Installation, operating and maintenance instructions

Fan Coil System
INDULVENT ec

- Draught-free ambient air flow pattern for cooling capacity up to 2400 W
- Low sound power
- Requires only electrical, coolant and condensate connections
- Energy saving EC technology
- Stepless output control
- Integrated condensate pump
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1. EC declaration of conformity

EC declaration of conformity

In line with Annex II Part 1, Section A of the Machinery Directive 2006/42/EC, dated 17/05/2006

We hereby declare that the machine designated below meets the relevant provisions of the EC Machinery Directive 2006/42/EC.

Manufacturer: Maschinenfabrik Gg. Kiefer GmbH
Luft- und Klimatechnik
Heilbronner Straße 380
70469 Stuttgart

Machine: Ventilation unit
Type: INDULVENT ec

Relevant EC directives and regulations:
EC directive 2006/42/EC (Machinery Directive)
EC directive 2014/30/EU (EMC Directive)

Applicable harmonised standards, in particular:
EN ISO 12100:2011-03; EN ISO 13857:2008-06; EN 61000-6-2:2016-05;
EN 61000-6-3:2011-09; EN 60335-1:2015-10; EN 349:2008-09

Other national standards, guidelines and technical specifications:
EN 82079-1
VDI 6022 Part 1:2017-01
AHU Directive 03

Manufacturer's signature

Clemens Kiefer
Managing director

i. A. Daniel Nack
Head of Development
Ventilation System Components

Stuttgart, 31.03.2017
Place, Date
Signature
2. Safety

Assembly, installation, maintenance and dismounting may only be carried out by trained personnel. It must be ensured that all such work is performed reliably and safely.

2.1 Explanations of symbols and notes

This symbol can be found in all occupational safety instructions in this operating manual where there is a danger to life and limb. These instructions must be observed and require that work be performed with utmost caution. Occupational safety instructions must be passed on to users. Apart from the instructions in this operating manual, the generally applicable safety and accident prevention regulations must also be observed.

Topics in the operating manual which are particularly relevant and require special attention for reasons of safety and service life of the unit. Directives, regulations and instructions must be complied with here. Examples of such topics include damage to the unit or building services.

General mandatory action sign for occupational safety and accident prevention. Compliance is compulsory due to various residual risks. Examples include wearing protective gloves, protective goggles and safety helmets.

Danger due to electric current!
Indicator of a risk of electric shock, which can result in personal injury, including death, and in material damage.

Risk of overhead hazard!
Indicator of a risk due to an overhead hazard, which can result – for example during maintenance work – in personal injury, including death, and in material damage.

Risk due to hot surfaces!
Indicator of a danger due to hot surfaces which can cause burns.

Risk of cuts!
Here you will find special information, instructions and prohibitions designed to prevent personal injury from cuts on metal panels. Indicator of a danger due to sharp edges.

Risk of falling parts and tools from work being carried out overhead.

Wear a safety helmet.

Danger due to rotating parts!
Indicator of a danger due to rotating parts of the unit, which can result in personal injury, including death, and in material damage.
2. Safety

2.2 Safety instructions

Please read the following operating instructions carefully before commissioning the INDULVENT ec! Failure to observe the operating instructions can endanger people and the environment, and void any potential claims. The unit meets all relevant safety regulations.

Installation, servicing, maintenance work and repairs may only be carried out by trained and qualified personnel. In the event of damage, parts of the unit in and on the housing may be live. In line with local safety regulations, only authorised people with appropriate training and qualifications are permitted to establish, disconnect and remove or change electrical connections. All safety instructions and mandatory action signs in the operating manual and on the unit must be observed. The access hatch on the side of the unit may only be opened for cleaning, maintenance or repairs after electrical isolation. The power connection and control voltage connection must be established in accordance with the wiring diagram. It is forbidden to operate the unit in a partially fitted or partially opened state, as earth connections may have been interrupted.

In continuous operation, the motor can heat up to approx. 70 °C. The motor must be left to cool sufficiently before it is touched.

Danger due to sharp edges!
Risk of cuts from sheet metal.

Objects and dirt must not be allowed to enter the fan impeller. A damaged impeller and the ejection of objects by the impeller can endanger people and shorten the service life of the unit.
2. Safety

The front plate must not be opened during operation. The units and suspension brackets must not be subjected to any additional load, as they may not be strong enough for this. If any damage caused by liquids, mechanical effects, corrosion, fire or similar is detected, the unit may only be restarted after adequate inspection by appropriate technical personnel. If any damage is detected, a specialist technician must immediately isolate the unit from the power supply across all poles and shut off the water supply to the unit. If any damage or soiling is present, this must be reported immediately to the responsible department. This also applies to unusual operating noises and odours.

2.3 Intended use

The INDULVENT ec fan coil system is used for cooling indoor spaces. The unit is designed for condensing operation. Precautions must therefore be taken to ensure that the condensate created via the integrated condensate pump can be drained off. This assumes there is a connection to an appropriate sewage system and, if necessary, integration into the BMS (condensate pump fault message).

The INDULVENT ec must not be used as a safety-related component or for performing any safety-relevant function. Please observe the permissible operating and ambient conditions. All information contained in these operating and maintenance instructions is based on the currently applicable standards and regulations, as well as the latest engineering standards.

The manufacturer accepts no liability for damage caused by:

- Incorrect use
- Failure to observe these instructions
- Installation and operation by untrained technical personnel
- Technical changes to/manipulation of the unit
- Failure to observe the maintenance intervals personnel
- Technical changes to/manipulation of the unit
- Failure to observe the maintenance intervals
- Use of non-approved spare parts
3. Transport instructions, delivery and storage

3.1 Transport instructions and delivery

The units are supplied in stable transport packaging. The installation and/or control accessories are supplied in a separate cardboard box.

3.2 Storage / inbound delivery

Please check the units immediately upon delivery and inform the haulier and your contractual partner if any damage is discovered or any parts on the delivery note are missing. Subsequent complaints cannot be considered. Packaged products must be transported and stored as follows:

- Fully protected from weather conditions and humidity/moisture, i.e. do not store products outdoors
- Transport and store products in dry, dust-free ambient conditions
- Protect products from humidity/dampness
- Do not expose products to corrosive or aggressive media
- Protect products from direct sunlight
- Storage temperature: 5 °C to 50 °C
- Relative humidity at the storage location: 20% to 90%

In order to prevent contamination of and damage to the unit, the packaging and protective film (if present) must not be removed until immediately before commissioning.

3.3 Disposal, environmental protection and recycling

All products are packaged carefully in environmentally friendly materials. The packaging material must be disposed of in accordance with local regulations.

The cardboard packaging and protective films serve to protect the unit from dirt and damage and must not be removed during the construction phase!

The manufacturer accepts no liability for soiling of or damage to the unit.
4. Function description

The INDULVENT ec comfort fan coil system is a 2-line recirculating air cooling unit used for cooling rooms.
The unit is designed for condensing operation and therefore has a condensate pan and a condensate pump.
The unit can either be installed in intermediate ceilings or suspended freely without a suspended ceiling (only in conjunction with front plate RQF).
The unit is designed for rooms with conventional air qualities, such as offices, meeting rooms, showrooms, laboratories, treatment rooms, etc. It is not suitable for rooms with extremely dirty and potentially oily or chemically aggressive air.
The centrifugal fan draws warm ambient air into the unit through the central air intake in the front plate via a filter fleece (EN779), blowing the air through a heat exchanger to cool it. The filter fleece (G2) protects the internal components from soiling. Water flows through the heat exchanger as a coolant. The cooled recirculating air is then introduced into the room via the front plate with the highly inductive and draught free air guide elements INDULCLIP (RQD version) and INDUDRALL (RQF version).

The sound power, caloric output and air flow rate are important considerations for the unit design.
The cooling capacity is adjusted to the cooling load of the room by changing the fan speed and/or by varying the amount of water. The control options are described in Chapter 6.

Precautions must therefore be taken at all times during condensing operation to ensure that the condensate created can be drained off via the integrated condensate pump.

Flow chart: INDULVENT ec

Front plate RQD for installation in intermediate ceilings.

Front plate RQF for freely suspended installation without an intermediate ceiling or for installation in intermediate ceilings.
A USB interface with two signal diodes is integrated in the front plate for monitoring and parameterisation of the unit. The current operating condition can thus be detected from the room. The ceiling fan coil unit also has an operating and fault message relay.

The front plate is particularly easy to service thanks to the folding hinges. This allows the unit to be opened and closed quickly for cleaning and maintenance. The front plate is made of galvanised sheet steel with a powder coating in RAL 9010 (standard). Other RAL colours are possible.

The air guide elements and grille cover on the front plate can be supplied either in black or light grey. Other colours are also possible on request.

The housing is made of galvanised sheet steel. The heat exchanger is made of AlCu, and the condensate pans are made of flame-retardant, impact-resistant ABS plastic.

### 5.1 Technical drawing

[Technical drawing image with annotations]
5. Technical data

5.2 Overview technical information

<table>
<thead>
<tr>
<th>Dimensions Housing</th>
<th>Operating range as indoor unit</th>
<th>°C</th>
<th>+ 5 up to + 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (Total)</td>
<td>mm</td>
<td>335</td>
<td></td>
</tr>
<tr>
<td>Width Size 625 (600)</td>
<td>mm</td>
<td>596 (571)</td>
<td></td>
</tr>
<tr>
<td>Length Size 625 (600)</td>
<td>mm</td>
<td>594 (569)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions front plate</th>
<th>Height</th>
<th>mm</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width Size 625 (600)</td>
<td>mm</td>
<td>623 (598)</td>
<td></td>
</tr>
<tr>
<td>Length Size 625 (600)</td>
<td>mm</td>
<td>623 (598)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions front plate</th>
<th>Operating limits water temperature</th>
<th>°C</th>
<th>+ 5 up to + 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test pressure</td>
<td>bar</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Nominal water flow rate</td>
<td>l/h</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>Nominal pressure drop</td>
<td>kPa</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions front plate</th>
<th>Supply/return water connection pipe</th>
<th>-</th>
<th>½” male thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water content</td>
<td>l</td>
<td>1.8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condensate pump</th>
<th>Condensate connection (pressure line)</th>
<th>mm</th>
<th>6 x 1.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condensate pump delivery head / flow rate</td>
<td>m/l/h</td>
<td>3.5 / 2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical system</th>
<th>Mains connection</th>
<th>V / Hz</th>
<th>230 / 50</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP rating (motor / electronics)</td>
<td>-</td>
<td>IP 00</td>
<td></td>
</tr>
<tr>
<td>Power requirement of condensate pump (Operation / Standby)</td>
<td>Watt</td>
<td>8 / 1</td>
<td></td>
</tr>
<tr>
<td>Fan power consumption²</td>
<td>Watt</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

| Total weight | kg | 31 |
| Filter class | - | G2 |

¹) without frontplate       ²) Power requirement at \( V_{\text{max}} = 470 \text{ m}^3 / \text{h} \)

### Cooling Capacity

<table>
<thead>
<tr>
<th>Control voltage [V(DC)]</th>
<th>Sound power level [dB(A)]</th>
<th>Total cooling capacity [W]</th>
<th>Electrical power [W]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cold water supply temperature</td>
<td>6°C</td>
<td>8°C</td>
</tr>
<tr>
<td>3.2</td>
<td>29</td>
<td>1305</td>
<td>1150</td>
</tr>
<tr>
<td>4.2</td>
<td>33</td>
<td>1565</td>
<td>1370</td>
</tr>
<tr>
<td>5.3</td>
<td>37</td>
<td>1775</td>
<td>1560</td>
</tr>
<tr>
<td>6.4</td>
<td>41</td>
<td>1950</td>
<td>1700</td>
</tr>
<tr>
<td>7.5</td>
<td>45</td>
<td>2095</td>
<td>1835</td>
</tr>
<tr>
<td>8.5</td>
<td>48</td>
<td>2220</td>
<td>1940</td>
</tr>
<tr>
<td>9.7</td>
<td>51</td>
<td>2365</td>
<td>2055</td>
</tr>
<tr>
<td>10.0</td>
<td>52</td>
<td>2390</td>
<td>2090</td>
</tr>
</tbody>
</table>

* Ambient air conditions: \(26°C / 60 \text{ % rel. humidity, dew point: } 17.6°C, m = 250 \text{ kg/h} \)
5. Technical data

The cooling capacity largely depends on:
- The set parameters
- The automatically adjusted or controlled fan speed (e.g. with external controller)
- The ambient air temperature and humidity
- The cold water supply temperature and the cold water mass flow rate

Determining performance based on charts or formulas is therefore complex and prone to errors.

The speed of the fan changes constantly depending on the ambient air temperature, as does the cooling capacity during condensing operation.

We recommend:
Because of the large variety of parameters, please contact our technical sales department for a specific design.
5. Technical data

5.3 Exploded view

- Condensate pump
- Water connections
- Heat exchanger
- Fan
- Internal insulation
- Controller
- Condensate pan
- Front plate
- Suction grille
6. Control and electrical connection

Application options and control

The required cooling capacity of the unit is adjusted to the cooling load of the room by changing the fan speed. In addition, primary control can be achieved via the amount of water.

The INDULVENT ec is equipped with an internal output controller and can thus be operated independently or be integrated in a BMS.

If all the relevant control functions are adopted from the BMS, the version without output controller is suitable. In this case, all the electrical connections are combined in a terminal box.

6.1 Version with integrated controller

The temperature of the ambient intake air is recorded by an internal temperature sensor. The integrated electronic controller responds to this measured temperature or to an external control signal. The cooling capacity is continuously adjusted to the cooling load of the room by changing the speed and thereby the recirculating air flow rate.

6.2 Electrical connection (with integrated controller)

Electrical connection box

The electrical connections as well as the internal electronics are housed on the central controller PCB in the electrical connection box.

For the switch-on process, the INDULVENT ec ceiling fan coil unit must be safeguarded with a circuit breaker, tripping characteristic "C", to EN 60898, DIN VDE 0641 Part 11. The power consumption during operation is max. 70 W per unit.

We recommend that you do not hook up more than 10 units on one circuit breaker to prevent the circuit breaker from tripping during the switch-on process.

Coded connection sockets are available for supplying a voltage, wiring a remote switch, for operating and fault message contacts and for communication. A suitable mains connection plug is part of the standard delivery (located inside the unit).

The unit must only be connected to the power supply by qualified personnel.

Example of a parameter setting

If several units are operated in the same control zone, a master unit can control up to 31 slave units via the two-wire VENT-BUS. The master specifies the speed of all connected slave units via its measured ambient air temperature.

Electrical connection box in the delivered condition

All the required settings for the unit can be made with a laptop via the USB interface in the front plate. The software containing the installation and operating instructions can be downloaded from www.kieferklima.de.
6. Control and electrical connection

6.3 Display and parameterisation

The VENT-BUS is based on an RS485 two-wire interface. Each unit in the VENT-BUS can be called up, scanned and parameterised by any other VENT-BUS subscriber.

The connection between laptop and INDULVENT ec can be established via an integral USB interface in the front plate without opening the unit. The necessary operating and parameterisation software can be downloaded from www.kieferklima.de. An installation wizard will help you to set up the program. Once the connection is established, the unit can be parameterised via a graphic interface. All the settings required to operate the unit can be read and amended. Updated operating software (firmware) can also be installed as required.

For further information about the INDULVENT ec PC software, please refer to our detailed software description at www.kieferklima.de.
6. Control and electrical connection

6.4 Control and electrical connection

Version for connecting operating messages to a BMS

Note:
The fault message signal must be connected because the cold water supply to the heat exchanger needs to be interrupted if the condensate pump and/or float module are faulty, in order to prevent further condensate accumulation and subsequent overflow of the condensate pan. The fan should run on for at least 10 minutes to dry the heat exchanger.
6. Control and electrical connection

External electrical connections

Version with control of a straight-through valve via operating message contact

Note:
The fault message signal must be connected because the cold water supply to the heat exchanger needs to be interrupted if the condensate pump and/or float module are faulty, in order to prevent further condensate accumulation and subsequent overflow of the condensate pan. The fan should run on for at least 10 minutes to dry the heat exchanger.
6. Control and electrical connection

VENT-BUS connection, external control voltage and remote switch

**Note:**
VENT-BUS communication between the units is only possible if the cable specification LICY/LIYCY 2 x 0.25 mm² is maintained. Using larger cable cross-sections or cable without shielding may lead to errors in VENT-BUS communication.
6. Control and electrical connection

6.5 VENT-BUS termination

At the beginning and end of each VENT-BUS series wiring, the signal must be terminated by installing a 100 Ω resistor. The resistor is connected to the respective free contacts A-B or AA-BB. The 100 Ω resistor is included in the optionally available connector kit.

**Note**
If the VENT-BUS signal is not terminated, no communication can take place!

Example of VENT-BUS series wiring of 4 units with termination

Up to 32 subscribers are possible

![Example diagram](image)

Wiring inside the 12-pole connector

![Wiring diagram](image)
6. Control and electrical connection

6.6 Controller function

Each ceiling fan coil unit can be operated as a single unit or as part of a VENT-BUS network. Up to 32 subscribers can be linked via the VENT-BUS.

The operational characteristics are determined by individually adjustable operating parameters:
- The ambient air temperature \( T_1 \) "minimum cooling capacity"
- The ambient air temperature \( T_2 \) "maximum cooling capacity" as well as
- Recirculating air flow rate \( V_1 \) "min. recirculating air flow rate at \( T_1 \)"
- Recirculating air flow rate \( V_2 \) "max. recirculating air flow rate at \( T_2 \)"

In addition, the following can be set:
- Constant recirculating air flow rate \( V_k_1 \)
- Constant recirculating air flow rate \( V_k_2 \)

Digital control function

In "Automatic mode", the output control of the INDULVENT ec responds either to the signal from the temperature sensor integrated in the inlet port, to an externally fed 0-10 V DC voltage signal, to information from the internal VENT-BUS or to a remote switch (optional). Parameterisation during commissioning determines which signal is the control variable.

Automatic mode function

If the ceiling fan coil unit is operated in automatic mode, the control affects the speed of the recirculating air fan depending on the measured temperature of the intake air (ambient air temperature), and sets the recirculating air flow rate required for this load case.

Control parameter factory settings:
\[
\begin{align*}
T_1 &= 23.0 \, ^\circ C \\
T_2 &= 26.0 \, ^\circ C \\
V_1 &= 150 \, m^3/h \\
V_2 &= 470 \, m^3/h
\end{align*}
\]

Function with "external control voltage"

In this operating mode, the set value is not entered automatically, but externally within the limits of the parameterised external control voltage \( Y_1 \) and \( Y_2 \). This affects the speed of the recirculating air fan within the parameterised limits between \( V_1 \) and \( V_2 \). This provides the cooling capacity delivered to the room.

Control parameter factory settings:
\[
\begin{align*}
Y_1 &= 2.0 \, V \\
Y_2 &= 10.0 \, V \\
V_1 &= 150 \, m^3/h \\
V_2 &= 470 \, m^3/h
\end{align*}
\]

Function of fixed switching stages \( V_k_1 \) and \( V_k_2 \)

If the ceiling fan coil unit is set via a remote switch to \( V_k_1 \) or \( V_k_2 \), the unit will run whatever the currently measured ambient temperature at a constant recirculating air flow rate, which in turn can be set via the parameterisation software.

Switching stage factory settings:
\[
\begin{align*}
V_k_1 &= 200 \, m^3/h \\
V_k_2 &= 350 \, m^3/h
\end{align*}
\]

Operating mode display

Each unit has two signal diodes, which indicate the current operating condition. The various signals and the corresponding operating conditions are listed in the following table:

<table>
<thead>
<tr>
<th>Display</th>
<th>Betriebsmodus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neither of the two signal diodes is lit up</td>
<td>• Unit in OFF position</td>
</tr>
<tr>
<td></td>
<td>• There is no mains voltage</td>
</tr>
<tr>
<td>Green LED lit up continuously</td>
<td>• Automatic mode or</td>
</tr>
<tr>
<td></td>
<td>• External control voltage</td>
</tr>
<tr>
<td>Green LED flashes at 3-second intervals</td>
<td>• Unit running at ( V_k_1 )</td>
</tr>
<tr>
<td>Green LED flashes twice at 3-second intervals</td>
<td>• Unit running at ( V_k_2 )</td>
</tr>
<tr>
<td>Red LED lit up continuously</td>
<td>• There is a fault</td>
</tr>
</tbody>
</table>

USB Port

![USB Port Diagram]
6. Control and electrical connection

6.7 Adjustable parameters

The operational characteristics of the ceiling fan coil unit are determined by eight individually adjustable parameters. The factory setting is described in section "Controller function" on page 19.

The factory settings have been matched to standard applications in the office sector. In special application cases, however, it may make sense to adapt some parameters.

Parameter setting limits:

- \( T_1 = 18 - 26 \, ^\circ \text{C} \)
- \( T_2 = 24 - 32 \, ^\circ \text{C} \)
- \( V_1 = 100 - 300 \, \text{m}^3/\text{h} \)
- \( V_2 = 300 - 470 \, \text{m}^3/\text{h} \)
- \( Y_1 = 0 - 5 \, \text{V} \)
- \( Y_2 = 5 - 10 \, \text{V} \)
- \( V_k_1 = 100 - 470 \, \text{m}^3/\text{h} \)
- \( V_k_2 = 100 - 470 \, \text{m}^3/\text{h} \)

Master/slave operation with VENT-BUS

Up to 32 subscribers can be connected to the VENT-BUS group. Communication within the "VENT-BUS" takes place via a two-wire VENT-BUS cable (customer to supply). It connects all the units in the VENT-BUS group in series. We recommend a twisted and screened two-wire cable with the specification LICY 2 x 0.25 mm². The maximum permissible cable length in the VENT-BUS is 100 m. The controller PCB in the electrical box has two pre-installed terminal blocks (A-B, AA-BB) for connecting the VENT-BUS cable. The wiring is shown in a wiring diagram on pages 17 and 18. Any groups of parallel running units can now be linked at any time in a "VENT-BUS" wired on the hardware side. This is facilitated by the parameterisation software.

A special feature of the "VENT-BUS" is the ability to parameterise every subscriber from any INDULVENT ec in the VENT-BUS. This means, for example, that sensitive rooms need no longer be entered to perform adjustments.

Master/slave dependencies in the traditional sense can no longer be found in this system. Each VENT-BUS subscriber can call up the following control signals from any subscriber:

- Measured value of the ambient temperature
- Position of the remote switch or
- Value of an external control voltage

During parameterisation of a specific unit, it therefore only remains to determine which signal and, if applicable, which remote switch in the VENT-BUS the subscriber should respond to – to its own control signals – single unit or "master" – or to a third party "slave".

In spite of the group formation, individual adjustability is retained for each unit. So while the guide signal for a group is provided centrally, the setting parameters such as the start point \( T_1, Y_1 \), end point \( T_2, Y_2 \) maximum output, start flow rate \( V_1 \) and end flow rate \( V_2 \), as well as the constant air flow rates \( V_k_1 \) and \( V_k_2 \) for an activated remote switch, can be adjusted freely for each unit.
6. Control and electrical connection

6.8 Version with terminal box

In the version with a terminal box, the fan of the INDULVENT ec is controlled via an external 0-10 V signal. The corresponding connectors are also combined in the terminal box, e.g. the 230 V connection and the connection for condensate pump fault messages. Terminals S1 and S2 are closed in the event of a fault in the condensate pump and/or float module. With these floating contacts, the fault must be connected to the BMS. The cold water valve must be closed if there is a fault, in order to prevent the condensate pan from overflowing in the event of a fault and in condensing operation. The fan should run on for at least 10 minutes to dry the heat exchanger.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Colour</th>
<th>Function / assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>White</td>
<td>Speed output: Open Collector, 1 pulse per revolution, galvanically isolated, Isink max. = 10 mA</td>
</tr>
<tr>
<td>G+</td>
<td>Yellow</td>
<td>Control input: 0-10 V or PWM, galvanically isolated</td>
</tr>
<tr>
<td>Bl -</td>
<td>Blue</td>
<td>GND – earth connection of the control interface</td>
</tr>
<tr>
<td>Rt</td>
<td>Red</td>
<td>Voltage output: 10 V / 1.1 mA, galvanically isolated</td>
</tr>
<tr>
<td>S2</td>
<td>Black</td>
<td>Switching contact max. 230 VAC / VDC max. 8A with ohmic load*</td>
</tr>
<tr>
<td>S1</td>
<td>Black</td>
<td>Switching contact max. 230 VAC / VDC max. 8A with ohmic load*</td>
</tr>
<tr>
<td>L</td>
<td>Brown</td>
<td>Voltage supply 230 VAC, 50-60 Hz</td>
</tr>
<tr>
<td>N</td>
<td>Blue</td>
<td>Neutral conductor</td>
</tr>
<tr>
<td>PE</td>
<td>Green/yellow</td>
<td>Earth conductor</td>
</tr>
</tbody>
</table>

* When a fault occurs switch is closed
7. Installation information

7.2 Installation information
Installation/suspension from a bare ceiling is achieved using threaded rods or easy-span hangers of sufficient size and quantity. The unit must be fitted in such a way as to be freely suspended and isolated from the power supply, with the possibility to compensate for thermally induced changes in size. The transmission of vibration and structure-borne noise to the building structure must be prevented, as this can lead to acoustic problems. There must be a minimum clearance of 25 mm between the top edge of the unit and the lower edge of the bare ceiling.

7.3 Minimum clearances

Minimum installation clearances
The following minimum installation clearances to other components must be observed to allow maintenance and repair work inside the intermediate ceiling.

Access hatches
We recommend installation in removable ceiling systems. For installation in closed ceiling systems, adequately dimensioned access hatches should be fitted in the area around electrical connection boxes as well as cold water and condensate connections.

All regular maintenance work can then be carried out without opening the intermediate ceiling. To enable replacement of the controller or heat exchanger, however, access to the intermediate ceiling space must be provided, if necessary via a suitable access hatch. The optional straight-through valve is supplied loose. We are unable to recommend exactly where to fit an access hatch for this.
7. Installation information

7.4 Cold water connection

The cold water connection is made via two connection nipples with a ½" male thread mounted on the heat exchanger.

- When making the cold water connection, always counter-hold the connection nipple with a hex tool to prevent damage to the inner line routing, for example by twisting off.
- Shut-off valves must be provided in the supply and return for service purposes.
- Optional regulating valves must be installed to ensure correct adjustment of the water mass flow rate.
- An air vent valve must also be provided in the supply at the highest installation point.
- The cold water hoses must not place any load on the unit.
- The manufacturer's instructions for both the actuator and valve must be observed at all times.
- The valve group and supply lines must be insulated with vapour diffusion-proof material for condensing operation.
- The maximum operating pressure of the heat source is 10 bar.

We recommend:

Use the operating status relay to control the through valve; this ensures that the cold water supply is only active when the unit is running (page 16). A suitable ½" through valve with thermal actuator is available as an optional accessory.
8. Maintenance and repairs

8.1 Technical maintenance

Please note that maintenance work may only be carried out when the unit is isolated from the power supply!

8.2 Maintenance intervals

The maintenance intervals specified below are scheduled as per VDI 6022. The maintenance interval must be shortened if the level of soiling is particularly high.

<table>
<thead>
<tr>
<th>Performed by</th>
<th>No.</th>
<th>Task</th>
<th>Action if required</th>
<th>Interval – no. of months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trained cleaning personnel</td>
<td>A</td>
<td>Spot-check units for soiling</td>
<td>Clean and repair unit (housing, front plate, fan)</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Change filter</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Clean heat exchanger</td>
<td>Clean and repair</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>Spot-check all other components through which secondary air flows</td>
<td>Clean and repair</td>
<td>x</td>
</tr>
<tr>
<td>Qualified personnel only</td>
<td>E</td>
<td>Hygiene inspection</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>Check unit for damage and corrosion</td>
<td>Clean or replace</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>G</td>
<td>Check fan for soiling, damage and corrosion</td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

Individual components in the INDULVENT ec
8. Maintenance and repairs

**Maintenance-friendly access**

For ease of maintenance, the front plate has two folding hinges. These hold the front plate and use spring force to press the plate against the foam seal of the housing. To open, unlock the quick-action fastener by turning through 90°, gently lift the front plate away from the box and fold downwards. After completing work on the unit, close the front plate again and lock it with the quick-action fastener.

[View of the INDULVENT ec with open front plate]

**Filter fleece**

The condition of the filter fleece must be checked for soiling at regular intervals, at least every 6 months. In the case of heavy soiling, the fleece must be replaced. To do this, open the front plate and replace the fleece, which is attached to the side of the inlet port with hook tape. The filter fleece is available as a spare part. If filter media from other manufacturers are used, reductions in caloric output and increases in sound power may occur.

**Floats and float modules**

Maintenance: every year before the start of the cooling period. The float module must only be cleaned with an alcohol-free cleaning agent! Carefully remove the module cover to clean the float and float module.

**Fan**

The fan is maintenance-free. If you nonetheless detect any soiling of the fan impeller surface during the visual inspection, you can wipe it with a damp cloth.

**Condensate pan, condensate pump float module and condensate line**

The soiling on these components depends on the degree of contamination in the ambient intake air as well as the amount of condensate produced. The INDULVENT ec is normally used primarily in the summer months. Condensate is produced at this time due to the higher relative humidity of the outdoor air. We therefore recommend that the relevant condensate drain components are cleaned at the end of the cooling period. The components should be inspected visually in the middle of the cooling period. Additional cleaning may be required.

Clean the condensate pan with a slightly damp cloth and a commercially available neutral cleaning agent. To do this, open the front plate and loosen the four nuts (spanner size 10). The USB cable must be disconnected from the adhesive sockets before the pan can be removed. To clean the components, remove the sheet metal part affixed to the condensate pan by pulling it down and out of the unit. Be aware that there may still be water in the condensate pan.

The condensate pump itself is maintenance-free. However, the associated float module must be cleaned regularly to ensure reliable operation. Heavily soiled float modules can get stuck and cause the condensate pan to overflow. Damage caused by soiling of the float module therefore does not constitute grounds for complaint.

After successfully removing the condensate pan, separate the float module from the condensate pump via a plug-in system. Now remove the float module from the retaining bracket, rinse it with clear water and put it back in place.

In order to ensure reliable condensate drainage, ensure that the condensate line does not become clogged with deposits. You should therefore perform a visual inspection of the transparent condensate hose. If deposits are detected, the hose must also be flushed or replaced if necessary.

After completing the cleaning work, put all the components back correctly and reattach the USB cable.

When refitting the float switch, ensure that the cable leading to the pump is fixed to the float module with a cable binder to form a siphon-like loop (see image).
8. Maintenance and repairs

Once the float module has been fitted, the power cable of the float module must be attached to the condensate drain hose using a cable tie.

You then need to check that the condensate pump is functioning properly by adding water to the condensate pan.

Heat exchanger
The recirculating air drawn in is filtered before flowing through the heat exchanger, so no significant soiling should occur if the filter fleece is changed regularly. Clean the heat exchanger carefully with a brush if it still becomes soiled. Ensure that the aluminium fins are not bent out of shape during cleaning!

Insulation of the housing
The high grade insulation foam is halogen free and corresponds to building material class B1 to DIN 4102 and B-S2,d0 to EN 13501, and is generally maintenance-free.

Any initial smell which occurs is due to the manufacturing process and does not constitute grounds for complaint. The odours emitted are quite harmless. Please ensure that the room is well ventilated, especially in the early days. Depending on the air quality requirements, the air exchange rate can then be lowered to the required minimum air flow rate.

We would be happy to send you the corresponding datasheet from the manufacturer.
9. Tender text

**INDULVENT ec comfort fan coil system – version with electronic output controller**

A square design with the following functions:
- Room cooling and dehumidification in recirculating air mode with a highly inductive ceiling air swirl diffuser for maximum thermal comfort according to EN 13779 and ISO 7730
- Easy to clean unit to VDI 6022
- Variable speed control of the fan unit depending on the ambient air temperature, external control voltage, remote switch or VENT-BUS
- Output of operating and fault messages via floating changeover contacts
- Operation, monitoring and parameterisation are performed using a laptop (customer to supply) via a built-in USB interface in the front plate

**Type INDULVENT ec consisting of:**
- Galvanised sheet steel housing, thermally insulated with eight Ø 9 mm attachment points
- Front plate in RAL 9010 with air guide vanes in black or light grey similar to RAL 7035
  - Version □ RQD for installation in intermediate ceilings
  - □ RQF for freely suspended installation without an intermediate ceiling or for installation in intermediate ceilings
- Folding hinge for easy access via the front plate for servicing and cleaning work
- EC centrifugal fan with backwards curved blades, stable performance curve, low noise level and low power consumption
- Heat exchanger for high caloric output, made of copper tube with press-fitted aluminium fins, hydrophobic coated high performance fins for optimal condensate drainage (water connections ½'' male thread)
- Electronic output control with ambient air temperature sensor and USB interface
- Condensate pan made of flame-retardant ABS with condensate drain connector to the outside
- Condensate pump with float control and safety shutdown integrated in the unit
- 3-pole plug for mains connection consisting of a plug part and cable housing
- Easy to replace G 2 filter fleece, Weight in operation approx. 31 kg

**External dimensions:**
- □ Nominal size 625  □ Nominal size 600
- Nominal size of front plate: □ 623 mm x 623 mm □ 598 mm x 598 mm
- Housing dimensions: □ 596 mm x 594 mm (without front plate) □ 571 mm x 569 mm (without front plate)
- Installed height: □ 335 mm □ 335 mm

**Type INDULVENT ec**
**Manufacturer:** Kiefer Luft- und Klimatechnik

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Type</th>
<th>Unit price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional charge for coating the front plate in selected RAL colours, air guide vanes in black or light grey similar to RAL 7035</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

□ Additional charge for remote switch for operation from the room

Square mounted | Item | Quantity | Unit price |
| | | | |
| Flush mounted | Item | Quantity | Unit price |
| | | | |

□ Additional charge for straight-through valve ½'' thermal actuator for cold water shut-off during downtimes (supplied loose)

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit price</th>
</tr>
</thead>
</table>

□ Additional charge for connector kit consisting of:
- 1 x 3-pole plug for fault messages, 1 x 3-pole plug for operating messages
- 1 x 12-pole plug for connecting remote switch, external control voltage and VENT-BUS

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit price</th>
</tr>
</thead>
</table>

□ Additional charge for parameterisation of the INDULVENT ec units at the construction site by Kiefer according to our installation rates.

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Estimated price</th>
</tr>
</thead>
</table>
9. Tender text

INDULVENT ec comfort fan coil system – version with terminal box without electronic output controller

A square design with the following functions:
- Room cooling and dehumidification in recirculation air mode with a highly inductive ceiling air diffuser for maximum comfort according to EN 13779 and ISO 7730
- Easy to clean unit to VDI 6022
- Fan speed is controlled via an external 0-10 V signal
- Output of fault message in the event of a condensate pump fault

Type INDULVENT ec consisting of:
- Galvanised sheet steel housing, thermally insulated with eight Ø 9 mm attachment points
- Front plate in RAL 9010 with air guide vanes in black or light grey similar to RAL 7035

Version
- RQD for installation in intermediate ceilings
- RQF for freely suspended installation without an intermediate ceiling or for installation in intermediate ceilings

- Folding hinge for easy access via the front plate for servicing and cleaning work
- EC centrifugal fan with backwards curved blades, stable performance curve, low noise level and low power consumption
- Heat exchanger for high calorific output, made of copper tube with press-fitted aluminium fins, hydrophobic coated high performance fins for optimal condensate drainage (water connections ½” male thread)
- Terminal box to connect all electrical connections
- Condensate dish made of flame-retardant ABS with condensate drain connector to the outside
- Condensate pump with float control and safety shutdown integrated in the unit
- Easy to replace G 2 filter fleece
- Weight in operation approx. 31 kg

External dimensions:
- Nominal size 625
- Nominal size 600

Nominal size of front plate:
- 623 mm x 623 mm
- 598 mm x 598 mm

Housing dimensions:
- 596 mm x 594 mm (without front plate)
- 571 mm x 569 mm (without front plate)

Bauhöhe:
- 335 mm
- 335 mm

Additional charge for coating the front plate in selected RAL colours, air guide vanes in black or light grey similar to RAL 7035

Additional charge for straight-through valve ½” thermal actuator for cold water shut-off during downtimes (supplied loose)
Product range

Components
Linear, wall, ceiling, and displacement outlets, chilled ceilings, ceiling fan coolers, transfer elements, concrete core cooling with air. Axial and radial ventilators, hot-gas ventilators, plastic ventilators.

Systems
Air conditioning systems of all types for comfort (offices, administration buildings, department stores, hospitals, libraries, museums, etc.) and industrial purposes (mechanical engineering, high technology, textile, plastics, chemical, automobile, drinks, foodstuffs and other industries).

Services

Advice and Planning
We will advise you in all questions concerning the application of our systems, carry out system investigations, and prepare cost estimates including calculation of cooling loads, piping networks, energy costs, and operating efficiency. Preparation of structure proposals for air distribution, lighting, ceiling systems. Illumination calculations using the latest software tools. Design and implementation of control concepts in our own instrumentation and control department. We incorporate our knowledge and experience in product innovations and new projects.

Air-conditioning laboratory

Maintenance and Service
Maintenance service contracts for all types of ventilation and air-conditioning systems.

With release of this printing, all earlier versions of the Technical Information lose their validity.