ICI-F-160 Version A01

ICI-F-200 Version B01

ICI-F

Active Supply Air Diffuser, Visible Mounting

Quick Facts

- Part of Lindinvents' 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 motor-controlled valve for regulating air volume
  - Built-in sensors
- Exceptional sound performance
- Draft-free and adjustable air distribution
- Network connection for visualisation and administration via LINDINSPECT®
- Bluetooth® for access via LINDINSID

ICI-F provides workplaces with a smart, energy-efficient, and quiet system for optimal, demand-based indoor climate control.

Lindinvent's series of active supply air diffusers focus on superior technical performance, maximum flexibility, and digitalisation. With innovative solutions, carefully selected materials, built-in controller with sensors and, Bluetooth® ICI-F is a quiet, smart choice for future-proofing buildings.

LINDINVENT®

Why Active Air Devices?

Lindinvent's series of supply air devices incorporates several technical solutions aimed at installation efficiency and high-performance climate control. Some of these solutions have been granted international patents.

Simplicity and Performance

Unique technical performance makes active air devices easy to plan, install, commission, and use, making them optimal for 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 Staff Efficiency

Cooling primarily through supply air increases airflow, which in turn enhances staff 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 system is built with an architecture for stable network communication between devices, equipped with Bluetooth®. Data can be accessed via API, Modbus, HTTP, and app, making property data meaningful and enabling maximum digitalization.

Sustainable Material Choices

All air devices are constructed using recyclable materials, and packaging requirements have been minimized to reduce waste.

Environmental Product Declaration (EPD)

Environmental impact data can be retrieved from www.epdhub.com. The values for the devices in the INSQAIR series are representative of all Lindinvent active air devices. Life cycle data only differ by material weights, which are lower for upcoming Lindinvent devices.

Maximum Flexibility

Lindinvent's supply air devices can create an optimal indoor climate without the need for waterborne cooling, offering greater flexibility during renovations. The integrated sensors in the active device reduce the need for additional wiring. In many cases, walls can be built or moved without requiring the rerouting of cables. Additionally, renovation projects are simplified as active devices within a flow area can be serviced by separate supply air channels.

Table of Contents

Quick Data ICI-F-160

- Flow range: 4 to 85 l/s
- Sound performance: Below 30 dB(A) up to 85 l/s at 200 Pa
- Height: 273 mm

Quick Data ICI-F-200 (version B01)

- Flow range: 5 to 125 l/s
- Sound performance: Below 30 dB(A) up to 125 l/s at 120 Pa
- Height: 313 mm

System Overview

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

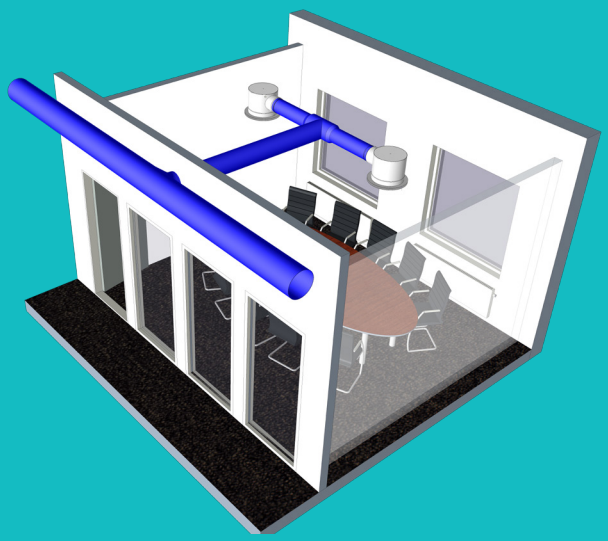
With the INSQAIR product series, we have developed unique, quiet, versatile and smart supply air diffusers that meet the requirements for room climate control in various environments.

Conference Rooms with ICI-F-200

ICI-F enables climate control based on temperature, occupancy detection, and CO2 levels.

- 10 - 250 l/s
- Quiet Regulation
- No additional supply air dampers
- No wall-mounted sensors

A flexible solution with low installation costs, the occupancy detector increases ventilation to a typical flow level when people are present. The CO2 sensor can be retrofitted into one of the devices without the need for electrical installation. This sensor regulates airflow based on demand and can also estimate the number of people in the room. Integration with a room booking system allows tracking of room usage and reservations. The device's regulator can sequentially control valve actuators for heating. Using the INOFFIX app, users can book the room, adjust the temperature, and submit fault reports.



Conference Rooms with Active Air Devices

Functionality

Airflow Control
The air volume is continuously measured and regulated by the motor-controlled valve 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.

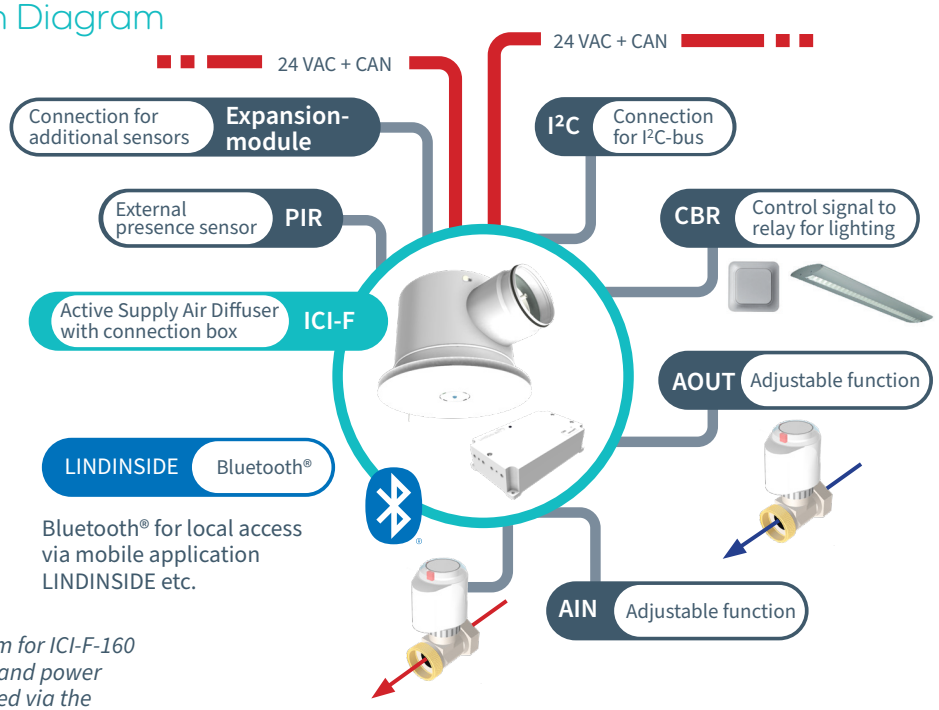
Operating modes with current or historical values are graphically visualised in the web-based interface LINDINSPECT.

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.

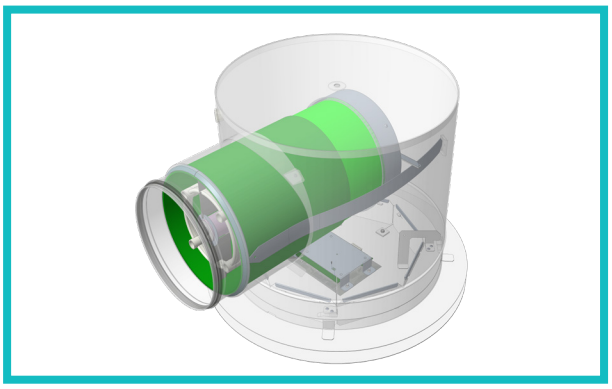
Diffusers can be assigned a system affiliation to optimise the air handling unit's pressure and temperature setpoint.

Connection Diagram

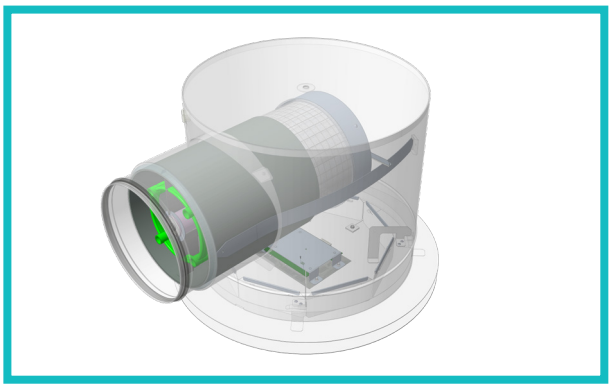


Connection diagram for ICI-F-160 and ICI-F-200. CAN and power supply are connected via the supplied CBD connection box.

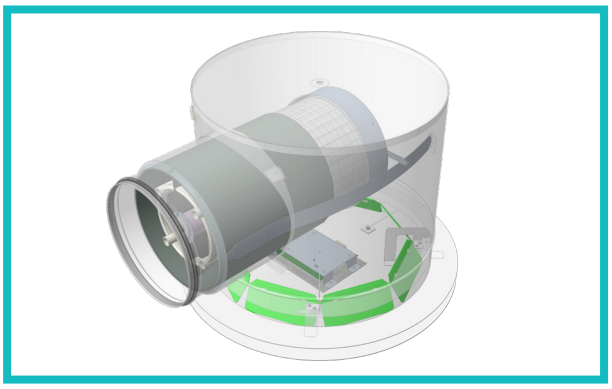
Construction



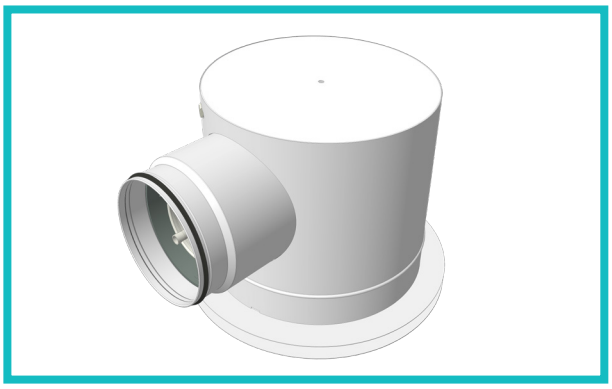
A patented motorised valve for air volume control. The valve is built around permeable fibre material and designed for quiet regulation even at high duct pressures and high airflows.



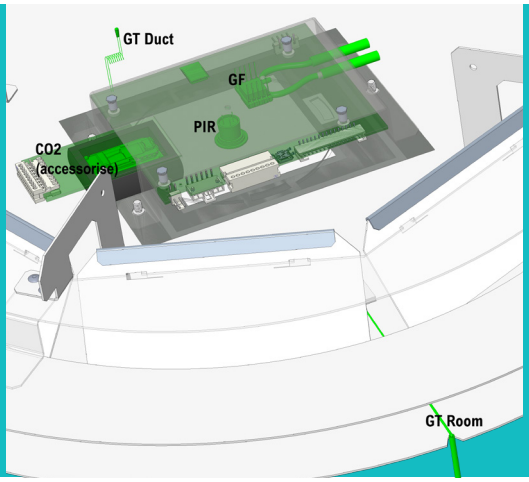
The measuring unit is designed for measurement within a wide flow range. Its design reduces the need for a straight section in front of the diffuser, so it can, for example, be mounted directly after a 90° bend.



Self-acting openings in the inlet to the spreader part opens or closes when the air flow 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.



ICI-F is delivered with the spreader part and plenum box separately. The room climate controller with sensors and the connection box are included with the plenum box.

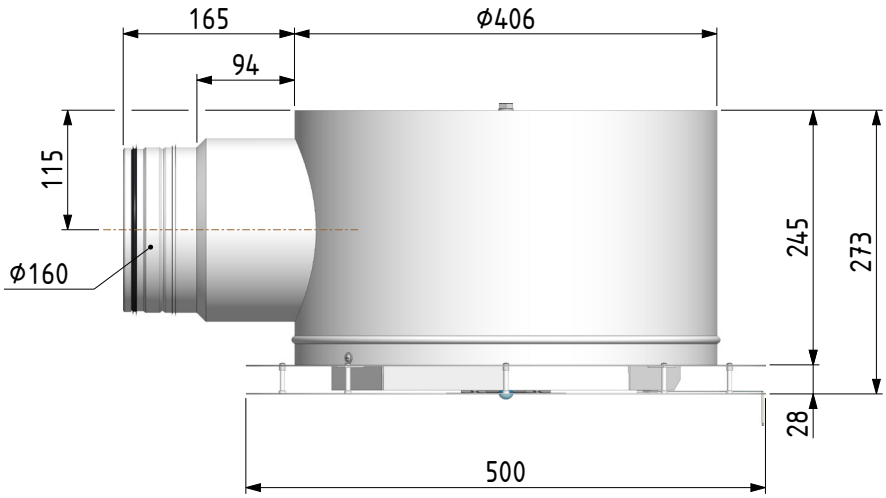


Built-in sensors

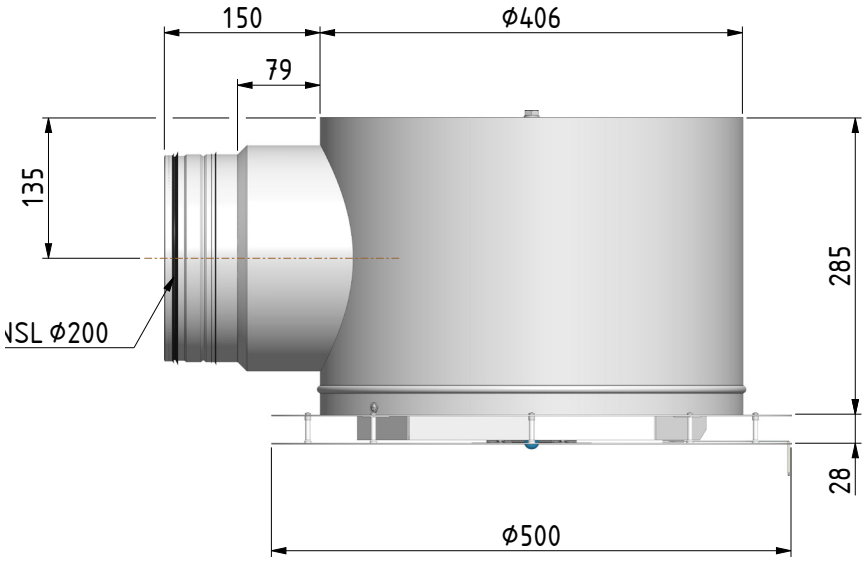
The room climate controller, equipped with sensors, is centrally located on the inside of the removable spreader part.

- 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

Dimensions (mm): ICI-F-160 verion A01



Dimensions (mm): ICI-F-200 verion B01



Technical Specifications

Materials
Spreader part: Powder-coated steel plate
Casing: Galvanized steel, C3
Airflow valve (housing), measuring unit, and self-acting discs: Thermoplastics (PS, PP)
For detailed material specifications:
Refer to Byggvarubedomningen.se
Net Weight: 7,5 kg
Net Weight: 8,5 kg

Duct connection
ICI-F-160: Nipple Ø 160 mm
ICI-F-200: Nippel Ø 200 mm

Diffuser Color
Standard: RAL 9003 (gloss level 30)
Custom colors available by specifying RAL number

Temperature Limits & IP Rating
Operating: 10°C to 40°C; <85% RH
Storage: -20°C to 50°C; <90% RH
IP Rating: IP 22

Cabling (16-wire)
ICI-F comes with a pre-installed cable connected to the CBD junction box. Standard length: 1 m (maximum length up to 5 m).

IP-class
IP 22

Electrical System
Power Supply: 24 VAC

Power Consumption
Standby: 2 VA
During regulation: 4 VA (approximately 200–300 h/year)

Communication
CAN Communication: Signal cable with integrated power supply wires (shielded cable 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.

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

Light level measurement
LUX sensor

Occupancy Detection
PIR Sensor: Passive IR detector with 200 detection zones
Detection range: 107° x 107°

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

CO2 Measurement (optional expansion module)
Slot on the control unit for easy retrofit.
Measurement Range: 400 - 10,000 ppm
Accuracy: ± (30 ppm + 3%) with background calibration

Humidity Measurement (optional expansion module)
Measurement Range (at 25°C):
Relative humidity: 0 - 100% RH
Accuracy (at 25°C and 50% RH):
Relative humidity: ± 5% RH
Absolute humidity: ± 1 g/kg
Dew point: ± 1 K

Airflow Measurement and Control
The diffuser, which has a built-in sensor for air volume measurement, controls the supply air volume via a motor-controlled valve with a measuring unit.
Working Range: ICI-F-160: 4 - 85 l/s
Working Range: ICI-F-200: 5 - 125 l/s
Minimum airflow: Applies to duct pressure up to 100 Pa
Noise Levels: As shown in diagram
Tolerance: ± 5% or at least ± 2 l/s
Minimum straight section before the diffuser:
- after 90° bend: 0 mm (no straight section required)
- after T-junction: 400 mm
- for dimension change in one step: minimum 200 mm
- for two or more dimension changes: minimum 400 mm

Duct Pressure Calculation
The duct pressure is calculated based on measured airflow and the valve opening degree.
Accuracy: ± 10 Pa (with valve opening > 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

Installation

One delivery unit

ICI-F is delivered and installed, complete with the diffuser part pre-assembled in the associated plenum box.

Suspension of the plenum box

A blind nut for fastening a threaded rod (M8) is centrally located on the top of the plenum box. A U-bracket or equivalent should be used to connect the threaded rod to the blind nut.

Note: A penetrating threaded rod or other attachment must not be made on the top of the plenum box.

Dust covers are left until commissioning.

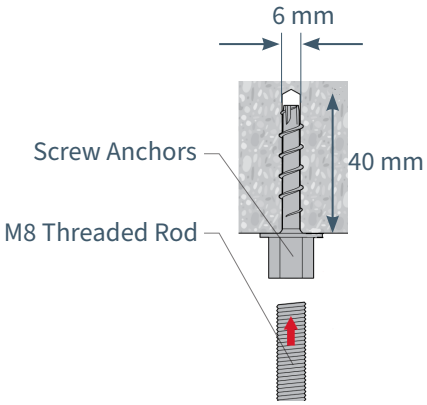
Connection Box CBD

The enclosed connection box is used to connect the diffuser to accessories and the CAN loop with power supply.

Delivery

Each diffuser is packed in a cardboard box. The diffusers are then delivered on pallets.

A complete ICI-F-200.



Example of fixing a threaded rod in concrete via a screw anchor (internal M8 thread).

Example with a U-bracket as a suspension device. The bracket is mounted on the top of the plenum box with a screw (M8x16).

ICI-F-160: Pressure, Flow, and Noise Levels

The sound pressure levels (LPA) in the diagram correspond to A-weighted sound levels in a reverberation field with an equivalent sound absorption area of 10 m^2. This corresponds to a 4 dB room attenuation in a normally damped room with a volume of 25 m^3.

- Sound Power Level/Octave Band, $L_w = L_{P10A} + K_0$ [dB]
- L_{P10A} = Sound pressure level [dB(A)] from the diagram
- K_0 = Correction factor/octave band [dB] from the table
- p_t = Total pressure drop
- Self-damping from table

Sound pressure and sound power measurements have been conducted according to ISO 3741 and ISO 5135. Measurements of sound attenuation have been performed in accordance with SS-EN ISO 7235:2009.

Room Damping Correction [dB]

Room Volume	Room Type	Correction
25 m^3	hard	+2 dB
25 m^3	normal	0 dB
25 m^3	damped	–2 dB
150 m^3	hard	–3 dB
150 m^3	normal	–5 dB
150 m^3	damped	–7 dB

Correction Factors, K_0 [dB]

ICI-F-160	Octave Band [Hz]							
	63	125	250	500	1K	2K	4K	8K
160	3	10	8	1	-3	-10	-11	-9

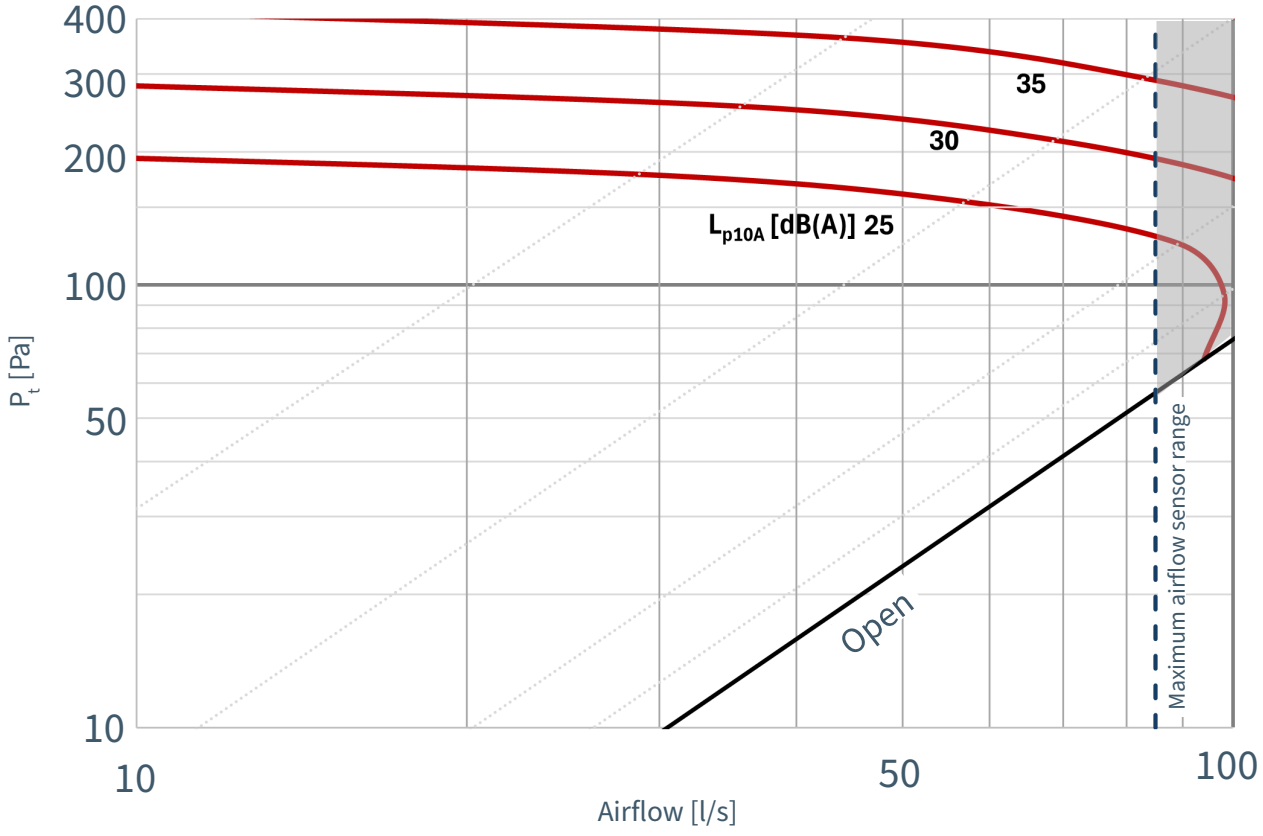
Self-Damping ICI-F [dB]

ICI-F-160	Octave Band [Hz]							
Opening	63	125	250	500	1K	2K	4K	8K
25%	23	13	11	19	16	21	13	9
100%	21	12	11	20	11	11	12	9

Tolerances [dB]

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

Diagram ICI-F-160, Sound Pressure Level L_{P10A} dB(A)



ICI-F-200: Pressure, Flow, and Noise Levels

The sound pressure levels (LPA) in the diagram correspond to A-weighted sound levels in a reverberation field with an equivalent sound absorption area of 10 m^2. This corresponds to a 4 dB room attenuation in a normally damped room with a volume of 25 m^3.

- Sound Power Level/Octave Band, $L_w = L_{P10A} + K_0$ [dB]
- L_{P10A} = Sound pressure level [dB(A)] from the diagram
- K_0 = Correction factor/octave band [dB] from the table
- p_t = Total pressure drop
- Self-damping from table

Sound pressure and sound power measurements have been conducted according to ISO 3741 and ISO 5135. Measurements of sound attenuation have been performed in accordance with SS-EN ISO 7235:2009.

Room Damping Correction [dB]

Room Volume	Room Type	Correction
25 m^3	hard	+2 dB
25 m^3	normal	0 dB
25 m^3	damped	–2 dB
150 m^3	hard	–3 dB
150 m^3	normal	–5 dB
150 m^3	damped	–7 dB

Correction Factors, K_0 [dB]

ICI-F	Octave Band [Hz]							
	63	125	250	500	1K	2K	4K	8K
200	10	11	6	2	-2	-8	-13	-10

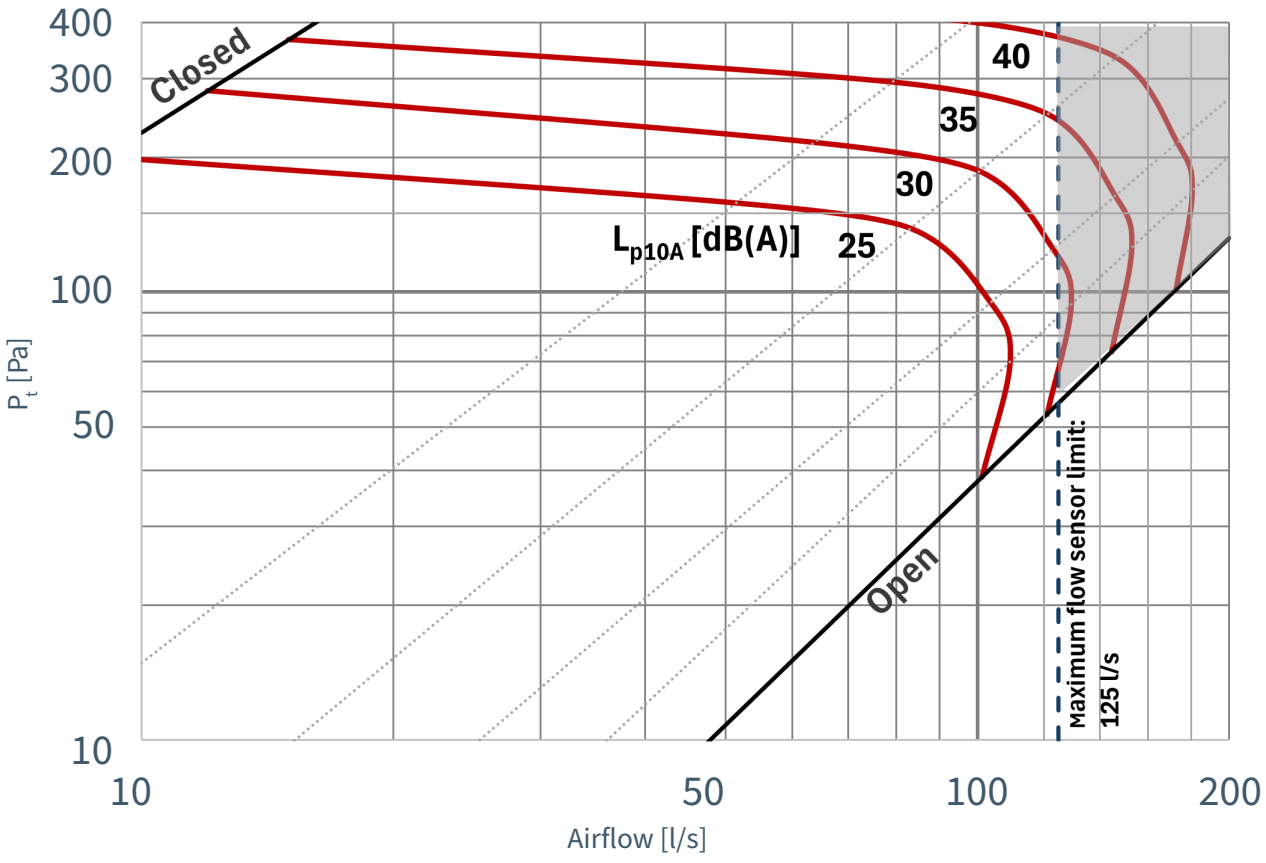
Self-Damping ICI-F [dB]

ICI-F-200	Octave Band [Hz]							
Opening	63	125	250	500	1K	2K	4K	8K
25%	20	13	15	17	18	19	18	12
100%	19	12	14	18	11	13	14	11

Tolerances [dB]

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

Diagram ICI-F, Sound Pressure Leve L_{P10A} dB(A)



Accessories

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

CO2 and Humidity Sensors
The GQH-I expansion card or any of Lindinvent's other CO2 sensors can be easily retrofitted.

Lighting Control
The active diffuser supports lighting control via presence detection and selected lighting function. Relay box CBR enables relay control using a push button. See SBDb for DALI control.

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

Radiator Control with Function Check
GT-S temperature sensor with a connection for valve actuators is used to control a radiator circuit.

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

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

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

Setpoint Adjuster
CAN-connected DRP wall-mounted user panel. The panel can be configured to allow users to temporarily adjust the room temperature setpoint and activate forced ventilation. See also INOFFIX® for corresponding functionality.

Supplementary Product Documentation for ICI-F

Documents are available on the product page for ICI-F at Lindinvent.com

Documents	Comment
Installation Instructions:	Note: Designed for horizontal mounting. See this description for guidance.
Commissioning Instructions	Login to ICI-F via LINDINSIDE and Quick Setup guide.
Maintenance Instructions	Considered maintenance-free.
External Connection Diagram	Shows how equipment is connected.
Environmental Product Declaration	Assessed by Byggvarubedömningen in Sweden. EPD registered for similar active devices in June 2022.
User Information	Overview of Lindinvent's smart ventilation system.
Modbus List	Common for ICI-F, ISQ-V, ISQ-F, ISQ-160, and ISQ-200.
AMA Text	Descriptive text according to AMA standards.
Design Guidelines	See the instruction with information and comments on airflows, dispersion images, CFD and type rooms.

LINDINVENT®
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