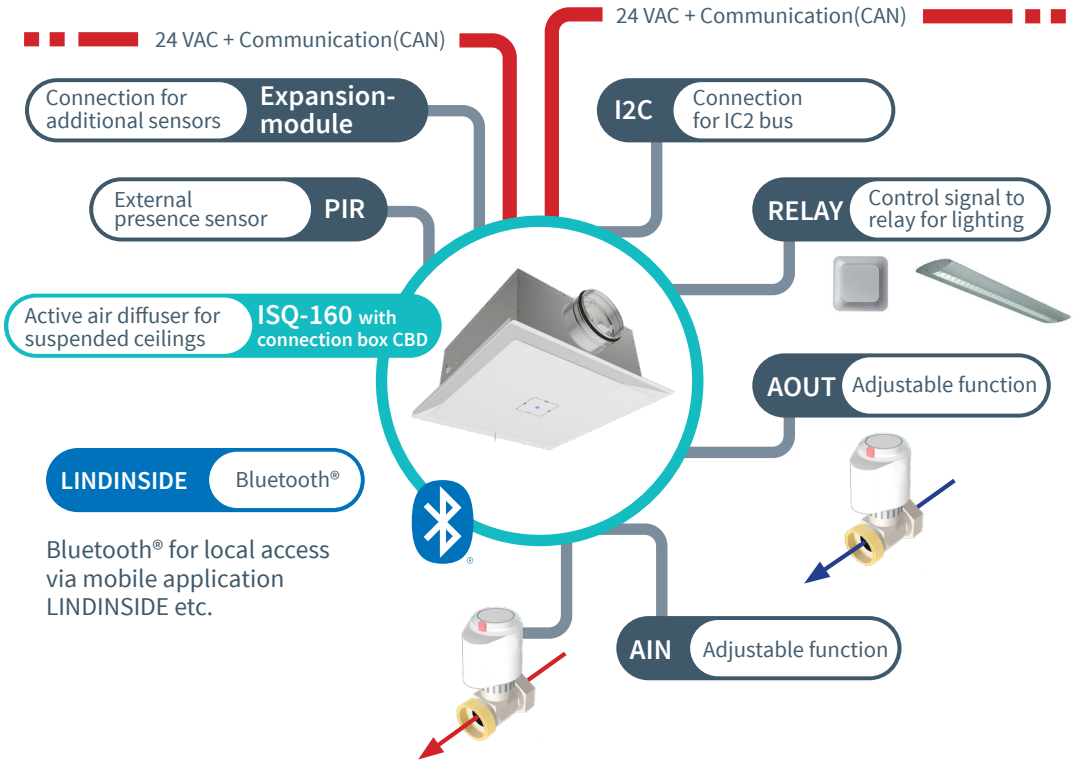
Temperature and air quality measurement
The diffuser is equipped with both a room- and a duct temperature sensor. A carbon dioxide- and humidity sensor is optional. The room temperature sensor is placed at the edge of the diffuser plate. The placement provides a more accurate and faster value than that 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 presence sensor with almost 200 detection zones. Exhaust and supply air fan units can be controlled by the detected degree of presence.

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.

connections (ISQ-160 and ISQ-200)



Accessories

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. The unit is easily 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
Control additional cooling via control boxes CBF-E/CBF-S.

External presence detector
For an alternative placement of a occupancy detector, GO-C or PD-2400 can be connected.

Setpoint adjuster
A wall-mounted panel can be installed to allow users to adjust the room temperature setpoint or temporarily activate a ventilation function. See user panel DRP. See also INOFFIX ® below.

Presence-controlled power outlet SPD
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 diffusers 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.

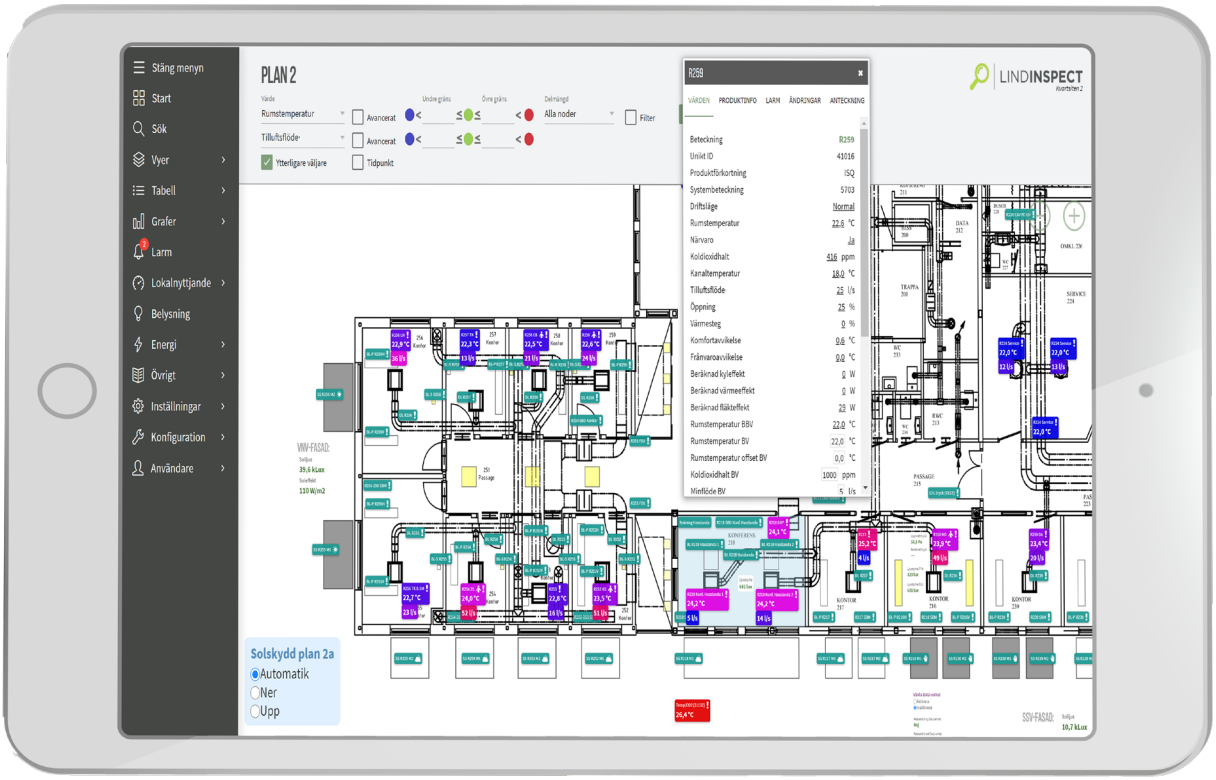
LINDINSPECT® requires a system build-up where Lindinvent's central unit is connected to all individual control units through Gateway NCE.

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.



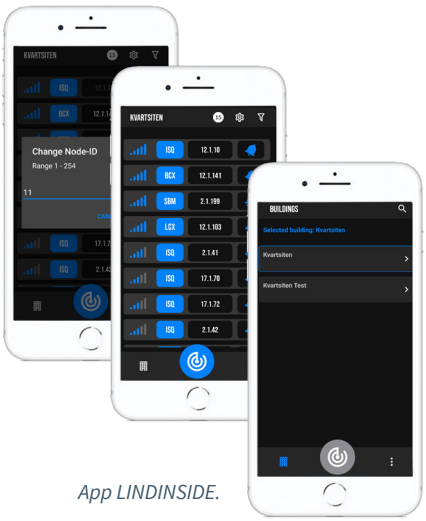
Plan view - LINDINSPECT®.

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

Leave space for easy installation

The suspended ceiling support structure needs to be in place with the required mounting space in height. Easy mounting requires maneuvering space for duct connection. Connection via a flexible aluminum hose or push nipple is recommended.

Mounting handles

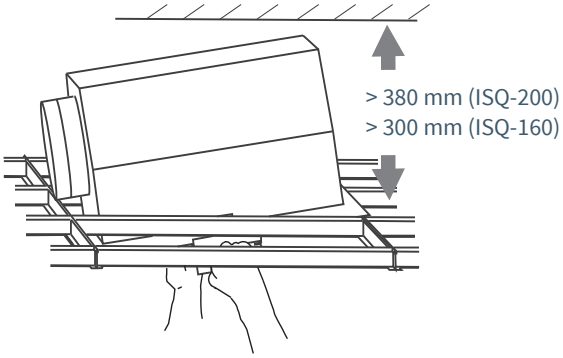
The diffuser is ready to be lifted up, connected to the duct and placed in the suspended ceiling in one assembly step, directly from the pallet, using the two pre-assembled mounting handles. The handles are removed and left for recycling when the diffuser is in place.

Cover profiles for concealed installation

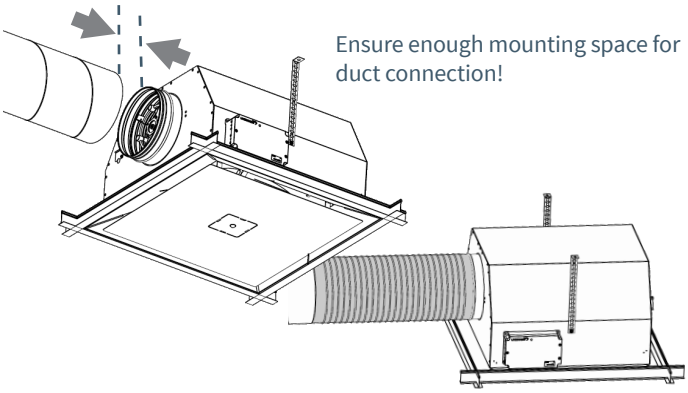
Gaps between the outer edge of the diffuser and the suspended ceiling profile occur on both sides where the handles have been removed. These gaps must be covered by the two supplied cover profiles.

Connection box CBD

Peripherals as well as the combined cable for power supply and communication are connected via CBD. Magnets make it possible to easily place the box on the diffuser.

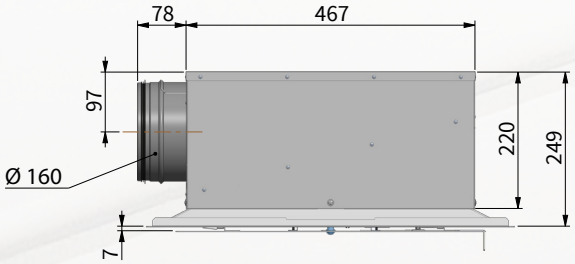


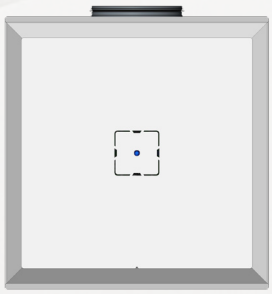
Minimum space above the suspended ceiling.

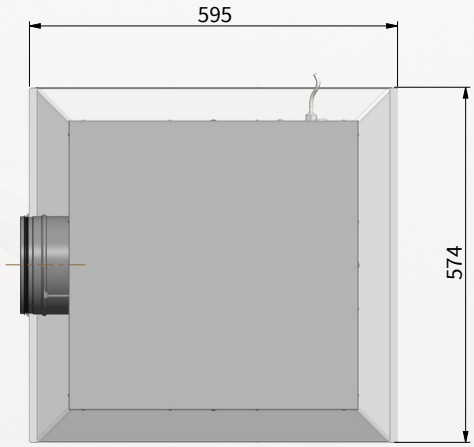


Duct connection via a flexible aluminum hose.

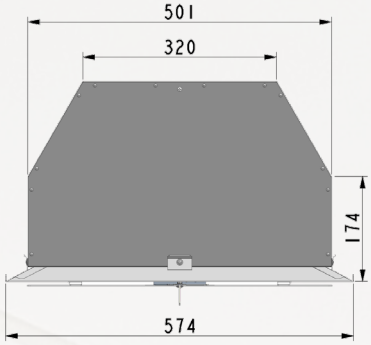
Dimensions (mm): ISQ-160

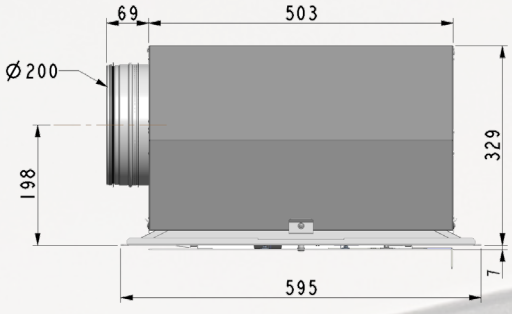


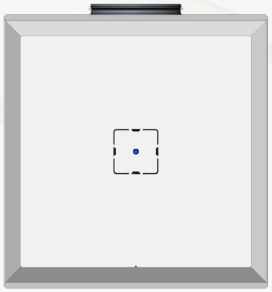




Dimensions (mm): ISQ-200







Technical specifications

Material
Diffuser part: Powder coated steel plate
Plenumbox: Galvanized steel plate, C3
Valvehousing: Aluminium plate
Flow meter and lamellas: Thermoplastic
Other: Electronics and electrical motor
EPD and Building material declaration available.
Net weight ISQ-200: 12 kg
Net weight ISQ-160: 11 kg

Color
RAL 9003
Other colours may be specially ordered;
please state RAL number.

Suspended ceiling
ISQ is adapted for suspended ceiling profile edge A and E. Profile D is feasable: State profile at order. Mounting angles are fitted on the plenum box and a cover frame is attached to the diffuser frame.

Duct connection
ISQ-200: Duct Ø 200 mm
ISQ-160: Duct 160 mm
Notice: Connection via a flexible aluminum hose or push nipple is recommended.

Temperature limits
Operation: 10°C till 30°C; <85% RF
Storage: -20°C till 50°C; <90% RF

Cable (16-conductor)
ISQ is delivered with an attached cable to connection box CBD. Standard length (16-conductor): 1 m
Longer cables can be specially ordered (5/10 m)

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 same cable as voltage supply (shielded FLAQQBR: 2x1+1x2x0.22)

Radio communication
Bluetooth® 2.4 GHz
Listen mode only for calls from the 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 detector
PIR: Passiv IR-detector with 200 zones
Detecting area: 107° x 107°

Room temperature measurement
Sensor with termistor of NTC type.
Accuracy: ± 0,5 K

Duct temperature measurement
Sensor with termistor of NTC type.
Accuracy: ± 0,5 K

Carbon dioxide measurement (option)
Automatic Background Calibrating sensor
Range: 400 - 10 000 ppm
Accuracy: ± (30 ppm + 3%)

Relative humidity measurements (option)
Range: 0 - 100 % RH
Accuracy (at 25oC and 50% RH):
Relative humidity: ± 5% RH
Absolute humidity: ± 1g/kg
Condensing point: ± 1 K

Air flow adjustment
ISQ is equipped with an air flow sensor
Airflow range ISQ-200: 5 - 125 l/s
Airflow range ISQ-160: 4 - 85 l/s
Sound levels according to diagrams.
Accuracy: ± 5% or minimum ± 2 l/s
Length of straighet section after 90 ° bend: No need
Length of straighet section after T-piece: 400 mm
Length of straighet section for dimensional change in front of ISQ: 200 mm
Performance: The flow is adjusted to a new setpoint within approximately 2 minutes.

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 airflow at 10 l/s)
Pressure range: 10 - 200 Pa

Connection box CBD

- Connected to ISQ on delivery
- Magnets for flexible and easy mounting
- 2 terminals for connection of ISQ to 24 VAC + CAN
- 1 terminal 0–10 VDC analog input
- 1 terminal block for lighting control relay box CBR
- 1 terminal 0–10 VDC analog output
- 1 terminal 24 VAC, TRIAC - for valve actuator control
- Maximum load TRIAC: 10 thermal actuators of 1 W
- Terminal for I2C bus

Pressure, flow and sound levels

The sound pressure levels L_{PA} in the diagram corresponds to A-weighted sound level in the reverberation field at 10 m^2 equivalent sound absorption area. It corresponds to 4 dB acoustic attenuation in a normally damped room with 25 m^3 room volume. See table for other room types. For an account of the diffuser 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 beencarried out according to SS-EN ISO 7235:2009.

Correction for acoustic room attenuation [dB]

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

Correction factor, K0 [dB]

ISQ	Octave band [Hz]							
	63	125	250	500	1K	2K	4K	8K
200	6	9	8	1	-4	-9	-10	-7
160	3	4	4	3	-2	-7	-9	-7

Self attenuation ISQ-160 [dB]

ISQ-160	Octave band [Hz]							
Opening	63	125	250	500	1K	2K	4K	8K
25%	15	11	10	13	13	17	20	22
100%	15	9	10	11	9	12	16	18

Self attenuation ISQ-200 [dB]

ISQ-200	Octave band [Hz]							
Opening	63	125	250	500	1K	2K	4K	8K
20%	14	9	14	13	15	19	24	24
100%	14	9	13	11	12	14	18	19

Tolerance [dB]

ISQ ± [dB]	Octave band [Hz]							
	63	125	250	500	1K	2K	4K	8K
200&160	3	3	2	2	2	2	2	2

Diagram ISQ-160, Sound pressure L_{P10A} dB(A)

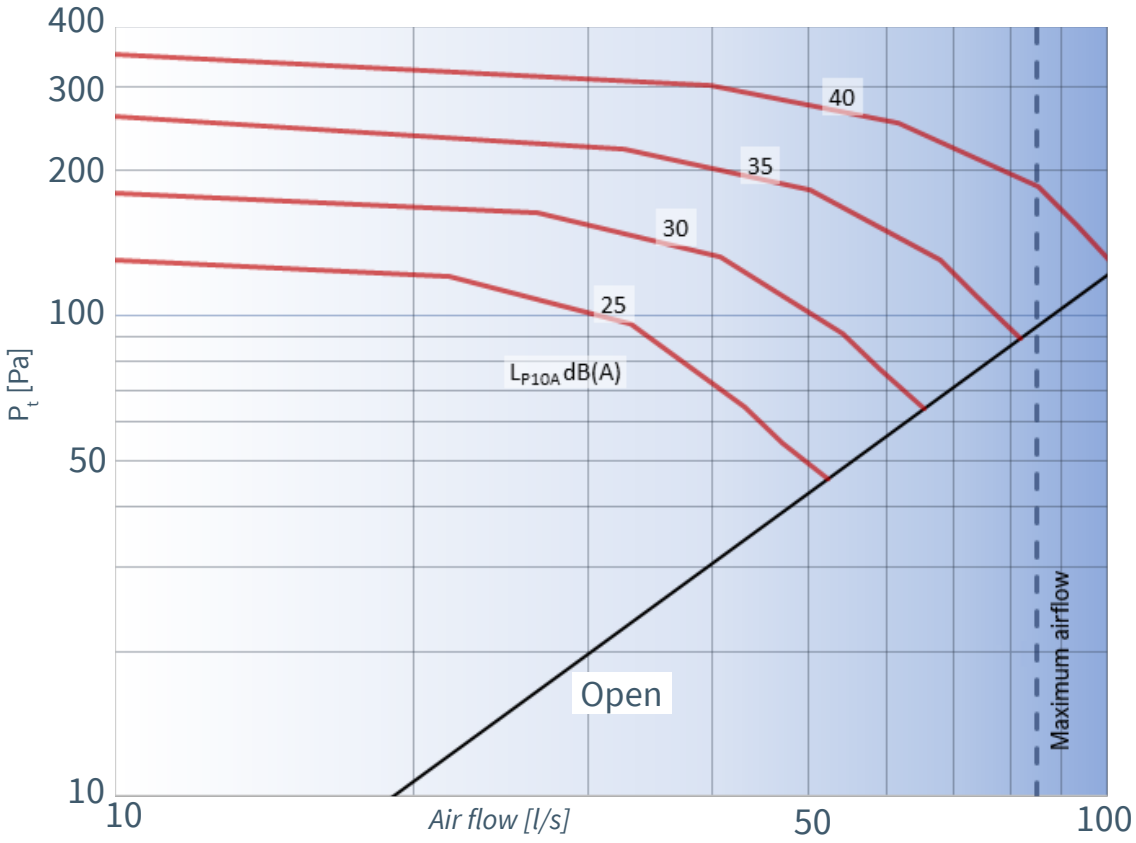
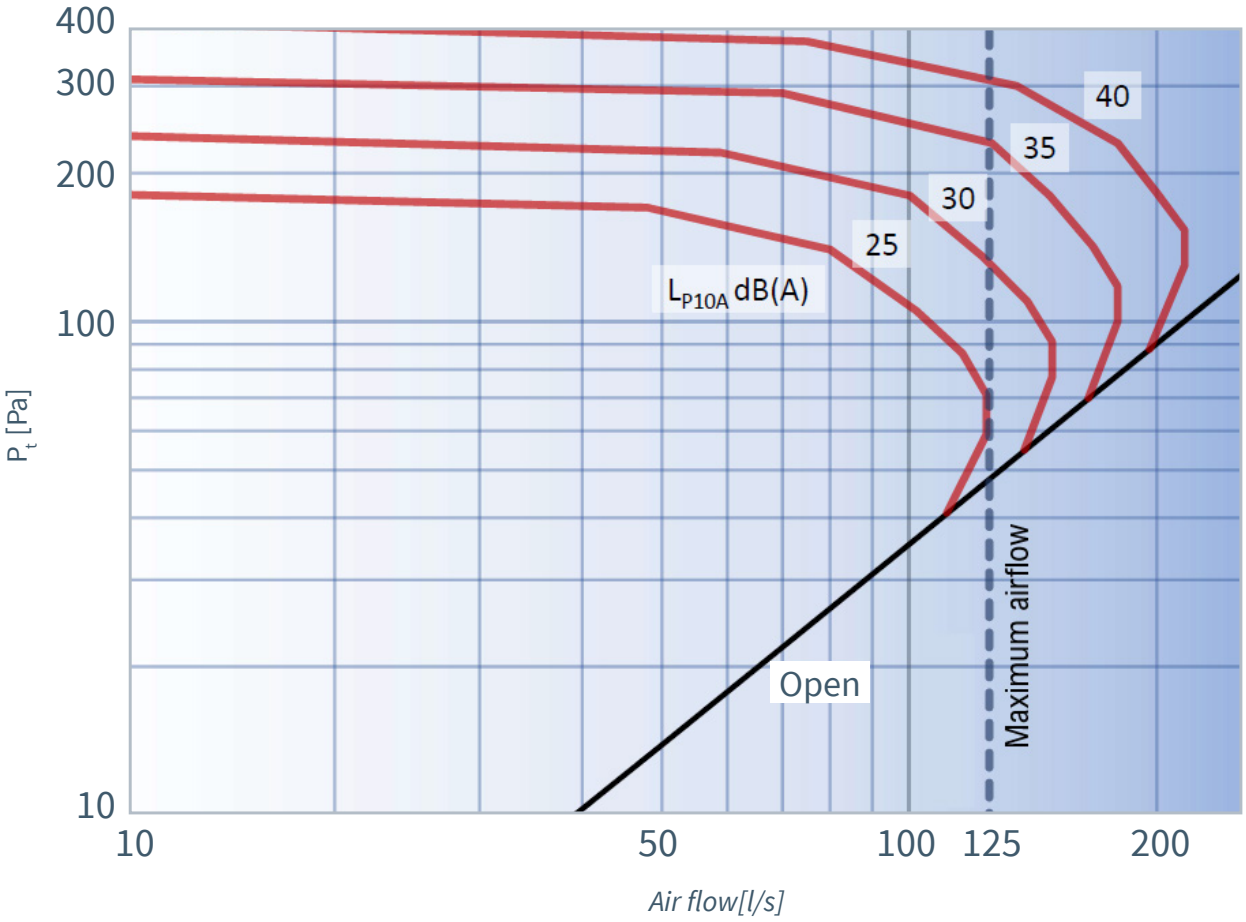


Diagram ISQ-200, Sound pressure L_{P10A} dB(A)



Additional product documentation

Download available in ISQ product page at lindinvent.com

Document	Comment
Installation instruction	Note: Intended for horizontal installation. Instruction with assembly steps.
Start-up instruction	A guide on how to use the app LINDINSIDE to start-up commisioning of ISQ.
Maintenance instruction	Regarded as maintenance-free.
External connection diagram	ISQ and connection box CBD.
Building material declaration	Material declaration assessed by Byggvarubedömningen. EPD registered in June 2022.
End-user info	A brief introduction to Lindinvent's system for smart ventilation.
Modbuslista	The latest modbus list for ISQ (ISQ-160/-200/-F/-V)
AMA-text	Descriptive text according to AMA standard.
Design instructions	For the INSQAIR® product series on flows, distribution patterns, CFD and type room solutions.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