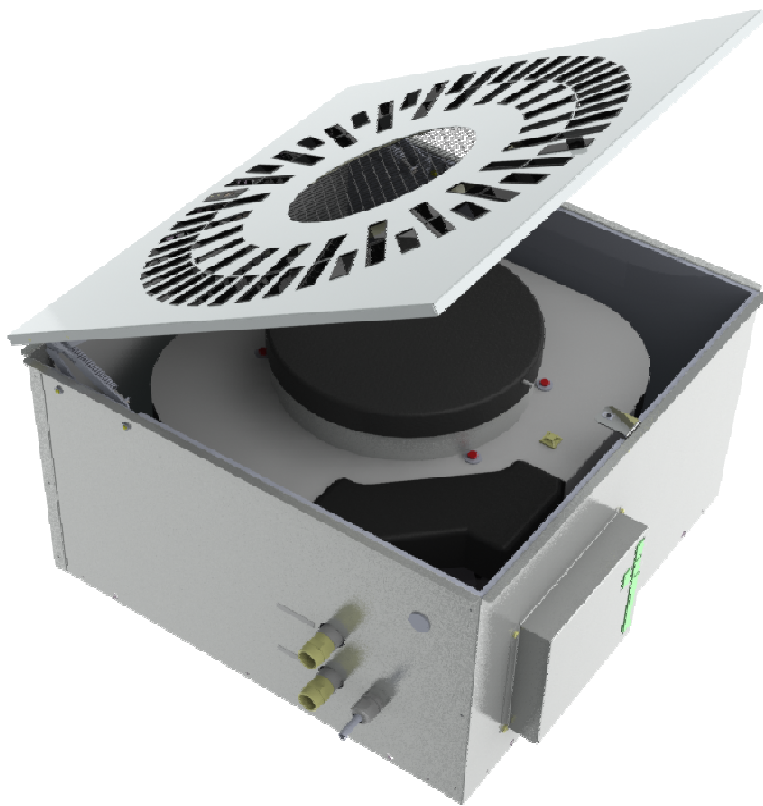


Software Description

Comfort Ceiling Fan Coil System INDULVENT ec



- Draught-free ambient air flow with cooling capacities up to 2600 W
- Low sound power levels
- Only electrical, cooling water and condensate connections required
- Energy-saving EC technology
- Stepless power regulation
- Integrated condensate pump
- Open Bus architecture



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1 General information

The INDULVENT ec module is used to control a ceiling fan cooling unit with installed fan and condensate pump.

In automatic mode, the fan is controlled using the measured temperature or an external control voltage. In addition, the fan can be operated at two different fixed speeds of rotation.

Using a remote switch, you can switch between the various modes. If a remote switch is not connected, automatic mode is always used.

INDULVENT ec can be operated either as a stand-alone device or up to 32 device can be connected together into a bus system. In the process, various control systems can react to the same remote switch and/or several control systems can process the temperature from the same control system.

The control system is configured using the respective PC software.

2 Technical data

Parameter	Min.	Typ.	Max.	Unit of meas.
Supply voltage		230		V AC
Operating temperature	0	-	+50	°C
Installation position	Any			-

3 Connections

The module has the following connections (see the following drawing for their position):

Function	Type of connection	Connection name	Signals/description
Supply voltage	Plug-in connector ST600	L	230V AC
		N	Neutral conductor
		PE	Protective earth conductor
Operation signalling contact	Plug-in connector ST500	A	Modes:
		B	A – B connected: Fan running (operation)
		C	B – C connected: Fan at a standstill
Fault signalling contact	Plug-in connector ST501	D	Fault indication:
		E	D – E connected: Fault present
		F	E – F connected: No fault
Fan bus	Plug-in connector ST200 (3-6)	A, B, AA, BB	RS 485 interface for bus wiring. Here, Signal A of the one control system is connected to Signal A of the other, while Signal B of the one is connected to Signal B of the other.

Function	Type of connection	Connection name	Signals/description
External control voltage	Plug-in connector ST200 (7-8)	-	Earth of the control voltage
		+	Control voltage (0-10V DC)
Remote switch	Plug-in connector ST200 (9-12)	1, 2, 3, 4	Connection of the remote switch All terminals open: Automatic mode 1 connected to 2: Off 1 connected to 3: VK1 1 connected to 4: VK2
Voltage supply of motor	Connection terminals ST701-ST703	L	230V AC
		N	Neutral conductor
		PE	Protective earth conductor
Control lines of motor	Connection terminals ST704-ST707	Pulse	Rotation speed pulse of motor
		+	Control voltage for motor
		-	Earth
		Out	10V output voltage of motor
Voltage supply of condensate pump	Connection terminals ST801-ST803	L	230V AC
		N	Neutral conductor
		PE	Protective earth conductor
Alarm relay of condensate pump	Connection terminals ST209-ST210	S1, S2	Connections for condensate pump contact
External temperature sensor	Connection terminals ST201, ST204, ST206-ST209	nCS	Chip Select
		SClk	Clock
		Sin	Signal in
		GND	Earth
		VCC	Supply voltage (5V)
USB connection pc board and external LEDs	Connection terminals ST202, ST203, ST205, ST300-ST303	GND	Earth for LEDs
		Err	Supply error LED (red)
		Sta	Supply status LED (green)
		GND	USB earth
		VCC	USB supply
		DP	Data line plus, USB
		DM	Data line minus, USB

4 Indicators

Three light-emitting diodes (LEDs) are used for the visualisation of the operating states of the module, of which two LEDs are located on the outside of the USB connection pc board (see the following drawing for the position of the LEDs):

LED	Function
Internal LED (on pc board)	USB connection to PC
Green external LED	Operating status indication Off = off Single flash = fixed air flow rate VK1 Double flash = fixed air flow rate VK2 Constantly lit = automatic mode
Red external LED	Fault indication Occurs in case of motor, temperature, condensate pump or collective fault.

If neither the green nor the red LED lights up, the unit is switched off (remote switch) or it has no mains voltage.

6 Function

After the INDULVENT ec software is turned on, the status of the remote switch is determined and the operating mode is set using this status. In the process, you can change the parameters that the remote switch to be used is connected to its own control system or, in case of bus operation, the remote switch can be polled from another control system (see below for details).

7 Operating modes

7.1 Off

The motor is switched off in this mode.

If a motor fault occurs in one of the other modes, it is reset to this mode.

This mode is selectable only when the remote switch is connected.

7.2 Constant air flow rate VK1 (fixed value)

The motor runs at a fixed speed of rotation that corresponds to a configured, constant air flow rate (VK1). This is freely selected within certain limits using the PC software.

7.3 Constant air flow rate VK2 (fixed value)

The motor runs at a fixed speed of rotation that corresponds to a configured, constant air flow rate (VK2). This is freely selected within certain limits using the PC software.

7.4 Automatic

7.4.1 Temperature

The temperature is determined using a local or, alternatively in bus operation, external temperature sensor.

The fan speed of rotation is determined using this temperature. If the temperature lies under the "Min. temperature (T1)" value, the fan is switched off. If the temperature lies between the "Min. temperature (T1)" and "Max. temperature (T2)" values, the speed of rotation is set according to the air flow rate that results from the "Min. autom. air flow rate (VAuto1)" and "Max. autom. air flow rate (VAuto2)" values. If the temperature exceeds the "Max. temperature (T2)" value, the speed of rotation is set according to the "Max. autom. air flow rate (VAuto2)" value.

If this mode is active, the "Auto" operating mode will be indicated in the PC software.

7.4.2 External control voltage

The external control voltage is determined using a local or, alternatively in bus operation, external input.

The fan speed of rotation is determined using this control voltage. If the control voltage lies under the "Min. ext. control voltage (Y1)" value, the fan is switched off. If the control voltage lies between the "Min. ext. control voltage (Y1)" and "Max. ext. control voltage (Y2)" values, the speed of rotation is set between 100 m³/h and 470 m³/h according to the air flow rate. If the control voltage exceeds the "Max. ext. control voltage (Y2)" value, the speed of rotation is set according to the volume flow rate of 470 m³/h.

If this mode is active, the "Ext. control voltage" operating mode will be indicated in the PC software.

7.5 PC

If a fixed speed of rotation or the switching of a relay (factory test) is selected using the PC software, the "PC" operating mode appears during the time in which this mode is active. See below for details.

8 Internal functions

8.1 *Follow-up time of condensate pump*

Activating the fan releases the condensate pump at the same time. The pump does not start to work until after the float switch is triggered.

When the fan shuts down again, either when you switch to the "Off" operating or, when the minimum temperature is not achieved, to the "Auto" operating mode, the condensate pump remains active for another five minutes to drain any condensate that occurs; after that, the 230 V supply voltage is switched off.

8.2 *Automatic fan startup*

If the automatic operating mode is active and the minimum temperature has not been achieved (the fan is at a standstill), the fan is activated for two minutes at a low speed of rotation every 20 minutes to blow air of the current air temperature onto the temperature sensor.

This is necessary for the case that the cold water is not shut off at the same time as the fan. In this case, the temperature sensor would be cooled constantly and thus an incorrect temperature that is too low would be measured.

8.3 *Blockage detection of the fan*

If the jamming of a fan is detected, the control system indicates a motor fault. The motor continues to be supplied with voltage for an additional 20 seconds. If the motor restarts in this time, the fault is reset. Otherwise the motor remains switched off and the fault active until the "Off" operating mode is selected once.

8.4 *Elimination of a fan fault*

If a motor fault is indicated due to the jamming of the fan and the follow-up time has expired so that the motor is no longer supplied with voltage, this fault message can only be cancelled by selecting the "Off" operating mode.

8.5 *Elimination of a condensate pump malfunction*

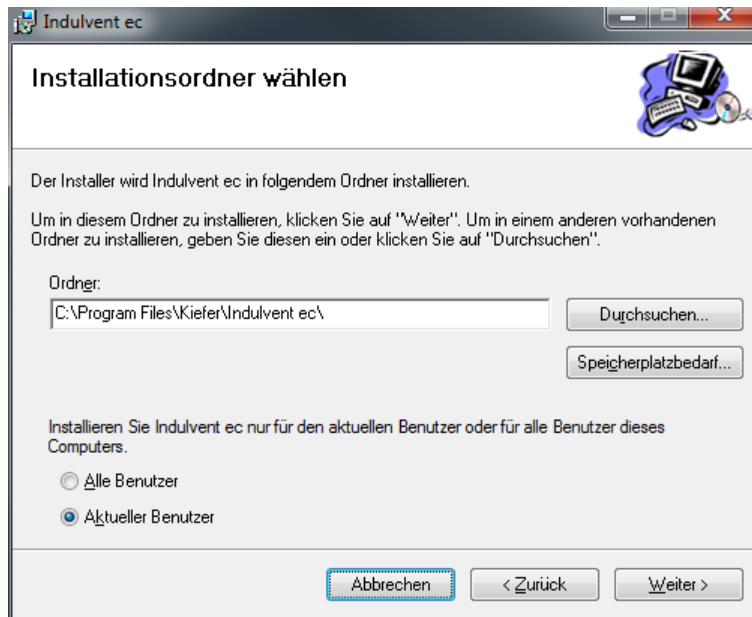
If the condensate pump indicates a fault, it is indicated to INDULVENT ec as a fault. This fault message is automatically reset when the condensate pump rescinds the fault. Nothing else must be done on INDULVENT ec.

9 Software installation

PC software with the USB driver necessary for INDULVENT control systems is available as a free download from www.kieferklima.de →Service →Downloads →Selection Indulvent ec. After downloading and unpacking the Zip file, start set-up.exe for the PC software.

9.1 *PC software*

The installation routine for the parameterization software starts when set-up.exe is opened, and first asks for the directory in which the software should be installed on the hard disk. The illustration below shows the dialog. The target directory is preselected, so that no changes are required in this case.



Alternatively, however, another directory can be selected.

Confirm the entries with "Next" and follow the instructions on the screen.

9.2 USB driver

The USB driver does not have its own installation routine, but rather can be installed easily using the Windows-internal setup wizard for new hardware. The installation takes place in two stages, which means that the setup wizard must be run twice.

- **Note:** After a USB cable is connected between the PC and the INDULVENT control system, the Windows message "New hardware found" appears at the lower left edge of the screen.

Shortly after that, the setup wizard for new hardware starts. A connection with "Windows Update" is not necessary (selection: "Not now") and the dialogue can be confirmed with "Next."

The next dialogue asks about the procedure for software installation. With the "Automatic" selection, the setup wizard automatically finds the driver when the dialogue is left by clicking "Next."

The setup wizard can be left with "Finish" after a successful search and installation.

After that, the setup wizard starts a second time and the previous dialogues are run through again.

10 PC software

After the start of the PC software, the following user screen appears:



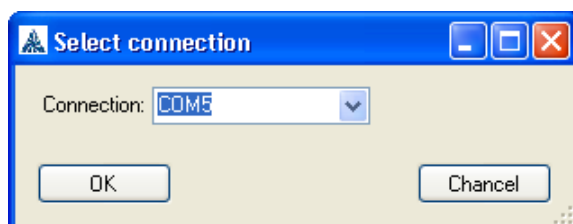
10.1 Setting the language for the PC software

If no connection has been established to a INDULVENT ec ("not connected" is displayed in the status bar), the language of the software user interface can be set.

Using the "Languages" item on the "Settings" menu, the available languages can be selected. The software user interface disappears briefly and then reappears in the new language.

10.2 Setting the correct connection (COM port)

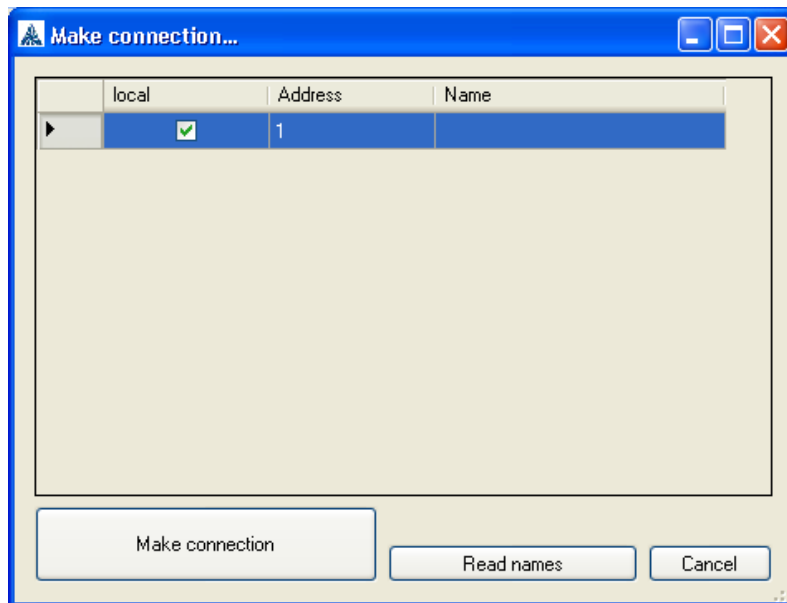
For the connection of a INDULVENT ec to the PC, the correct port (COM port) must be set. For this purpose, the "Port" item on the "Settings" menu must be selected. The following window appears:



All currently available COM ports are displayed in the list (which can be opened with the downward arrow). INDULVENT ec generally has the port with the highest number. The COM port should be selected and the selection should be confirmed with "OK."

10.3 Connection setup

After the start of the software, a connection must be set up to INDULVENT ec. For this purpose, click the "Set Up Connection" button. This action opens the following window:

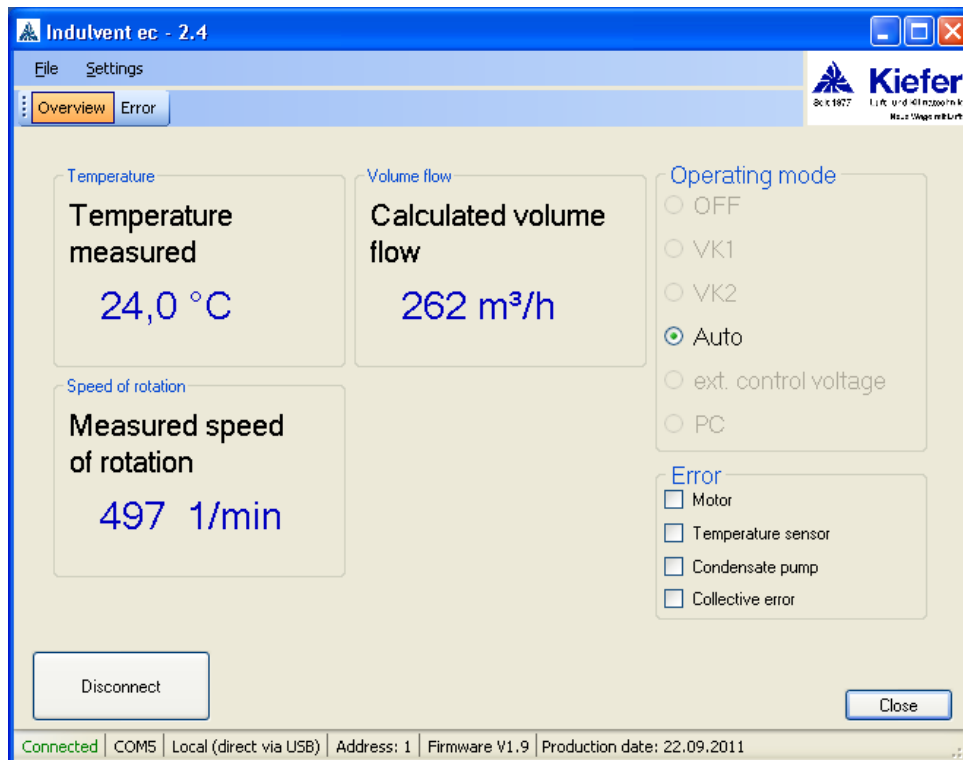


All devices connected to the bus are shown here. Using the "Read Names" button, the names of all bus subscribers can be read.

The device at which the USB connection has been established is always selected. It is possible, however, to connect to another device through the bus. For this purpose, select the desired address from the list and click "Set Up Connection".

10.4 Overview

After a connection setup, the current data such as the operating mode, faults that occur, unit temperature, unit control voltage, speed of rotation, and the air flow rate calculated from this speed of rotation are displayed.



10.5 Status line

The following data is displayed in the status line:

- Whether a connection is active ("connected") or inactive ("not connected")
- Set port (here: COM5)
- If the connection to the control system to which the USB cable is connected ("Locally, directly via USB") has been set up or the connection has been set up via the vent bus ("via vent bus")
- The address of the control system to which the connection exists
- The firmware version of the control system to which the connection exists
- The production date of the control system to which the connection exists

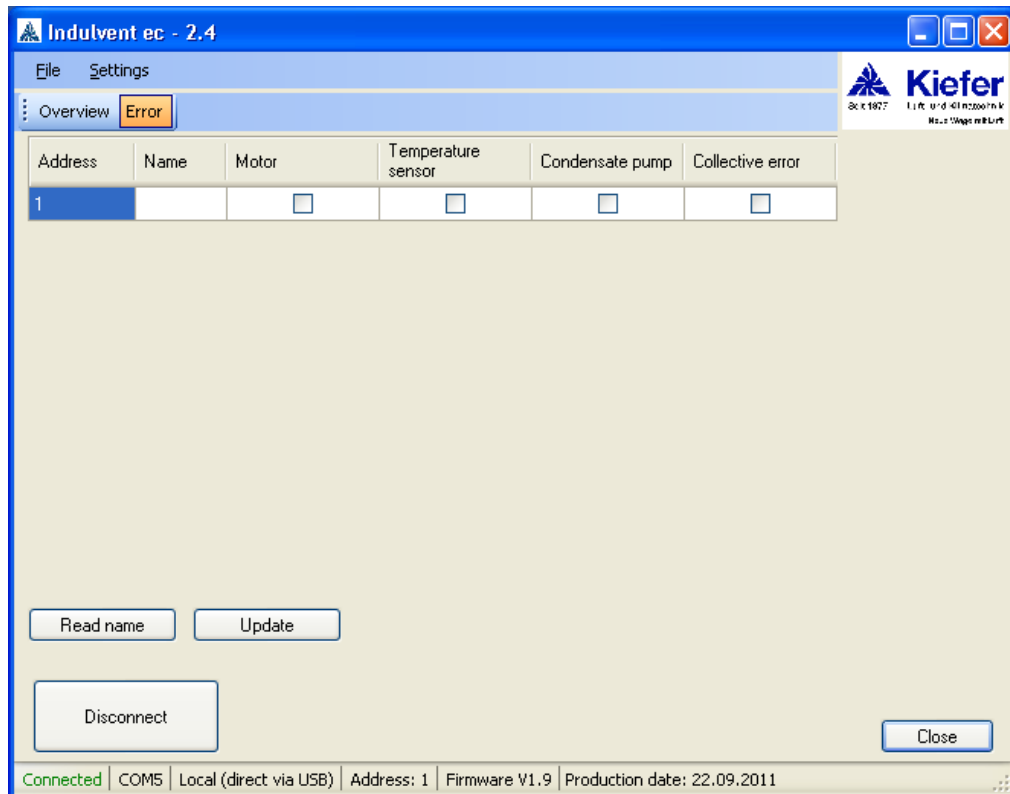
If no connection is active, a dash will be displayed for the last four values.

10.6 Display

The values for temperature, air flow rate, speed of rotation, and external control voltage shown in the overview are the values measured or calculated on the device. If another temperature is set as reference value via the bus, for example, the temperature measured on this device will continue to be displayed.

10.7 Collective fault message

On the "Fault" tab, you can request the status of all INDULVENT ec devices connected to the vent bus. When you switch to the tab, the current status of all devices is read. To update again, you must click the "Update" button.



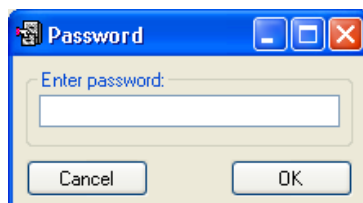
All connected INDULVENT ec devices and their respective statuses are included in the list. In case of a check mark by "Motor," "Temperature sensor", "Condensate pump", or "Collective fault message", the respective location has a fault.

The check mark for collective fault messages appears when the collective fault message has been activated in the settings of the respective device and another device indicates a fault on the bus.

Using the "Read Names" button, the names of all bus subscribers connected to INDULVENT ec devices can be read.

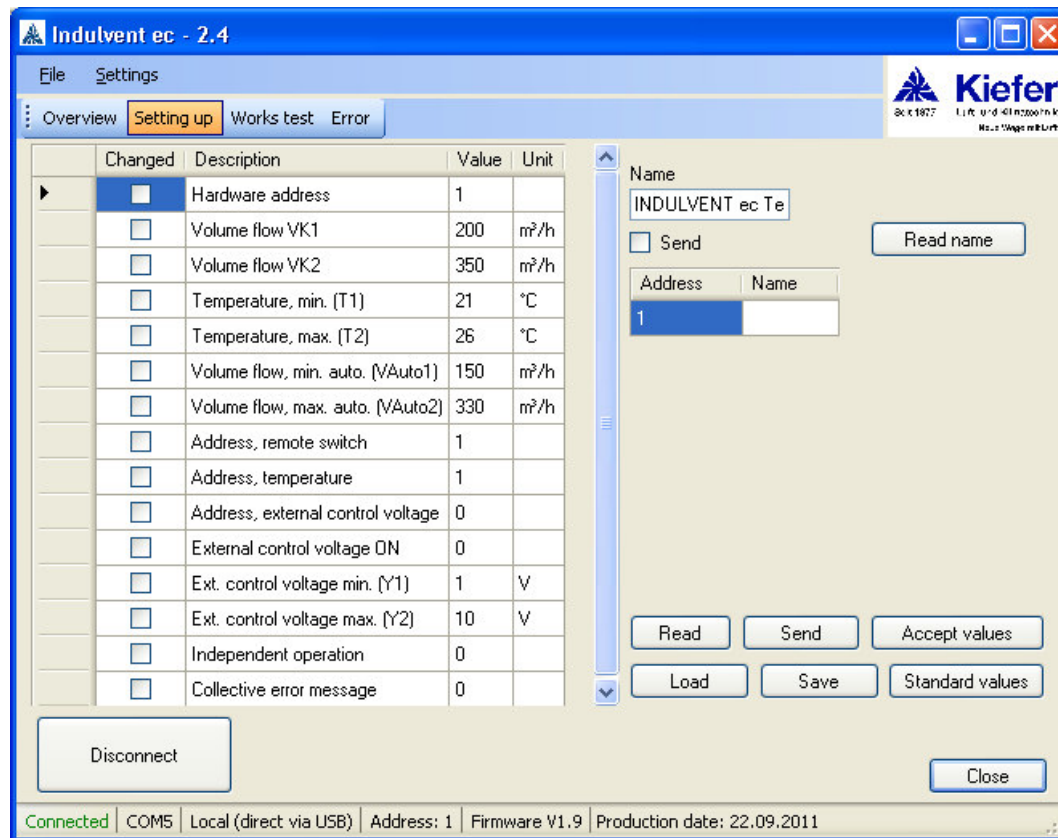
10.8 Factory configuration

Using the "Factory Configuration" item on the "Settings" menu, **the access to the parameter setup and factory test is enabled. For this purpose, the entry of a password is required. The password is: 99993**



After correct entry, the "Setup" and "Factory Test" tabs are enabled.

10.8.1 Setup



The respective parameters can be adapted in the Value column. If a minimum value is not achieved or a maximum value is exceeded in the process, the values are limited to the minimum or maximum value. A plausibility check does not take place. Larger values may be entered for a minimum value than for the maximum value. This could lead to malfunctions in INDULVENT ec, however.

If a value is changed, a check mark appears in the "Changed" column. If a value has been incorrectly entered, all values can be read again using the "Read" button. Clicking the "Send" button transfers all selected values. The name of the control system can be entered in the "Name" field.

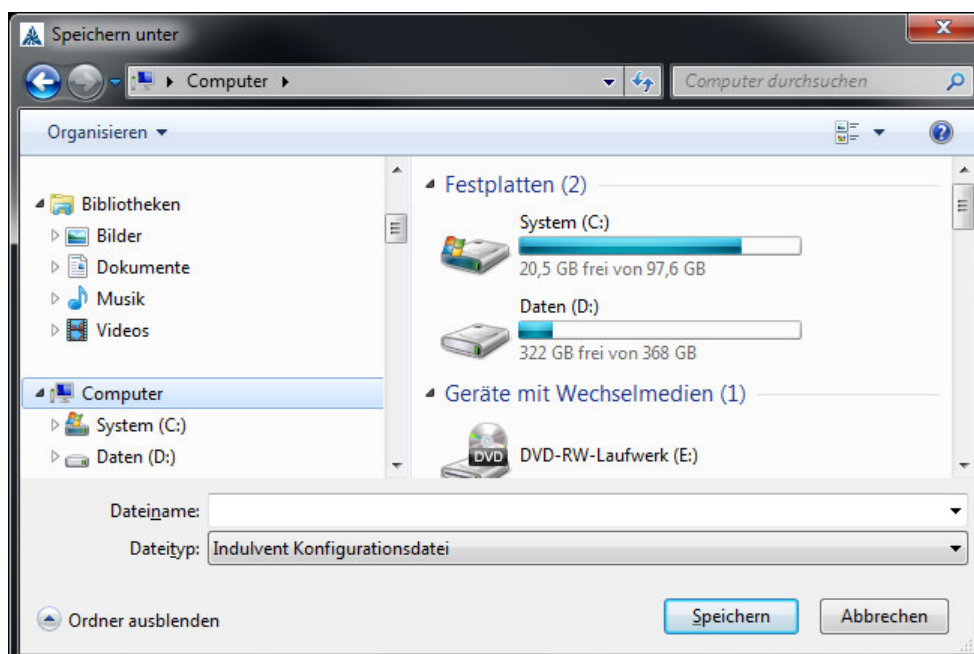
The parameters have the following meanings:

Parameter	Description
Hardware address	Address of INDULVENT ec (in bus operation, no addresses may be assigned doubly)
Air flow rate VK1	Air flow rate for operation VK1
Air flow rate VK2	Air flow rate for operation VK2
Min. temperature (T1)	Minimum temperature for "Auto" mode (the motor switches off below this temperature)
Max. temperature (T2)	Maximum temperature for "Auto" mode (the fan runs at the maximum air flow rate above this temperature)
Min. air flow rate (VAuto1)	Minimum air flow rate for "Auto" mode
Max. air flow rate (VAuto2)	Maximum air flow rate for "Auto" mode

Parameter	Description
Address of remote switch	The remote switch is evaluated from this address. A value of 0 means an own remote switch.
Address of temperature	The temperature is evaluated from this address. A value of 0 means an own temperature.
Address of external control voltage	The control voltage is evaluated from this address. A value of 0 means an own control voltage.
External control voltage on	0 = no control voltage → temperature control 1 = regulation to external control voltage
Min. ext. control voltage (Y1)	Minimum values of the control voltage. The fan switches off below this value. When this value is reached, the fan runs at a speed of rotation that corresponds to 100 m³/h.
Max. ext. control voltage (Y2)	Maximum values of the control voltage. Above this value, the fan runs at a speed of rotation that corresponds to 470 m³/h.
Independent operation	0 = Remote switch data, temperature, and control voltage from the set addresses are used. 1 = Only the own data is used.
Collective fault message	1 = If an error occurs at any address during bus operation, it will also be indicated to this INDULVENT ec. The alarm relay is switched accordingly.

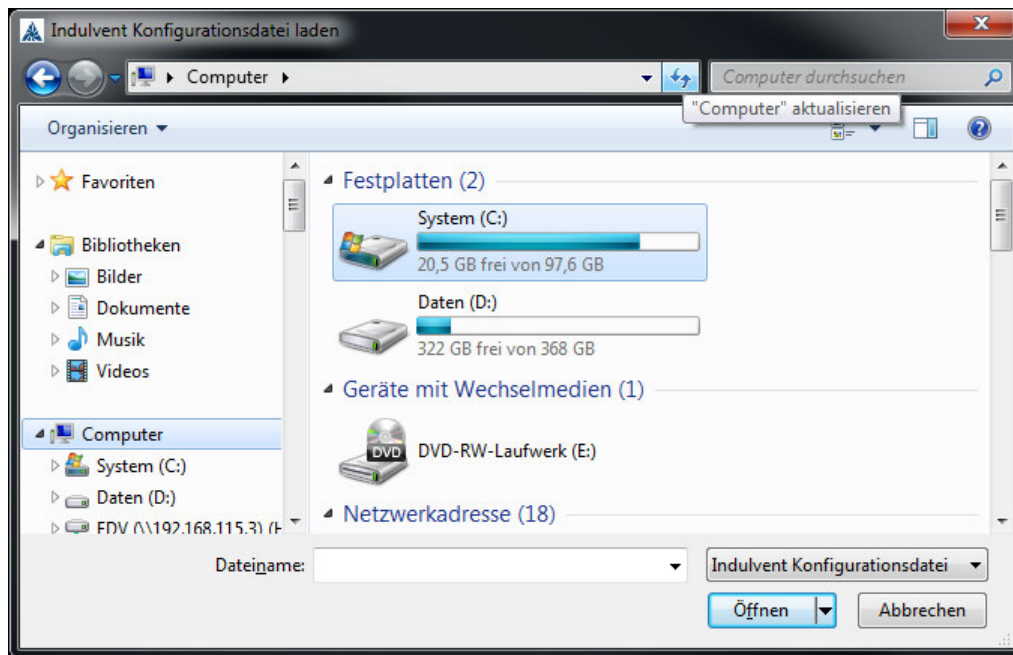
10.8.2 Loading/saving parameters

Using the "Load" and "Save" buttons, the current values can be saved or loaded. The following window appears during saving:



Here, the folder and file name can be selected.

The following window appears during loading:

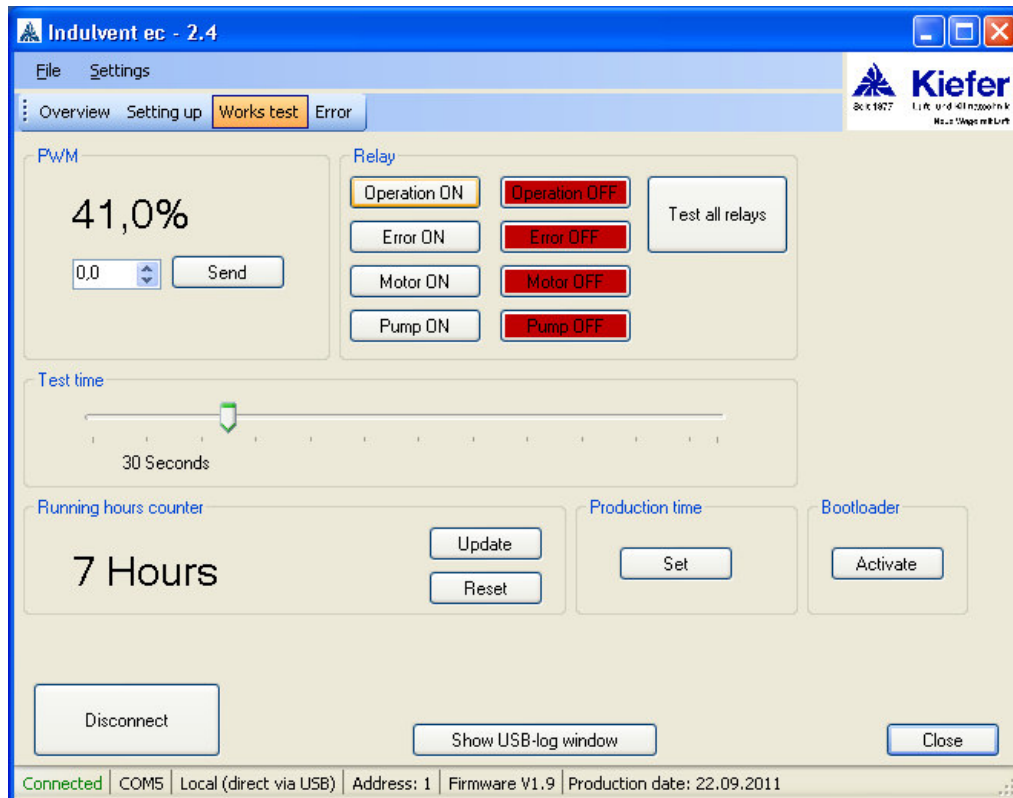


Here, the file to be loaded must be selected.

After the settings file is loaded, it must be loaded in the control system by clicking the "Send" button.

10.8.3 Factory test

Using the "Factory Test Pulse Width Modulation" screen, you can test all relays, set the fan to a speed of rotation, read or reset the operating hours, and call the boot loader.



In the "Pulse Width Modulation (PWM)" area, the current PWM with which the fan is actuated is displayed. The PWM can be changed by entering the corresponding value and clicking "Send". The PWM value can be set between 0 and 100%.

0% = fan not running; 100% = fan running at maximum speed of rotation.

In the "Relays" area, the four relays for operation, fault, fan, and condensate pump can be tested. (This area is available only if you are directly connected to INDULVENT ec. This option is not available in case of connections through the vent bus.) The "Test All Relays" button switches each relay on and off, one after the other. The status of the individual relays is marked in colour on the buttons. If the relay is switched on, the "On" button appears in green, and if the relay is switched off, the "Off" button appears in red.

In the "Testing Time" area, the time in which the PWM or relays remains in the selected setting can be set until they return to the status of the operating mode set on INDULVENT ec.

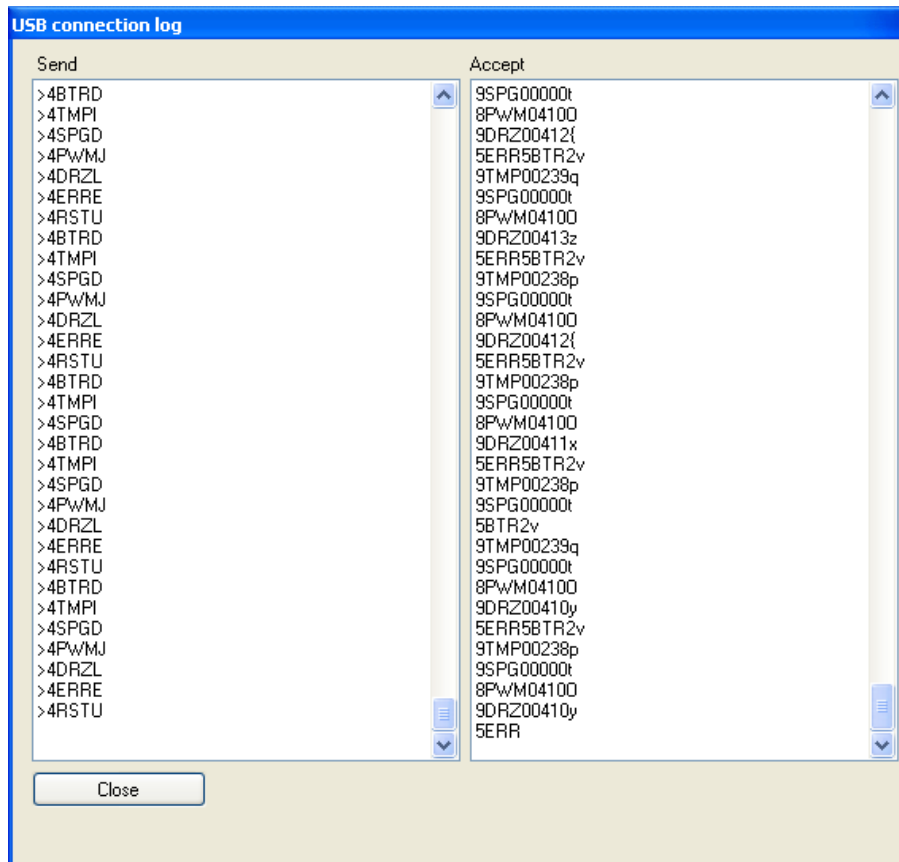
In the "Operating Hour Meter" area, the overall duration of running of the fan is displayed. If the control system is switched on or in the "Off" mode or if the "Auto" mode is active, but the fan is at a standstill, since cooling is currently not required, no operating hours are counted. The "Update" button reads the operating hours and the "Reset" button resets them.

The "Production Time" area is intended only for the initial startup of the manufacturer and protected with an additional password.

Using the "Activate" button in the "Boot Loader" area, a firmware update can be performed. See below for details.

Using the "Display USB Log Window" button, an additional window can be shown in which all communication between the PC and the control system is logged.

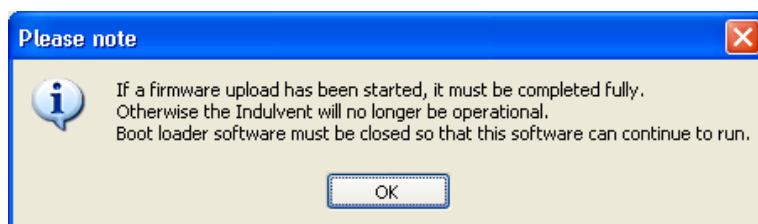
This has the following appearance:



10.9 Firmware update¹

To perform a firmware update, click the "Activate" button in the "Boot Loader" area of the "Factory Test" screen.

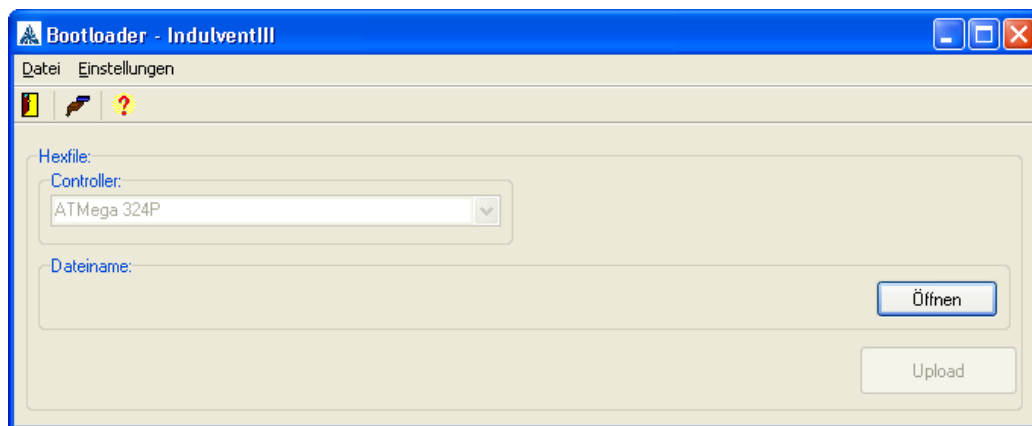
After that, the following note appears:



Clicking the "OK" button does not start an upload; the upload is started in the program that opens. The control system is thus still running after "OK" is clicked.

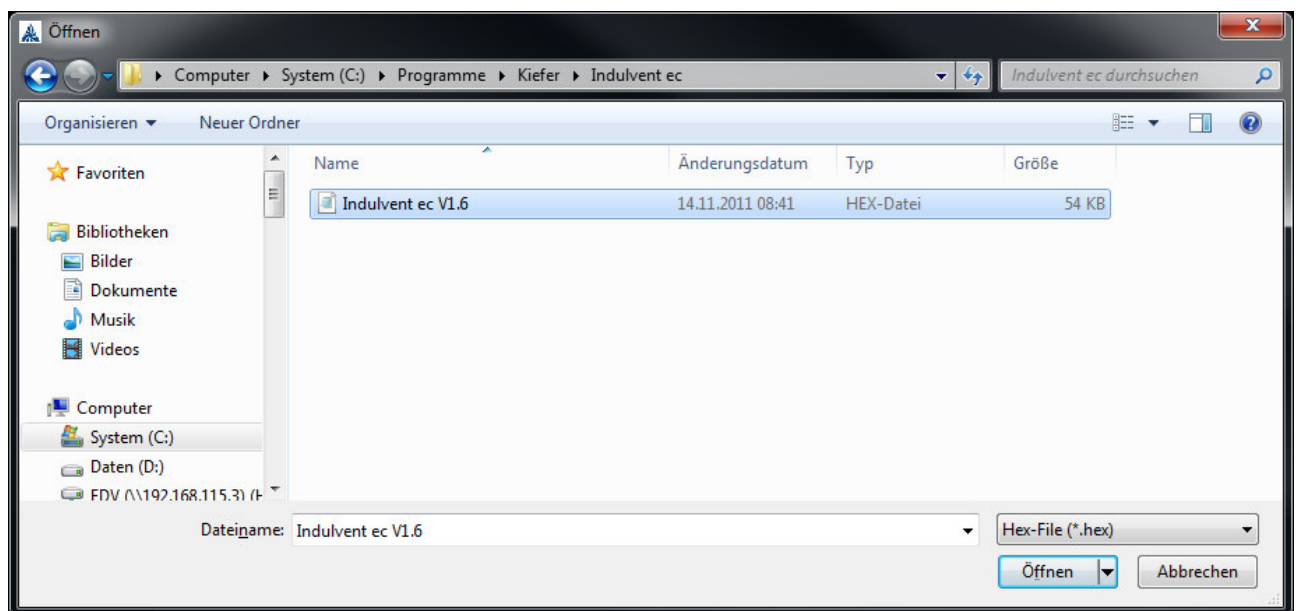
After the notice is confirmed, the software to perform the firmware upload is executed.

¹ Firmware is software embedded in electronic devices.



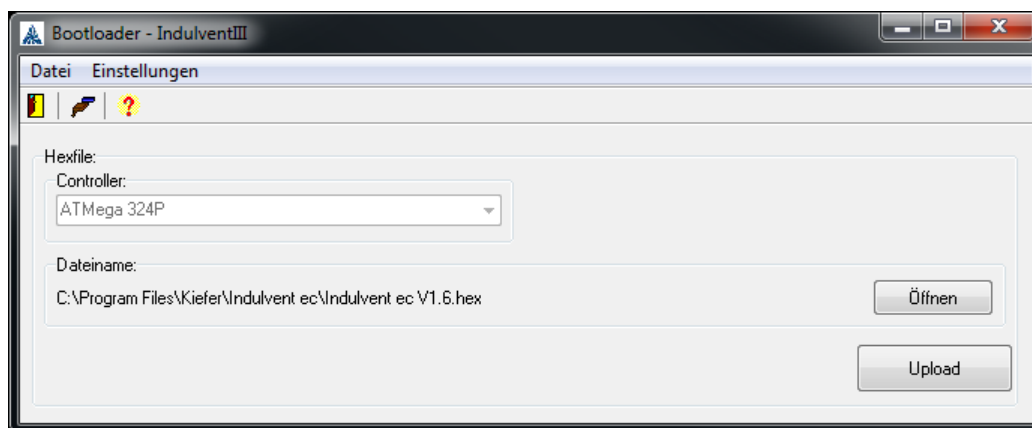
Here, no port settings must be made since they are made in the INDULVENT configuration software.

Clicking the "Open" button opens a window in which the firmware can be selected.



The "Open" button selects the firmware.

After that, the selected file is shown in the program and the "Upload" button is enabled.



The firmware upload is started by clicking the "Upload" button.

IMPORTANT:

The update procedure may not be interrupted. Do not pull the USB cable, switch off the PC, or disconnect INDULVENT ec from the power supply.

If the procedure could not be correctly performed, communication with the control system is no longer possible. Only a manual firmware upload can be performed.

For this purpose, select the "INDULVENTBootloader" item on the "INDULVENT" → "Firmware Upload" menu via the Windows Start menu. For this purpose, the correct port must be selected under the "ComPort" item on the "Settings" menu; after that, the file with the firmware can be selected using the "Open" button and the upload procedure can be started using the "Upload" button.

When the program is ended, a connection can be re-established with the INDULVENT PC software.

11 Vent bus recommissioning

At the factory, all control systems have been programmed with the hardware address 255. INDULVENT ec does not communicate via the vent bus using this address.

If bus operation has been recommissioned, the bus can already be completely wired. The addresses must then be changed using the PC software and "Setup" mode. For this reason, the PC and control system must always be **directly** connected. Address 255 cannot be reprogrammed through the vent bus.

**The INDULVENT ec software has been created in accordance with our best knowledge and endeavours.
Kiefer GmbH is not liable for any damage to hardware or software.**