

Product description

TTC – Active supply air diffuser

Introduction

TTC is a ceiling mounted supply air device with integrated electronics for room climate control. The design allows for a maintained high injection rate and thus mixing of room air even at low airflows. The result is, in addition to energy and environmental gains, a lower noise level and a draft-free regulation.

TTC's integrated functions include:

- Demand control of airflow based on occupancy/temperature/CO₂
- Sequential adjustment of cooling and heating
- Lighting system control
- Economy mode
- Multiple available interfaces for communication and downloading values of control variables

TTC is connected to a combined voltage feed and communication loop via Lindinvent's standard cable with two conductors for voltage feed and two twisted-pair conductors for communication.

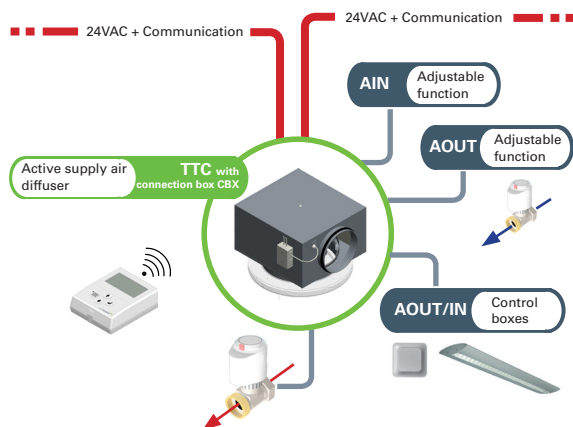
Energy saving potential

Compared with a conventional CAV system, considerable savings in energy usage can be achieved for:

- Supply air heating
- Fan power
- Cooling energy
- Radiator heating
- Lighting power

Connections

TTC is connected to the voltage feed and communication loop via connection box CBX, which can be mounted directly on the plenum box or located as desired. A number of items of equipment/functions can be connected to TTC via CBX.



Connection diagram TTC with connection box CBX. The diffuser is connected to the voltage feed and communication loop and other equipment via connection box CBX.



TTC - The active, ceiling mounted supply air diffuser.

Simplicity

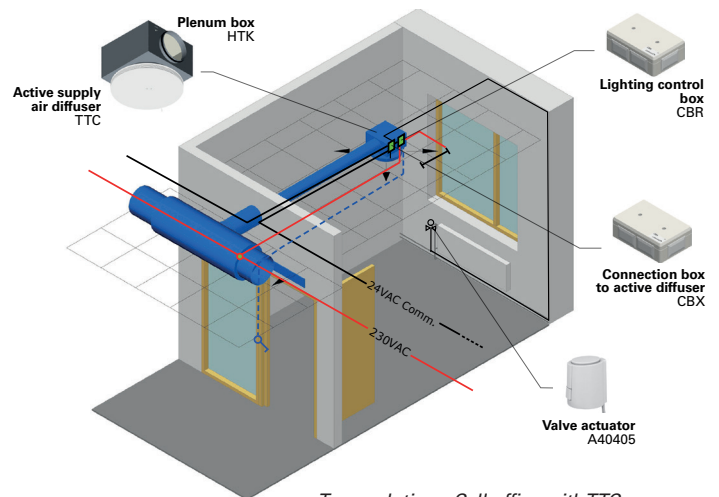
TTC has been designed with the focus on simplicity, installation and operation:

- Built-in control electronics and sensors.
- Factory calibrated.
- Minimized building measurements and several installation options.
- Downloading and setting of control variables is done wirelessly via handheld DHP or via connected communication network.

Renovation and rebuilding

The flexible system solution is very cost-effective for rebuilding or renovation work.

- Walls can be installed or moved without having to reroute ducts or cables.
- Existing CAV systems without cooling can be converted to VAV air conditioning systems by installing TTC diffusers and isolating existing duct systems.



Type solution - Cell office with TTC.

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Function

TTC is a ceiling mounted supply air diffuser with variable slot opening. The slot height is controlled by a motor that opens or encloses a number of slots, which permits higher pressure drop at lower noise levels. The diffuser has a high injection rate and maintains the mix of under-temperature supply air over the entire flow interval.

Pressure and flow sensors

The diffuser has a built-in air pressure and air flow sensor.

Temperature sensor

TTC is equipped with room and duct temperature sensors. The room temperature sensor is located at the edge of the device where it measures the room air in the living zone. The location of the room sensor at the device is more representative and faster than a wall mounted sensor.

Occupancy detector

Adjusted levels of airflow and lighting control are some of the functions that can be activated via the integrated occupancy detector; for details see the product description for XPIR.

IR link

Reading settings, actual values etc. can be done via the hand held user panel DHP.

Network communication

TTC is connected via node ID to a communication loop (CAN). Concurrent nodes are connected to the same physical loop. The communication loop is in turn connected to Gateway NCE, which represents the bridge to the superior system.

Calibration

TTC is pre calibrated with high precision in the factory. Network settings, balancing zones and the like are adjusted in the system on site.

Alarms

TTC has a number of built-in alarms and can alarm via network communication.

User interface

The following user interfaces are available:

- Wireless connection via user panel DHP
- Server with web interface LINDINSPECT (applies to systems with LINDINTELL)

Communication with external systems

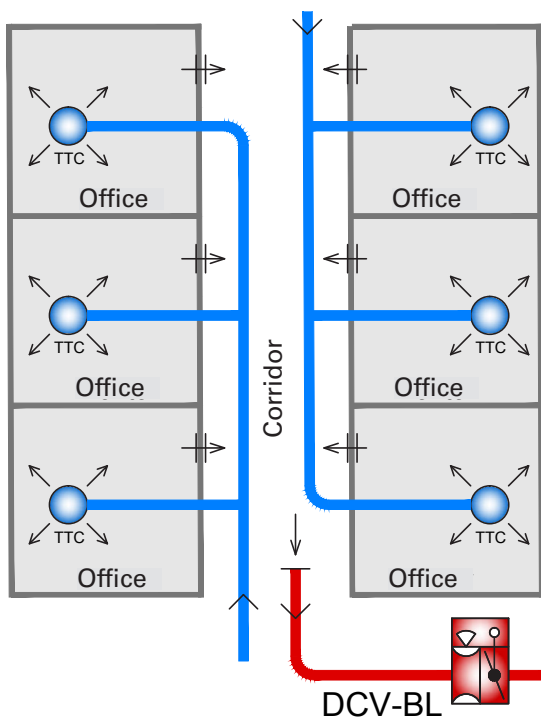
Communication with TTC is set up over Modbus TCP or Modbus RTU.

- Via server in system solutions with LINDINTELL
- Via Gateway NCE in system solutions without LINDINTELL

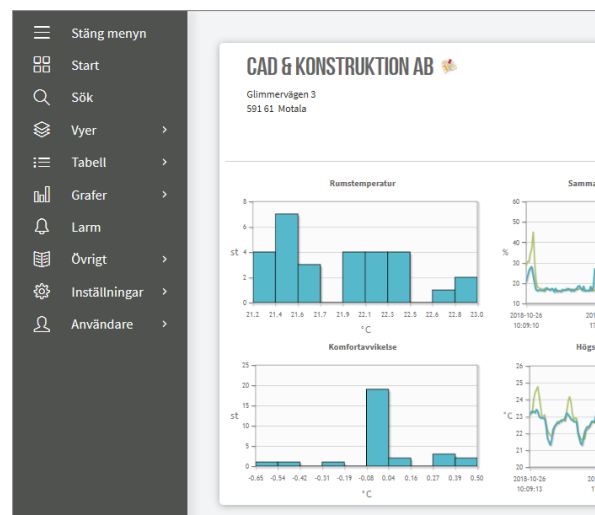
LINDINTELL/LINDINSPECT

LINDINTELL is a software package that is installed on a central server. LINDINTELL has among other things functions for optimization, override and free programming.

LINDINSPECT is a Web interface developed for use with LINDINTELL.



Functional chart TTC: The supply air flow from a number of active diffusers is summed up via network communication and balanced via airflow control unit DCV-BL.



Example of a start page and its instrument panel in the web interface LINDINSPECT. Nodes in the system for climate control can be monitored and administered via LINDINSPECT.

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Installation options

Generally

TTC is designed for horizontal mounting.

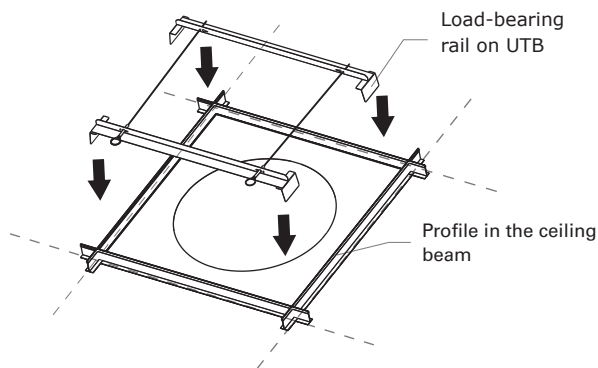
Installation via plenum box

TTC is easily installed with bayonet connection in the ceiling via plenum box HTK or as a suspended diffuser with plenum box HTR.

Mounting rail UTB

UTB is an accessory for Lindinvent's plenum box HTK, which is used when mounting TTC in suspended ceilings. UTB is also used with plenum box HTM, see Lindinvent's reactive diffuser MTC/MTN.

UTB locks the plenum box in the correct position relative to the duct connection. UTB is also used to position the diffuser at the correct height in relation to the suspended ceiling. UTB is available for the most common ceiling tile profiles. The thickness of the suspended ceiling tile must not exceed 40 mm.

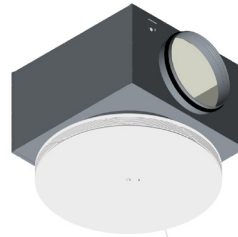


Direct installation in duct

TTC can be directly mounted in a duct with the aid of transformer DAB or DAS. The airflow is damped in the diffuser. It is therefore not necessary to use a plenum box for sound damping.



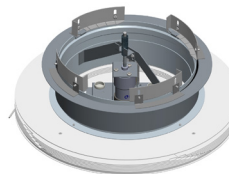
TTC-250 mounted with ceiling plate UTD.



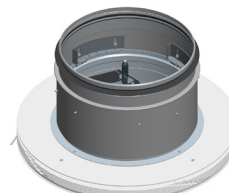
TTC-400 mounted in plenum box HTK-250/400 for concealed mounting.



TTC-400 mounted in plenum box HTR-250/400 for suspended mounting.



TTC-400 mounted in DAB-400 for mounting directly in rectangular duct.



TTC-400 mounted in DAS-400 for mounting directly in circular duct. This solution also enables extending the outlet of the plenum box.

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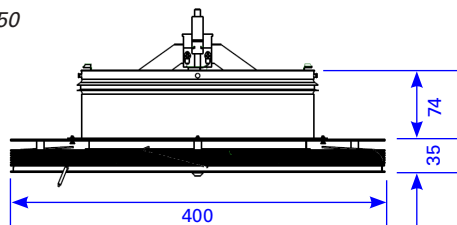
Technical specifications TTC

General

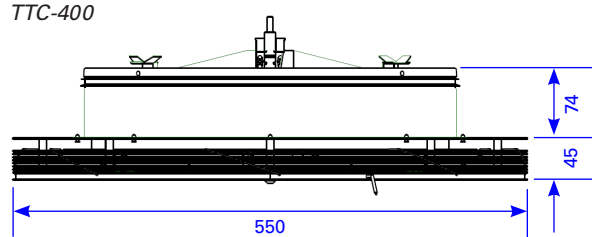
Dimensions (mm)

For dimensions of plenum boxes and diffuser adapters, see the product descriptions for HTK, HTR, DAB and DAS.

TTC-250



TTC-400



Material

Powder coated steel plate.

Net weight

TTC-250: 5.6 kg

TTC-400: 8.5 kg

Paint colour

RAL 9003

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

Temperature limits

Operation: 10°C to 30°C; <85% RF

Storage: -20°C to 50°C; <90% RF

Miscellaneous

Supplied with mounted and pre-connected 14-conductor cable (connects to connection box CBX) of the length stated when ordering.

Standard length of 14-conductor cable: 1 m

Maximum length of 14-conductor cable: 10 m

Electrical system

Supply voltage

24 VAC

Capacity

2 VA at rest

4 VA during adjustment (c 50–100 h/year)

CE marking

Complies with EMC and the Low Voltage Directive

Occupancy detection

Occupancy detector

The diffuser has an integral occupancy detector (passive IR detector).

Coverage angles

See product description for XPIR.

Duct temperature measurement

Temperature sensor

Sensor with thermistor of NTC type.

Accuracy

Temperature ± 0.5 K

Room temperature measurement

Temperature sensor

Sensor with thermistor of NTC type.

Accuracy

Temperature ± 0.5 K

Pressure and air flow measurement

Pressure and air flow sensor

TTC is equipped with a pressure sensor, for duct pressure and air flow measurement.

Interval

TTC-250: 10-120 Pa

TTC-400: 10-120 Pa

If a higher pressure range is needed (max 250 Pa) please state this when ordering

Accuracy

$\pm 5\%$ or a minimum of ± 3 Pa

Air flow adjustment

Interval

TTC-250: 3-65 l/s

TTC-400: 5-100 l/s

Tolerance

$\pm 5\%$ or minimum ± 2 l/s (correct measurement does not require any preceding straight stretch)

Performance

Maximum change adjusted within c. 2 min.

Connections (Via connection box CBX)

- 2 x 24 VAC measurement + communication loop (CAN)
- 2 x 0-10 VDC analogue in
- 1 x control signal to relay on lighting card CBR.
- 1 x 5 VDC input for push button with lighting control.
- 2 x 0-10 VDC analogue out
- 1 x 24 VAC, TRIAC. Intended for valve actuator (maximum 10 x 1W).

Connections (Direct on diffuser)

- 1 x IR unit

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Pressure, flow and sound levels

The sound power levels L_{PA} in the diagram correspond to A-weighted sound level in the reverberation zone with 10 m² equivalent sound absorption area. This corresponds to 4 dB room absorption in a room with normal absorption and a volume of 25 m³. There are examples of corrections with other types of room on the right.

Sound generation

Sound power level, $L_W = L_{WA} + K_0$ [dB]

L_{WA} = Total A-weighted sound power level [dB (A)] is read from sound diagram TTC-250 and TTC-400 below.

K_0 = Correction factor for actual frequency band is read from Table 2.

Self-damping according to table 3-6.

The measurements have been performed according to ISO 9614-2 and ISO 691:1995.

Diagram 1: Sound diagram TTC-250

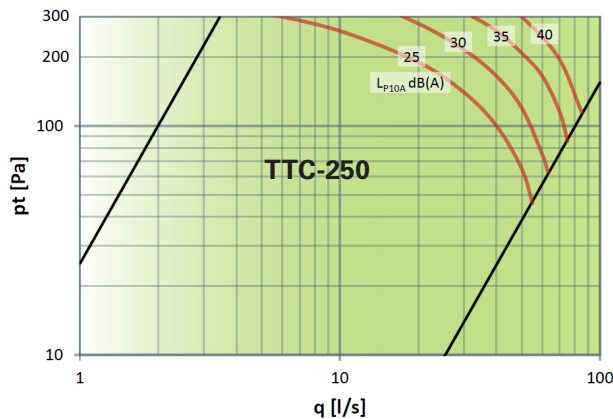


Diagram 2: Sound diagram TTC-400

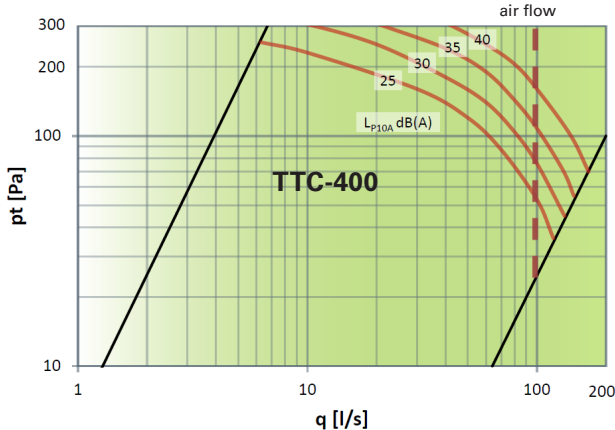


Table 6: Tolerances [dB]

TTC ± [dB]	Octave band [Hz]							
	63	125	250	500	1K	2K	4K	8K
250 & 400	3	3	2	2	2	2	2	2

Table 1: Correction for room damping [dB]

Room volume	Type of room	Correction
25 m ³	hard room	+2 dB
25 m ³	normal room	0 dB
25 m ³	damped room	-2 dB
150 m ³	hard room	-3 dB
150 m ³	normal room	-5 dB
150 m ³	damped room	-7 dB

Table 2: Correction factors, K_0 [dB]

TTC	Octave band [Hz]							
	63	125	250	500	1K	2K	4K	8K
250	10	2	-1	-2	-1	-2	-9	-11
400	15	5	-3	-4	0	-2	-14	-11

Table 3: Self-damping [dB]
TTC with plenum box HTK.



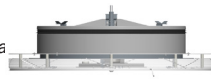
TTC/HTK	Octave band [Hz]							
	63	125	250	500	1K	2K	4K	8K
250	17	17	19	22	24	22	22	26
400	19	16	25	29	28	23	24	27

Table 4: Self-damping [dB]
TTC with plenum box HTR.



TTC/HTR	Octave band [Hz]							
	63	125	250	500	1K	2K	4K	8K
250	17	17	19	22	24	22	22	26
400	16	12	19	23	22	21	20	23

Table 5: Self-damping [dB]
Only diffuser part TTC mounted via transformer DAB or DAS.



TTC	Octave band [Hz]							
	63	125	250	500	1K	2K	4K	8K
250	20	22	15	18	18	15	16	21
400	21	19	15	21	17	15	14	20

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Accessories

Examples of generally available accessories in Lindinvent's room type solutions.

Flow balancing

Air flow control DCV-BL, which is included in Lindinvent's series of smart dampers and measuring units, is used for balancing supply air.

Lighting control

Lighting can be controlled via presence sensor and/or manually via push button by connecting relay box CBR. See control unit SBD for a DALI lighting solution.

Radiator control

A valve actuator for radiators can be connected for sequence adjustment of heating and cooling. There is a built-in function for cold intrusion protection.

Electric radiator control

Electric radiators and heaters can be controlled via an electric radiator control box.

Fan cooling

Additional cooling can be adjusted via a fan coil unit control box.

Carbon dioxide (CO₂) sensors

Carbon dioxide sensors can be connected to control air quality. GTQV and GTQD sensors are supplied for wall or duct mounting respectively.

Reference value adjuster

Reference value is normally changed via hand unit DHP or via LINDINSPECT. A wall mounted user panel can also be installed for changing temperature reference value; see digital room panel DRP.

External occupancy detector

External occupancy detectors can be connected for alternative sensor locations; see XPIR or PD-2400.

Wireless communication via IR link

DHP is a handheld user panel designed for easy and flexible access to Lindinvent's controllers and control units for climate control. The unit is connected to TTC via IR link.

Additional product documentation

Table 7: Additional documentation for TTC can be obtained via links on the product's website under Products at www.lindinvent.se

Document	Available	Not available	Comments
Installation Instruction	●		Including instruction for installation of the associated HTK and HTR plenum boxes.
Start-up instruction	●		Gives a list of actual values and settings.
Maintenance instruction	●		Dismantling and checkpoints etc.
External connection diagram	●		See also connection box CBX
Environmental product declaration	●		Assessed by Byggvarubedömningen.
User information	●		General information about Lindinvent's system for smart ventilation.
Modbus list	●		Common with VTD.
AMA text	●		

Product documentation can be downloaded via www.lindinvent.se/produkter/



Contact

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Lindinvent – Smarter indoor climate. **Greener** buildings.

The company offers products and systems for controlling ventilation, lighting, solar shading and local utilization. Equipment and climate solutions are being developed for offices, schools, hospitals, laboratories and similar working environments. Lindinvent's systems work together to provide high indoor comfort and the lowest possible energy use.