

## Quick Facts

- Part of Lindinvent's system for smart indoor 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 damper
  - 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



ISQ-160 (version C01)



ISQ-200 (version C01)

# ISQ

## Active Supply Air Diffuser

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 is on simplicity, maximum flexibility, and digitalization.

Performance, careful material selection, pre-assembled and configured sensors, Bluetooth®, and network connection make ISQ a silent and smart choice that prepares the building for the future.

## Why INSQAIR® and ISQ?

### INSQAIR® (INnovative Smart Quiet AIR)

INSQAIR is a series of air supply units from Lindinvent that share a number of technical solutions developed to achieve efficient installation and high-performance climate control. Several solutions have resulted in international patents.

### Simplicity and Performance

A unique technical performance. Simple planning, simple installation, simple commissioning, and simple user interfaces make the units in 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 sub-cooled supply air has the lowest investment and life cycle cost according to several studies.

### Increased Personnel Efficiency

Primarily cooling via supply air increases air volumes. Increased air volumes improve personnel efficiency by up to 8% according to the study *“Economic, Environmental and Health Implications of Enhanced Ventilation in Office Buildings”* published in November 2015.

### Maximum Digitalization

The architecture is designed for stable network communication between Bluetooth®-equipped devices. Measurement data is accessible via API, Modbus, HTTP, and app. This platform makes building data meaningful and enables maximum digitalization.

### Sustainable Material Selection

All units have been designed with recyclable materials. The need for packaging has been minimized

### Environmental Product Declaration - EPD

All air supply units in the INSQAIR product series have EPDs. Our EPDs can be retrieved via [www.epdhub.com](http://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 analysis of a product's environmental impact. Suppliers contribute to improved environmental declaration of buildings by providing EPDs.

### Highest Possible Flexibility

With Lindinvent's air supply units, an attractive indoor climate can be achieved without installing waterborne cooling. This results in increased flexibility in case of remodeling. The active unit's integrated sensors minimize the need for cabling. Walls can often be erected or moved without needing to reroute wiring. Remodeling projects are also simplified as active units in a flow range can be serviced from different air supply channels.

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### Quick Data ISQ-160

- Working range: 4 to 85 l/s
- Sound performance: Below 25 dB(A) up to 85 l/s at 200 Pa
- Height: 253 mm (above the suspended ceiling)



### Quick Data ISQ-200

- Working range: 5 to 125 l/s
- Sound performance: Below 30 dB(A) up to 125 l/s at 120 Pa
- Height: 329 mm (above the suspended ceiling)

## System Thinking

### 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 the system solution that efficiently and sustainably delivers a good indoor climate when and where it is needed.

- Wide flow range (supply and extract air)
- Low noise level even at high air flow and high duct pressure
- Draft-free environment even with highly sub-cooled supply air and low air flow
- A compact design that simplifies installation work
- Easy integration and commissioning of accessories
- Adjustable airflow distribution pattern
- Smart local control and optimization functions
- Superior functions for optimization and troubleshooting
- Robust and reliable communication between devices
- Multiple and intuitive user interfaces
- Commissioning and local access via app and Bluetooth®
- Environmentally friendly choice in all aspects

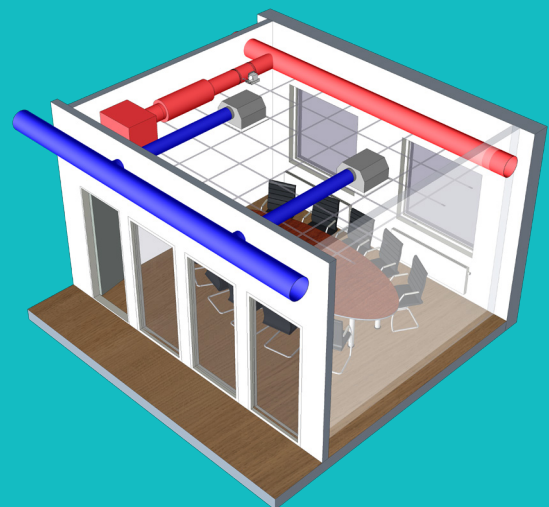
With the INSQAIR product series, we have developed unique, quiet, versatile and smart supply air diffusers that meet the requirements for room climate control in various environments.

## ISQ-200 in a Conference Room

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

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

The CO<sub>2</sub>-sensor is easily retrofitted into one of the diffusers via an expansion card. The sensor is used to adjust the airflow based on carbon dioxide levels and to analyze the occupancy level. By measuring the carbon dioxide level, the number of people in a room can be estimated. Integration with the room booking system allows for the release of "no-shows" for 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.

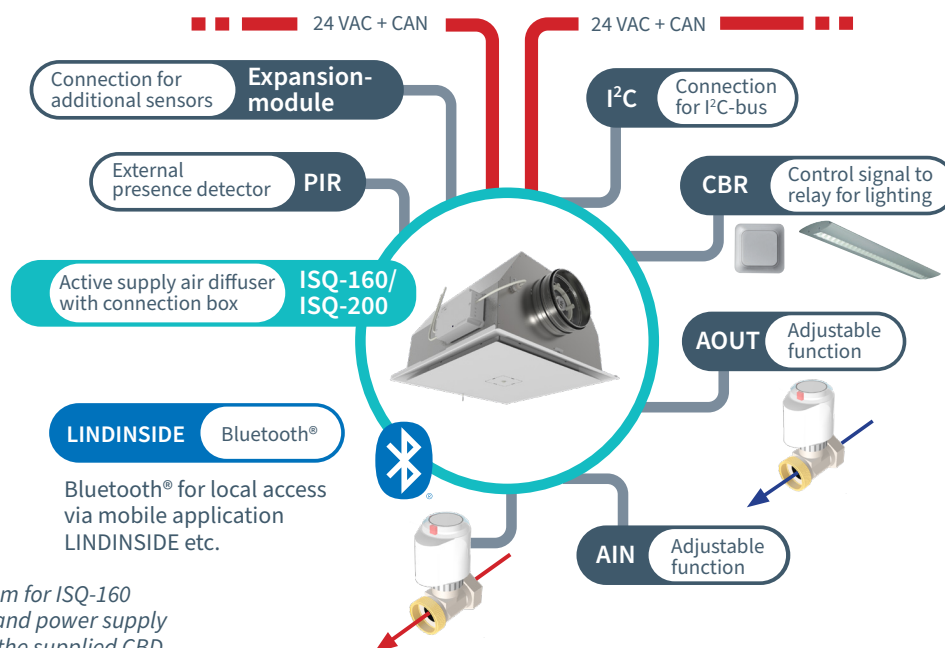
Operating modes with current or historical values are graphically visualised in the web-based interface LINDINSPECT.

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-160 and ISQ-200. CAN and power supply are connected via the supplied CBD connection box.

## Installation

### Mounting space for Installation

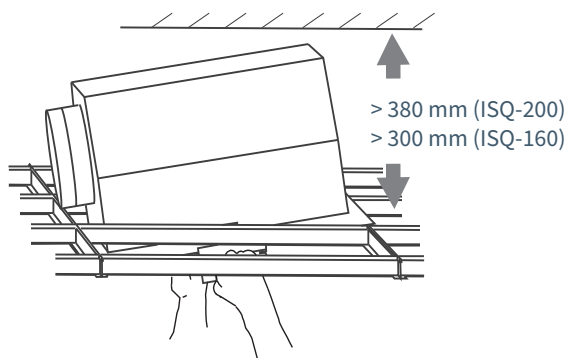
ISQ-M is supplied and installed complete with its plenum box. The suspended ceiling must be in place, and leave sufficient space above the suspended ceiling. Ducting to the unit should leave space for connection via a flexible aluminium hose or adjustable nipple.

### Mounting Handles

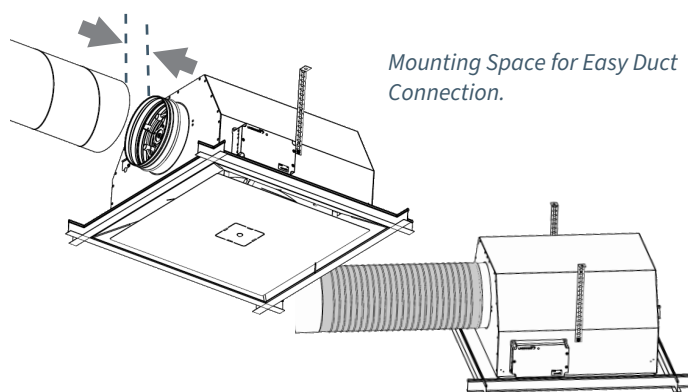
The diffuser is lifted and installed completely, as delivered, with its cardboard protection, cover profiles, and mounting handles, firmly in place. The handles and protections are not to be removed until the unit is correctly installed in the ceiling structure.

### Connection Box CBD

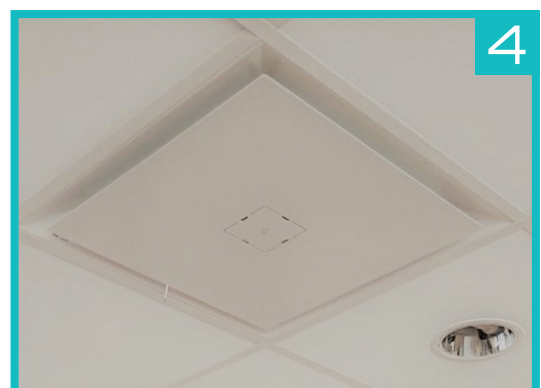
Peripheral equipment and the combined cable for power supply and CAN communication are connected via the included connection box CBD.



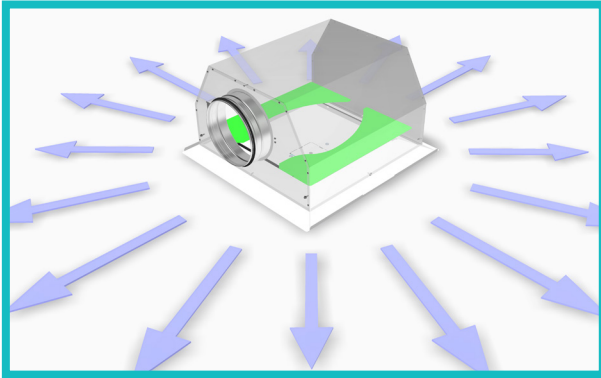
*Free Space for Easy Installation.*



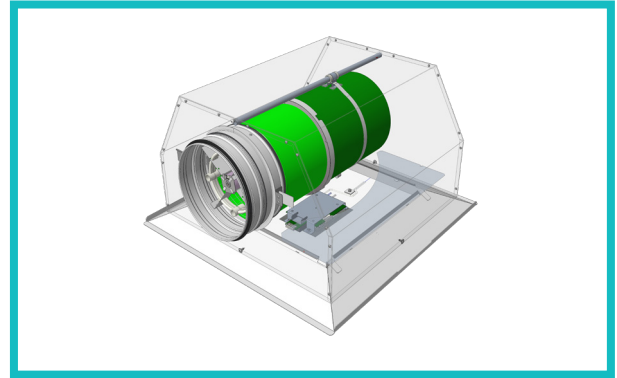
*Connection via Aluminum Hose Type Drasut.*



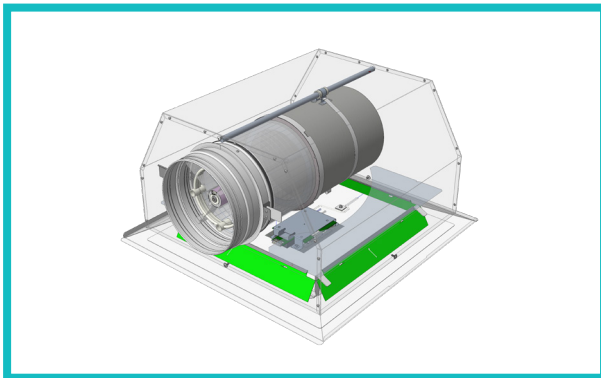
## Structure: ISQ-160 & ISQ-200



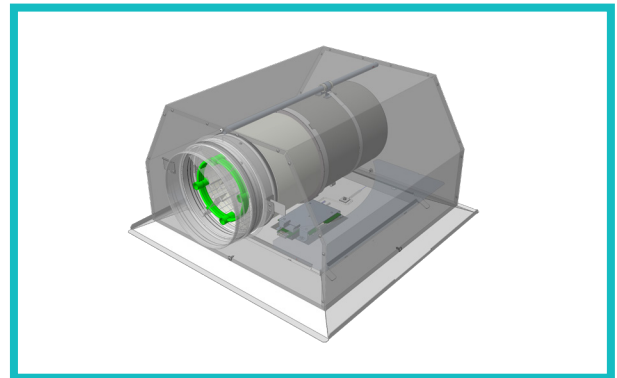
ISQ is designed for horizontal installation in suspended ceilings. Two air distributors provide a radial spread pattern that mimics that of circular diffusers.



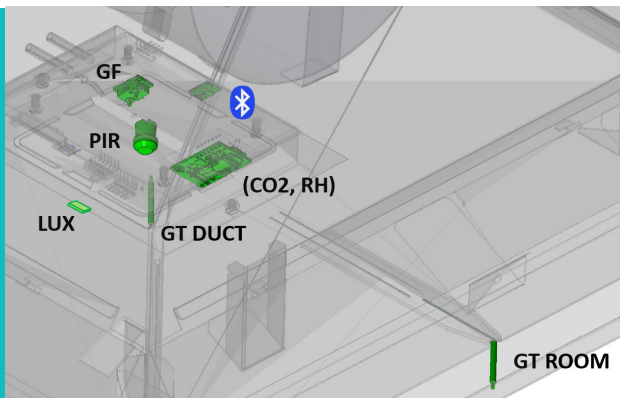
The diffuser includes a patented motor-controlled air damper made from permeable fibre material, designed for quiet regulation even at high duct pressures and air volumes.



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.



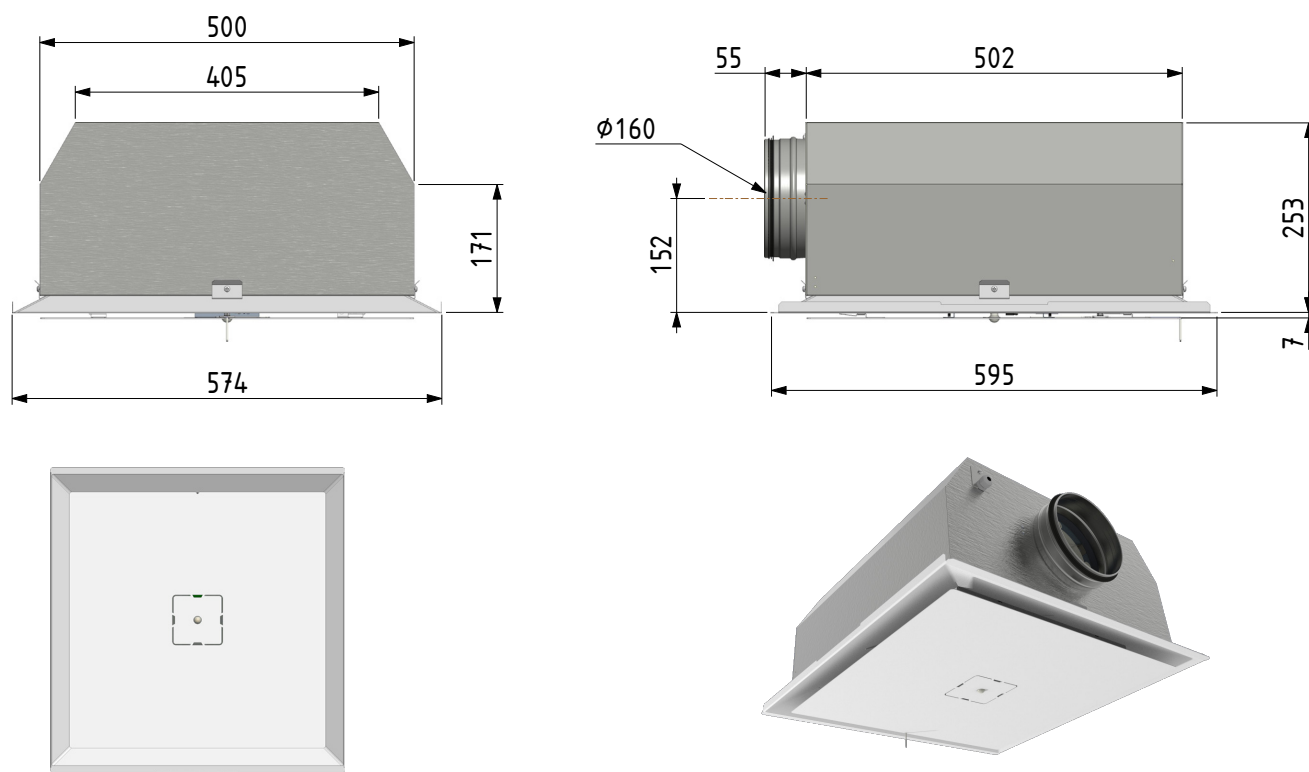
## Built-in sensors

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

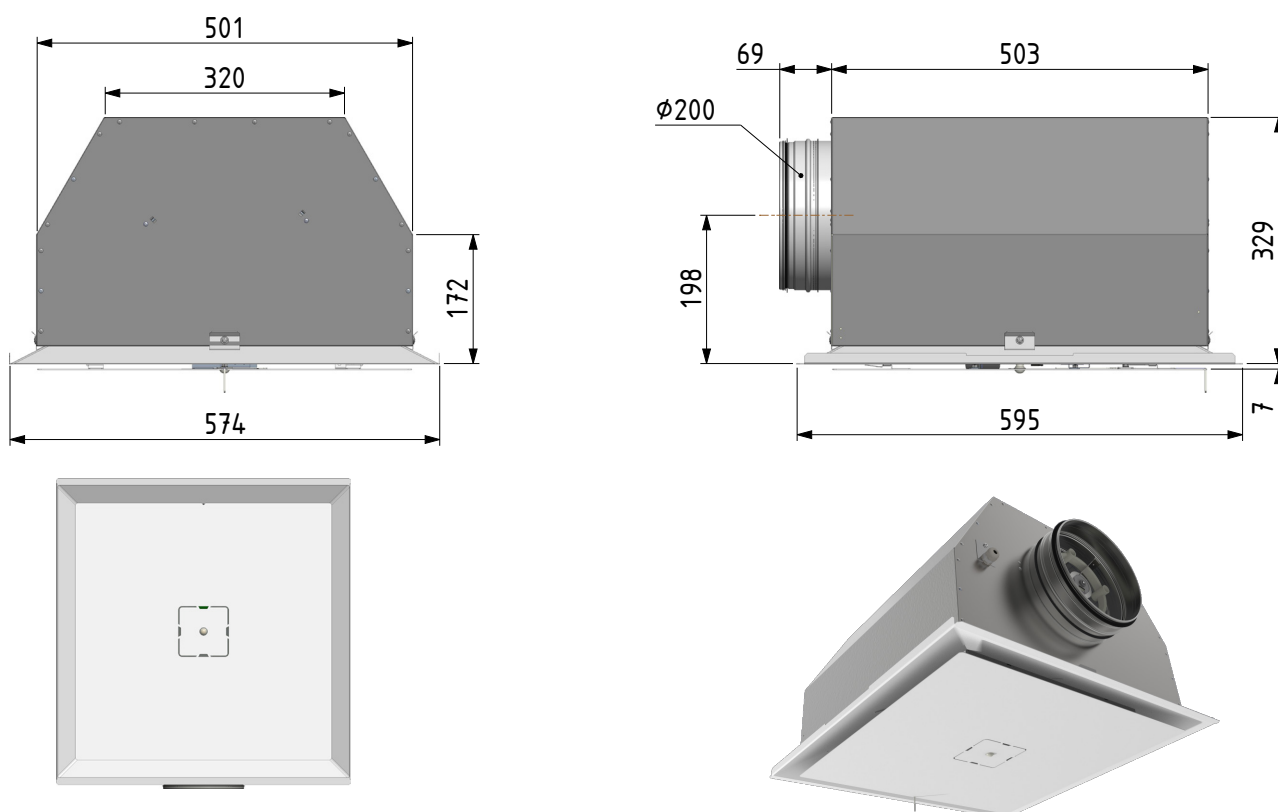
- GF for flow measurement and duct pressure calculation
- PIR for presence detection
- LUX for light level sensor
- CO<sub>2</sub>, RH for carbon dioxide and humidity measurement
- GT DUCT for duct temperature measurement
- GT ROOM for room temperature measurement



## Dimensions (mm): ISQ-160 (from version C)



## Dimensions (mm): ISQ-200 (from version A)



## Technical Specifications

### Material

Spreader part: Powder-coated steel sheet  
Plenum box: Galvanized sheet metal, C3  
Airflow damper (housing), distribution plates, measuring unit, and self-acting discs: Thermoplastics (PS, PP)  
For a detailed material description:  
See Bygghvarubedomningen.se  
Net weight ISQ-160: 10 kg  
Net weight ISQ-200: 12 kg

### Color Shade of Diffuser part

RAL 9003 (Gloss level 30) in standard execution.  
Color can be custom ordered, specify RAL number.

### Duct Connection

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

### Solutions for suspended ceilings

The unit is adapted for edge A and edge E. Profile edge DS needs to be specified when ordering: Mounting angles are fitted on the plenum box and a cover frame is attached to the diffuser frame. Fixed ceiling is specified when ordering. Safety grilles are available to order.

### Temperature Limits & IP Rating

Operation: 10°C to 40°C; <85% RH  
Storage: -20°C to 50°C; <90% RH  
IP Rating: 22

### Wiring (16 conductors)

ISQ comes with pre-installed cable connected to connection box CBD. Standard length: 1 m (specified when ordering, maximum length is 5 m).

### Electrical System

Supply Voltage: 24 VAC

### Power

Idle: 2 VA  
Regulation moment: 4 VA (approximately 200–300 h/year)

### Communication

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

### Radio Communication

BLE module: Bluetooth® 2.4 GHz  
Not continuous function. It listens to calls from an app or similar. Beacon functionality can be activated.

### CE Marking

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

### Light level Measurement

LUX sensor

### Occupancy 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

(optional, expansion module with sensor)  
Measurement range: 400 - 10,000 ppm  
Accuracy: ± (30 ppm + 3%) with background calibration

### Humidity Measurement

(optional, expansion module with sensor)  
Measurement 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

### 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 ISQ-160: 4 - 85 l/s  
Working range ISQ-200: 5 - 125 l/s  
Minimum airflow: Applies to duct pressure up to 100 Pa  
Sound levels according to diagram.  
Tolerance: ± 5% or at least ± 2 l/s  
Minimum straight section in front of diffuser:  
- after 90° bend: 0 mm / no straight section required  
- after T-piece: 400 mm  
- at single-step size change: at least 200 mm  
- at two or more steps of size change: at least 400 mm

### Duct Pressure Calculation

Calculated using measured air supply and the supply air damper opening degree.

Accuracy: ± 10 Pa (at opening degree > 20% and airflow > 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, Flows and Sound Levels

The sound pressure levels  $L_{pA}$  in the diagram correspond to A-weighted sound levels in the reverberation field with a 10 m<sup>2</sup> equivalent sound absorption area. This corresponds to 4 dB room attenuation in a normally attenuated room with a volume of 25 m<sup>3</sup>. For a presentation of throw lengths, refer to the design guidelines for INSQAIR.

- Sound Power Level per Octave Band,  $L_w = L_{p10A} + K_0$  [dB]
- $L_{p10A}$  = Sound pressure level [dB(A)] from the diagram
- $K_0$  = Correction factor per octave band [dB] from the table
- $p_t$  = Total pressure drop
- Self-attenuation from the table

Sound pressure and sound power measurements have been performed according to ISO 3741 and ISO 5135. Measurement of self-noise attenuation has been performed according to SS-EN ISO 7235:2009.

### Correction Room Damping [dB]

Room Volume	Room Type	Correction
25 m <sup>3</sup>	hard	+2 dB
25 m <sup>3</sup>	normal	0 dB
25 m <sup>3</sup>	damped	-2 dB
150 m <sup>3</sup>	hard	-3 dB
150 m <sup>3</sup>	normal	-5 dB
150 m <sup>3</sup>	damped	-7 dB

### Correction Factors, $K_0$ [dB]

ISQ*	Octave band [Hz]							
	63	125	250	500	1K	2K	4K	8K
160	13	10	6	2	-3	-7	-12	-8
200	6	9	8	1	-4	-9	-10	-7

\*ISQ-160 from version C, ISQ-200 from version A

### Self-Damping ISQ-160 from version C [dB]

ISQ-160	Octave band [Hz]							
Opening	63	125	250	500	1K	2K	4K	8K
20%	17	9	10	15	13	21	19	21
100%	16	9	10	13	12	12	16	17

### Self-Damping ISQ-200 from version A [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

### Tolerances [dB]

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

Diagram ISQ-160 from version C, Sound Pressure Level  $L_{P10A}$  dB(A)

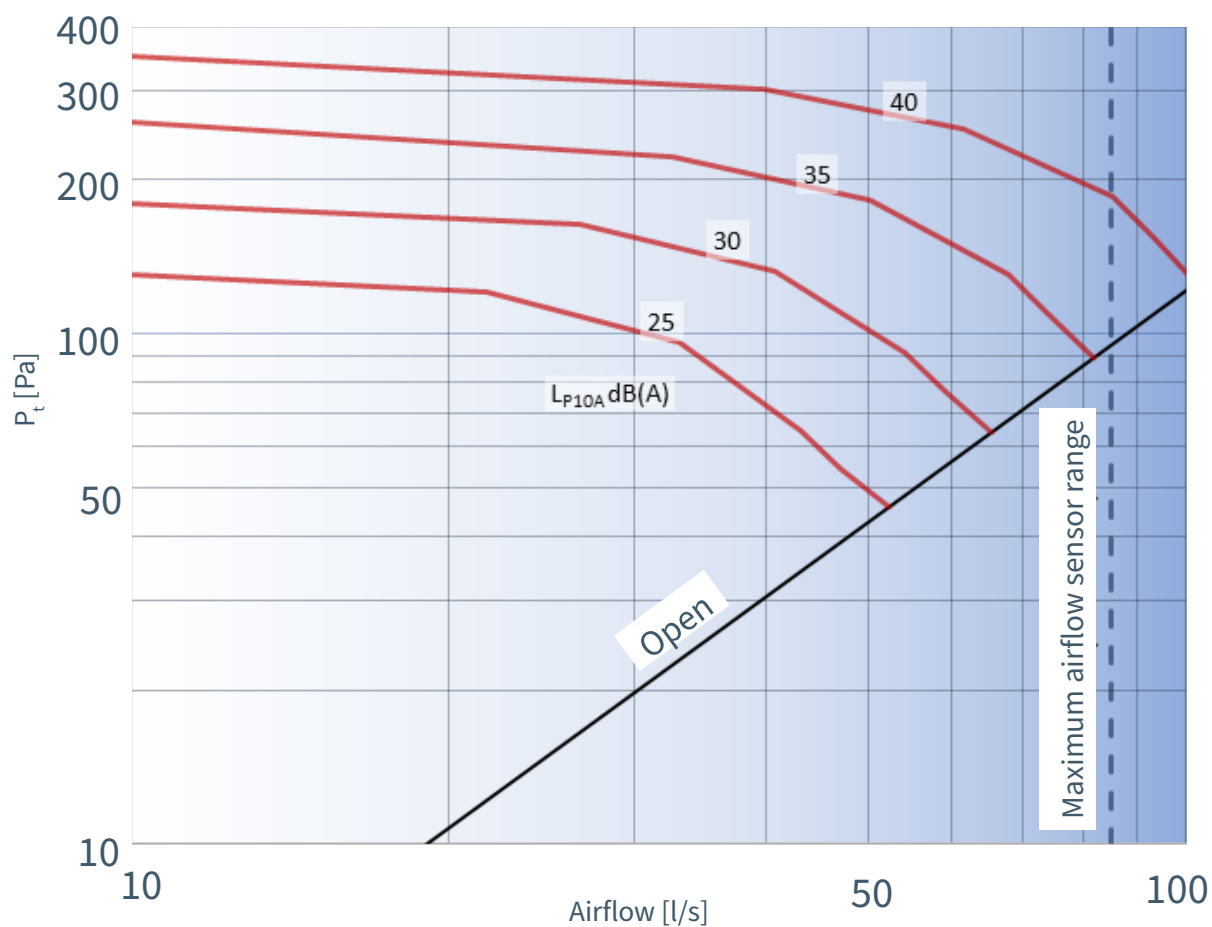
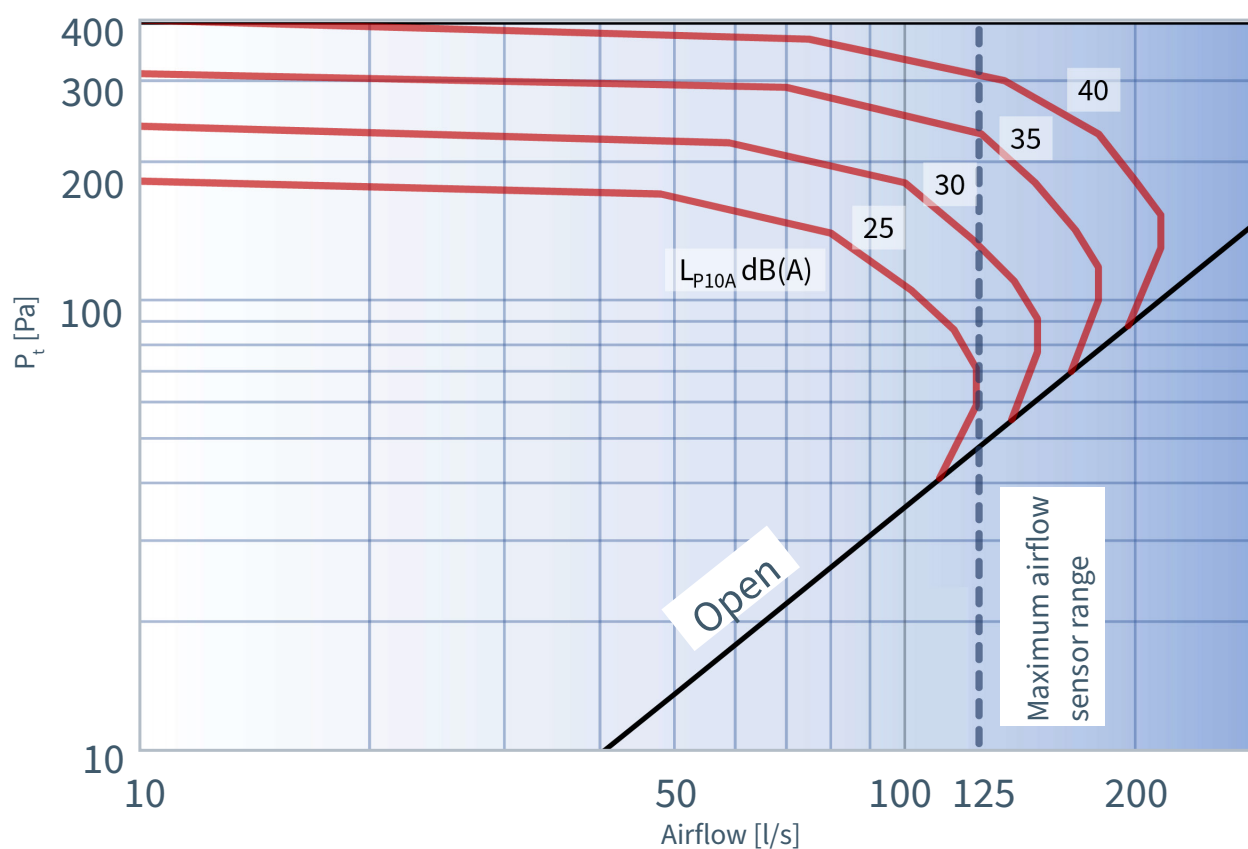


Diagram ISQ-200 from version A, Sound Pressure Level  $L_{P10A}$  dB(A)



## A selection of accessories

### Flow Balancing

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

### Adaptation to suspended ceilings

FFixed suspended ceilings: Mounting kit with cover frame and support bracket

Edge Ds: Mounting kit with cover frame and plenum box fittings

Note: The diffuser is adapted for edge A and edge E without the need for adaptation

### 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

Lindinvent'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 SBDdb.

### 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®.

## Supplementary Product Documentation

Documents can be accessed on the ISQ product page at [lindinvent.com](https://lindinvent.com)

Documents	Comments
Installation Instructions	Note: Intended for horizontal installation. Instructions with installation steps.
Commissioning Instructions	A guide on how to use the app LINDINSIDE for start-up commissioning.
Maintenance Instructions	Considered maintenance-free.
External Connection Diagram	Shows how to connect equipments.
Environmental Product Declaration	Assessed by Byggarbetet in Sweden. EPD registered in June 2022.
User Information	Overview of Lindinvent's system for smart ventilation.
Modbus List	Latest Modbus list for ISQ.
AMA-text	Descriptive text according to AMA standard.
Design Guidelines	See the instruction with information and comments on airflows, dispersion images, CFD and type rooms.

