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15.09.2021
DOC001181-EN-5
49 pages

LID-3300IP Type 2 Ice Detector

Ice Detector for Wind Turbines and Meteorological Stations

Installation and Operating Instructions

TABLE OF CONTENTS

Symbols in this document


Caution, risk of danger


Caution, hot surface

ABOUT THIS MANUAL

This manual includes instructions for the installation, commissioning and operating of Type 2 of the LID-3300IP Ice Detector system.

Labkotec products are designed to be safe when operated in the manner described in this manual. The safety of this product cannot be guaranteed if the product is used in any other way than is specified in this manual.

SUMMARY OF CHANGES AND NEW FUNCTIONALITY

The following table describes the latest changes and major new functionality in LID-3300IP Type 2 Ice Detector and this user manual.

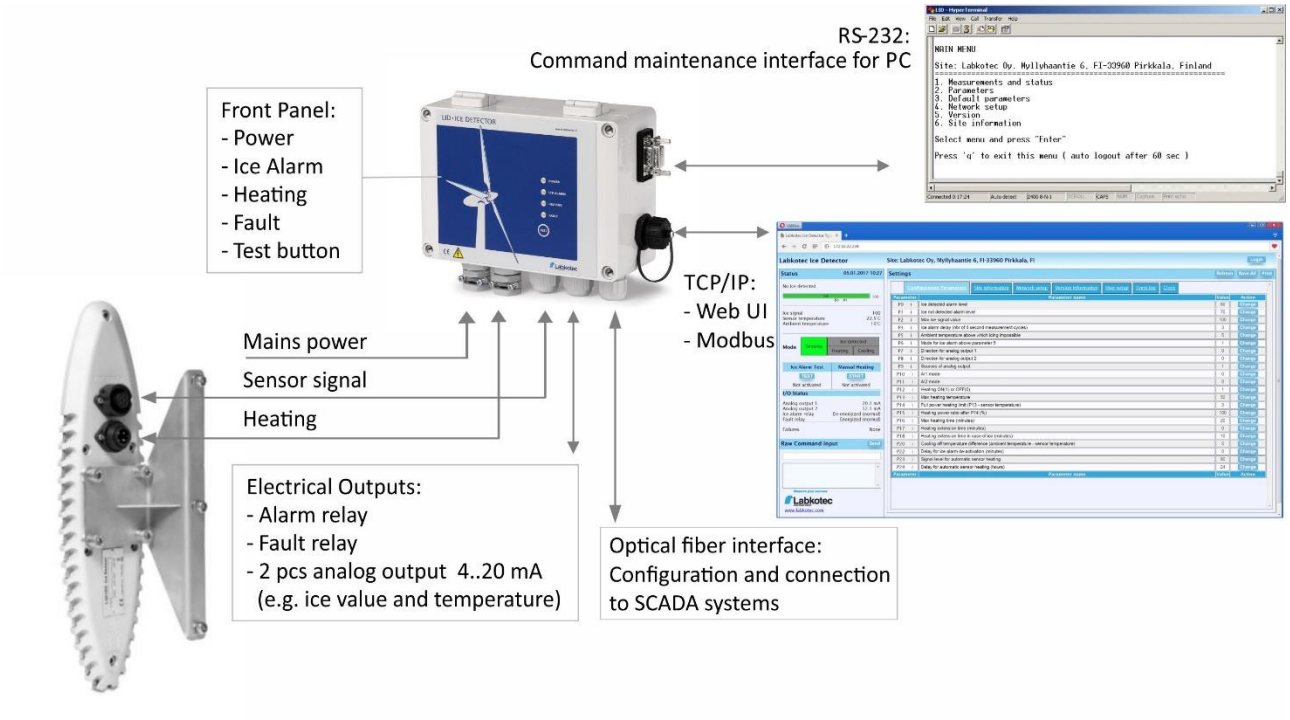
Changes in this user manual	More information in chapters
Updated changes in web access. From the software version 2.20 onwards it is possible to use https communication instead of http. However, default factory setting for the web communication is http. From the software version 2.20 onwards completely new usernames and passwords are needed. CAUTION, old usernames and passwords are disappearing and no longer in use. If the web interface is closed without first logging out, there will be an automatic logout after couple of minutes.	Chapter 6 Internet web access, Chapter 6.4 Web-ui settings, Chapter 6.5 Logging out, (new chapter)
New terminal commands (command numbers 12, 14, 37-43).	Appendix C Terminal commands
Updated event log messages.	Appendix E Event log messages

1 PRODUCT OVERVIEW

LID-3300IP Type 2 is an ice detector for wind turbines and meteorological stations. LID-3300IP Type 2 ice detector system consists of LID-3300IP Type 2 control unit (later referred to also as LID) and LID/ISD Type 2 ice sensor (later referred to also as ice sensor).

LID-3300IP Ice Detector system, Type 2, is the latest version of the product, which fullfills the requirements of PLd according to ISO 13849-1. The safety function is validated through relay outputs.

LID monitors the icing weather conditions on-line and reports icing events through various interfaces. Ice alarm and other measurement information are available via 2 relay outputs, 2 analog outputs, front panel or optical fiber interface and TCP/IP Web user interface or Modbus.



Ice detection of the ice sensor is based on an ultrasonic principle. Ultrasonic signal attenuates when ice is accumulated on the sensor wire.

By default, LID starts to heat itself after an ice detection to get rid of the accumulated ice.

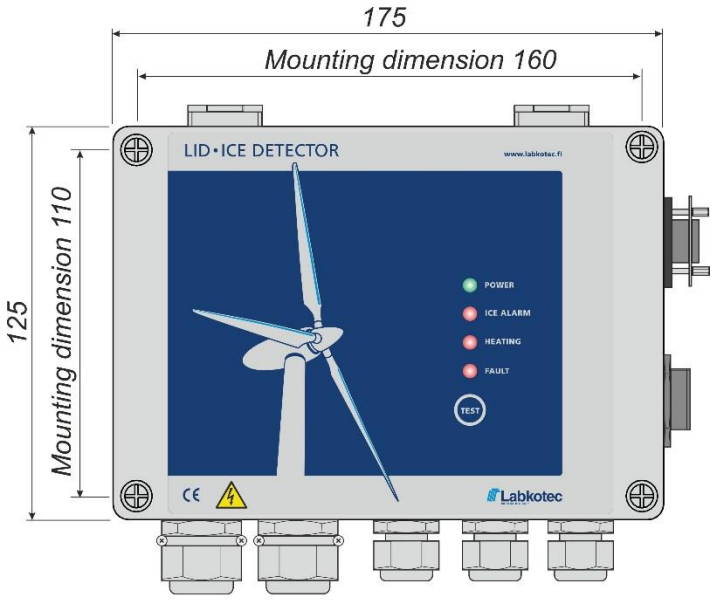
Alarm levels and ice sensor heating, among other functions, can be controlled by user-configurable parameters. Certain factory parameters have been defined by the manufacturer, which allow start-up and operation without any additional configuration.

2 INSTALLATION

Mounting, installation, commissioning, operation, maintenance and disassembly of the system may only be carried out by trained, qualified personnel. The instruction manual must be read and understood.

2.1 Installation and interfaces of LID-3300IP Type 2 Control Unit

The enclosure of LID is wall-mounted. Mounting holes are located in the base plate of the enclosure, beneath the mounting holes of the front cover.



Enclosure depth 75 mm, mounting holes ø4.5 mm

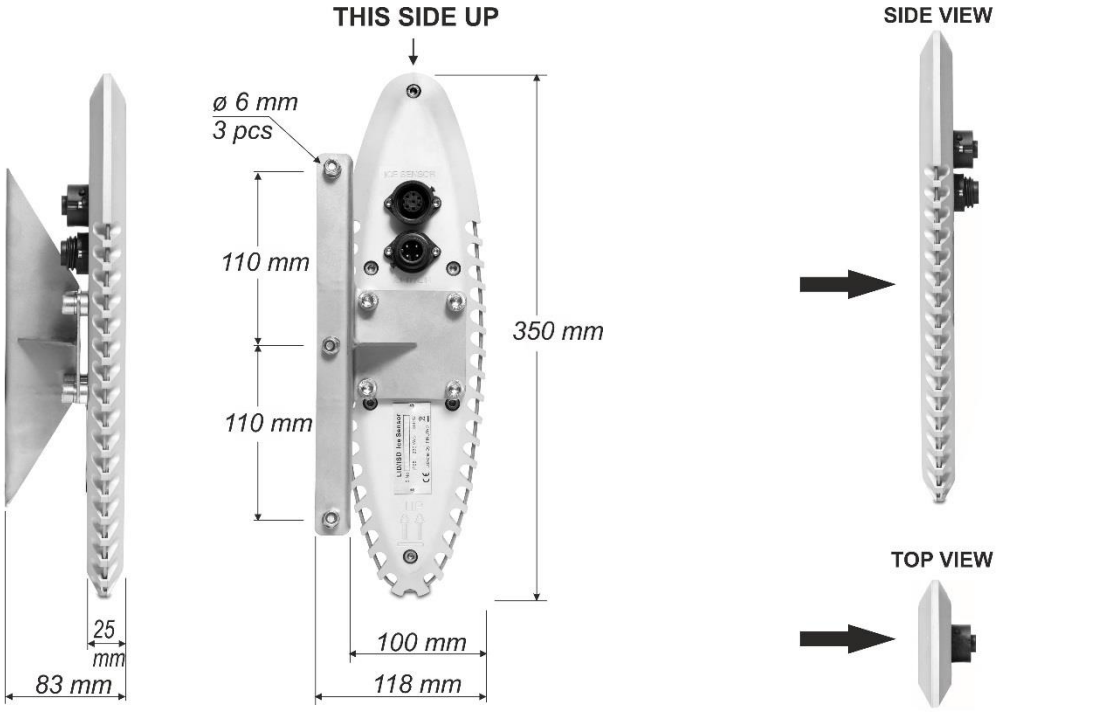
2.2 Installation of LID/ISD Type 2 ice sensor

The ice sensor is designed for mounting on a weather mast. The preferred place for installation in a wind turbine is on top of the nacelle. The correct installation orientation is marked with upwards-pointing arrows.

The ice sensor should be mounted against the wind so that there is free airflow in front of the ice sensor. See the below figure for the preferred installation direction. Free air distance must be minimum 500 mm.

Avoid installations where there is a possibility that the ice which accumulates to surrounding structures might reach the ice sensor.

A standard delivery includes a mounting kit for installing the ice sensor on the weather mast. See the figure below. Other mounting options are also available on request.



Flammable materials or materials that may melt are not allowed to locate close to the ice sensor.

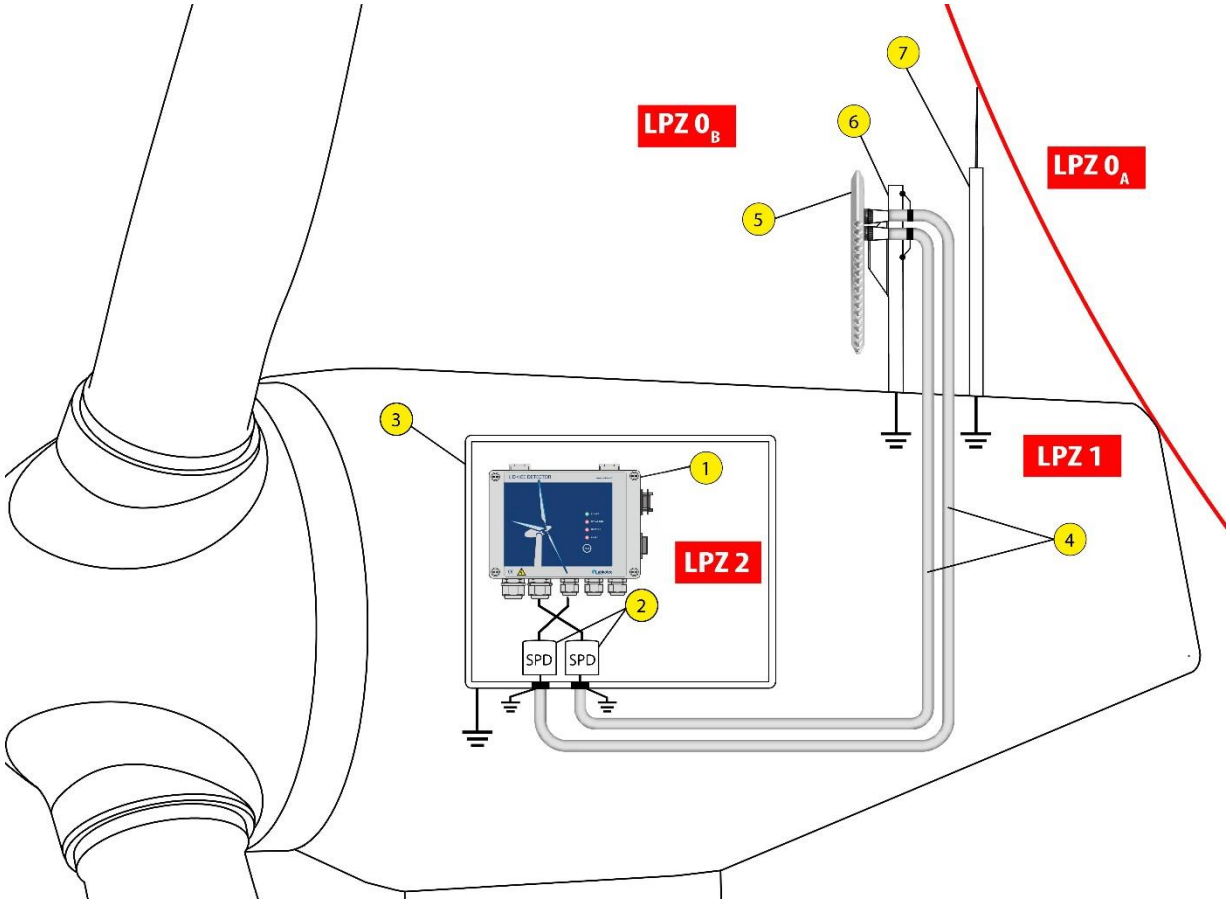
The ice sensor body includes a 350W heating resistor. A temperature sensor T1 (ice sensor temperature) is located in the centre part of the ice sensor and temperature sensor T2 (ambient temperature) inside the connector of the ice sensor cable. A safety thermostat is also mounted inside the body of the ice sensor to break the heating circuit if the ice sensor temperature rises above +65 °C.

NOTE! Ice sensor shall be placed in a way that it is not influenced by the warm air from the exhaust of the turbine cooling system.

NOTE! Ice sensor shall be placed in a way that it is within LPZ0B (see next chapter “Lightning protection”)

2.3 Lightning protection

Lightning protection for LID-3300IP control unit and LID/ISD ice sensor shall be done according to standard IEC 61400-24 “Wind turbines – Part 4: Lightning protection” when installed into a wind turbine.



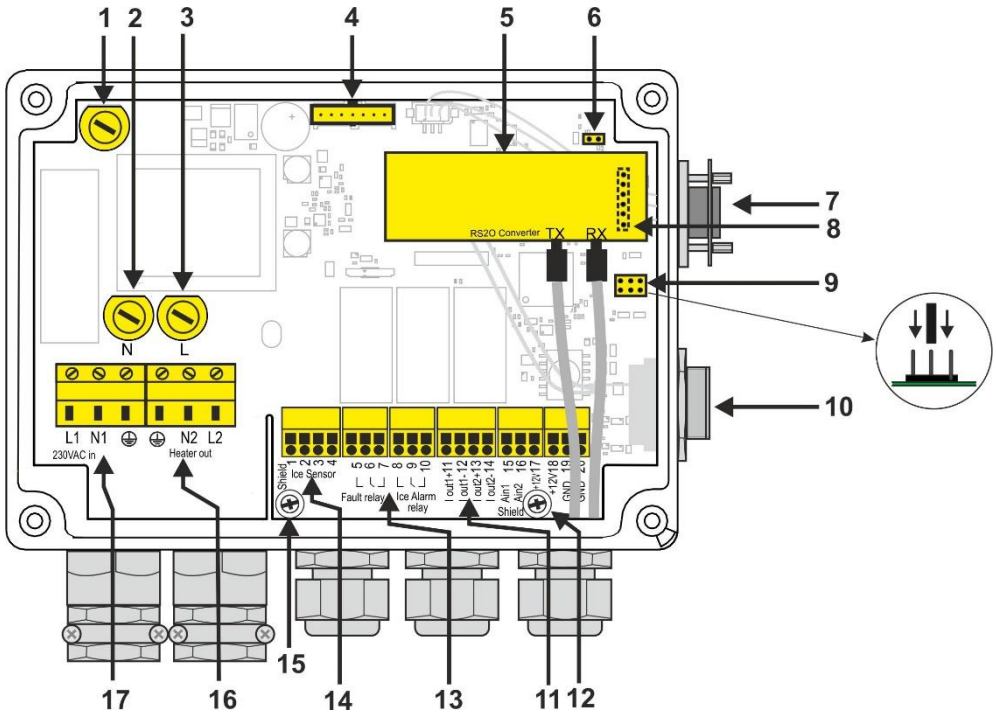
General principles for protecting ice detector system against overvoltage in case of lightning strike is presented in the above picture.

Components in the picture are:

1. LID-3300IP Type 2 control unit
2. Surge protection device
3. Automation cabinet
4. Metal tubes
5. LID/ISD Type 2 ice sensor
6. Holder for ice sensor
7. Air termination rod

3 ELECTRICAL CONNECTIONS

Interfaces and other important components of LID are described in the below list and picture.



1. Main fuse
2. Fuse for sensor heating
3. Fuse for sensor heating
4. Connector for front panel flat cable
5. Optical fiber converter module (RS2O). Tx connector (left), Rx connector (right)
6. Not in use
7. RS-232 D -connector (maintenance)
8. Connector for RS2O module and firmware download (alternative)
9. Jumper for manual firmware download
10. Ethernet RJ-45 connector for Internet Web access and Modbus TCP/IP
11. Analog outputs (source)
    Active current output 1
    11 = Iout1+
    12 = Iout1-
    Active current output 2
    13 = Iout2+
    14 = Iout2-
12. Analog signal cable shield connector
13. Relay outputs
    Fault relay (normally energized = no fault)
    5 = normally closed (NC)
    6 = common contact (CC)
    7 = normally open (NO)
    Ice Alarm relay (normally de-energized = no ice alarm)
    8 = normally open (NO)
    9 = common contact (CC)
    10 = normally closed (NC)
14. Ice sensor signal
15. Ice sensor cable shield connector
16. Sensor heating
17. Power

3.1 Power supply

The device does not have a mains switch. During maintenance and service operations it has to be possible to switch off the main supply.

Only an authorized electrician is allowed to install power supply cable to LID-3300IP control unit.

The installation of power supply can be done by two alternative ways:

- Permanent wiring: using a two pole mains switch (250 Vac, minimum 5 A), which isolates both lines (L1, N). Switch must be installed in the main power supply lines in the vicinity of control unit. Switch must be in accordance with IEC 60947-1. Copper wires 1.5 - 2.5 mm^2 (AWG 16 - 13) can be connected to the power supply terminal of the control unit.
- Plug connection: using supply cable with plug that can be disconnected from socket outlet when necessary. Remember to tighten the strain relief of the cable gland.

Control unit must always be connected to protective earth (PE).

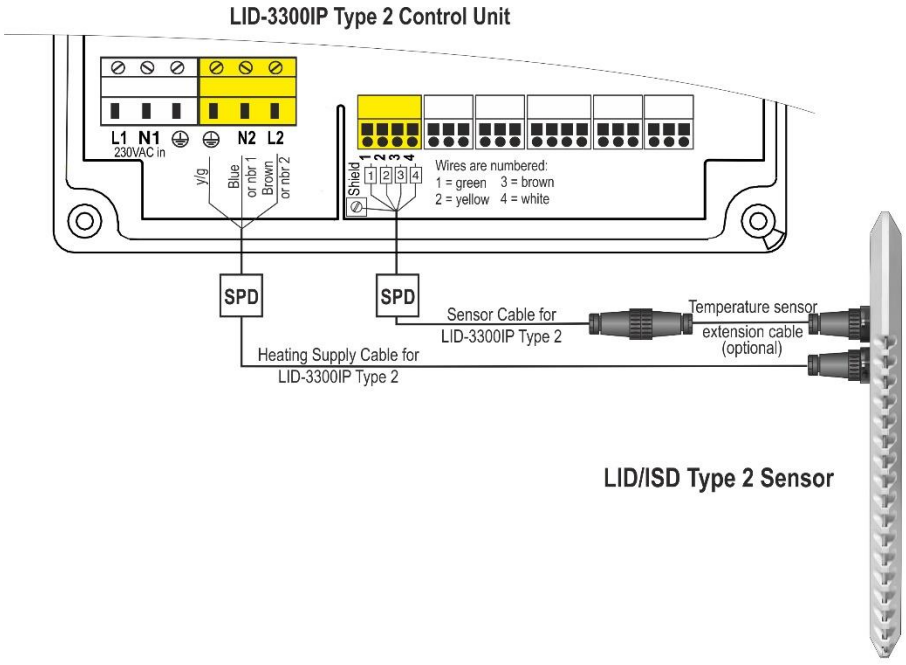
3.2 Connections between ice sensor and control unit

The cables connecting the ice sensor and LID are included in the delivery. The standard length of the cables is 10 m.

For cables longer than this, there are special requirements for installation. See section “Additional power supply requirements for long sensor cables”.

Only an authorized electrician is allowed to install heating cable between ice sensor and LID.

The connections between LID-3300IP Type 2 control unit and LID/ISD Type 2 ice sensor are shown in the following figure. Optional temperature sensor extension cable improves ambient temperature accuracy. Included Heat shrink tube is recommended to be added around the extension cable connectors for extra protection against possible water leakage.

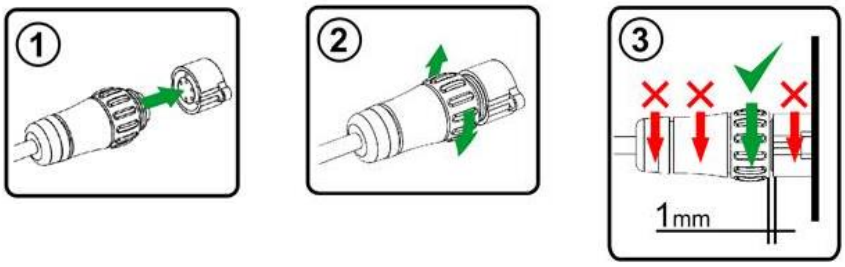


NOTE! Additional measures regarding lightning protection might be needed according to IEC 61400-24. See also chapter 2.3 Lightning protection.

NOTE! Make sure that high voltage cabling and equipment will not interfere ice detector system or cabling of ice detector.

NOTE! Do not coil cables because inductive coupling can cause harmful interferences.

Instructions for proper use of ice sensor cable connectors are shown in picture below. A narrow gap around 1 mm will remain, when the connector is perfectly connected. This applies for both cables, signal cable and heating supply cable.



More information is available in document D80359_E “Instructions for proper use of LID/ISD ice sensor cable connectors”.

3.2.1 Additional power supply requirements for long sensor cables

Normally, the contact protection of the sensor (protection against electric shock) is based on basic insulation and protective earthing. If the device is ordered with standard sensor cables longer than 10 m, the resistance of the protective earth of the sensor will become too high to meet the electrical safety requirements.

For cables over 10 m, but under 50 m, the contact protection is based not only on the basic insulation but also on the automatic disconnection of the supply. The disconnection takes place with the internal fuses of the LID-3300IP and its short-circuit current must be measured to ensure that it operates quickly enough. The value must be at least 200 A.

Current is measured from the LID-3300IP voltage supply terminal between L1 and N1.

In order not to exceed the breaking capacity of the fuses, the short-circuit current of the supply must also not exceed 1500 A.

For more information about the use of cables longer than 50 m, contact Labkotec Oy’s service.

3.3 Relay outputs

LID-3300IP has two relays with potential free relay outputs. Both relays have NC (normally closed), CC (common contact) and NO (normally open) connections available at the connectors.

Ice alarm relay is de-energized during normal operation. Ice alarm relay is energized when ice is detected.

Fault relay is energized during normal operation. Fault relay is de-energized when fault is detected.

The safety function of the ice detector is validated through relay outputs.

See the table below:

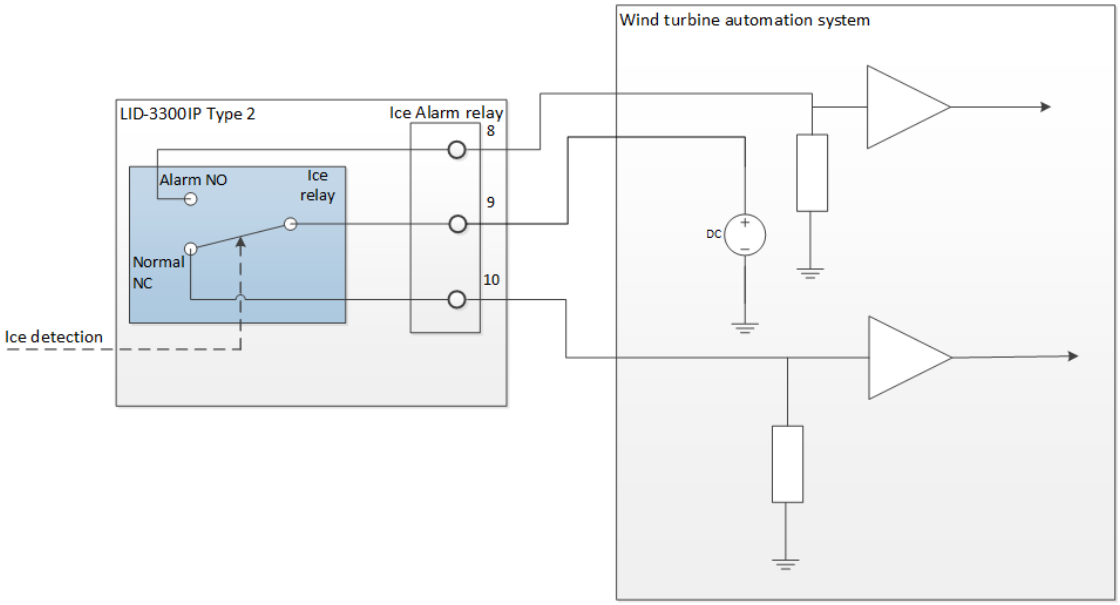
Signal	Ice alarm relay	State
Ice detected	8 (NO) – 9 (CC) = connected 9 (CC) – 10 (NC) = open	energized
Ice not detected	8 (NO) – 9 (CC) = open 9 (CC) – 10 (NC) = connected	de-energized
Signal	**Fault relay**	
Fault detected	5 (NC) – 6 (CC) = open 6 (CC) – 7 (NO) = connected	de-energized
No faults	5 (NC) – 6 (CC) = connected 6 (CC) – 7 (NO) =open	energized

The following chapters present the two alternative ways to utilize the relay outputs.

3.3.1 Three-wire relay connection

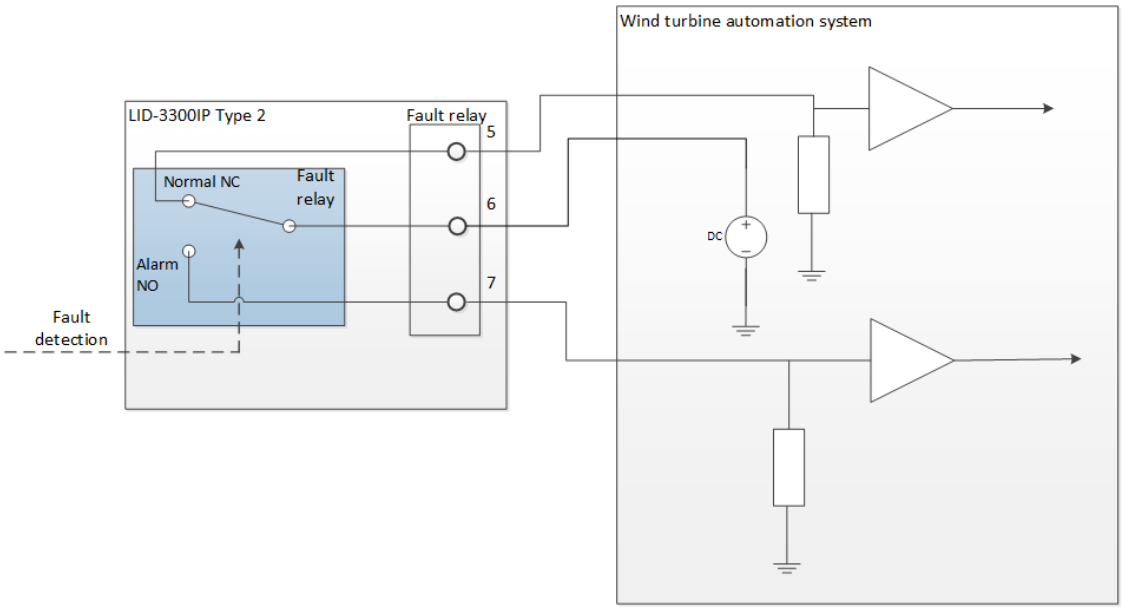
If there is adequate amount of I/O in the automation, it is recommended to use the three-wire connection for LID-3300IP Type 2 installation, as shown in the figure below.

With this connection, the automation can detect if the cabling is properly connected. In case there is an alarm state, the Ice alarm relay connector pin 10 is Low and pin 8 is High. With no alarm, pin 10 is High and pin 8 is Low (the situation in the figure below). If pins 8 and 10 are Low or High simultaneously, the cable is faulty.



The same connection principle goes also for the Fault relay. However, the pins are reversed. This is shown in figure below.

With this connection, the automation can detect if the cabling is properly connected. In case there is a fault state, for the fault relay connector pin 5 is Low and pin 7 is High. With no fault, pin 5 is High and pin 7 is Low (the situation in the figure below). If pins 5 and 7 are Low or High simultaneously, the cable is faulty.

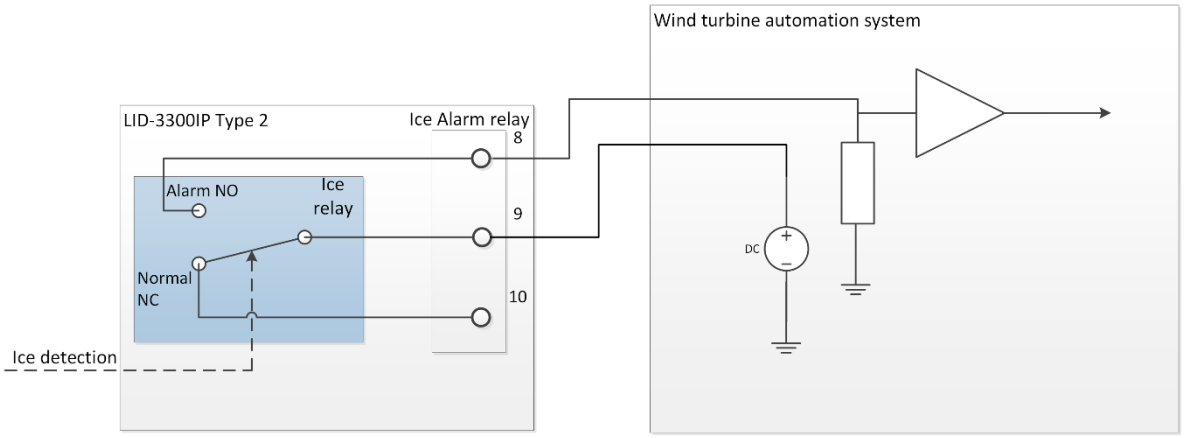


3.3.2 Two-wire relay connection

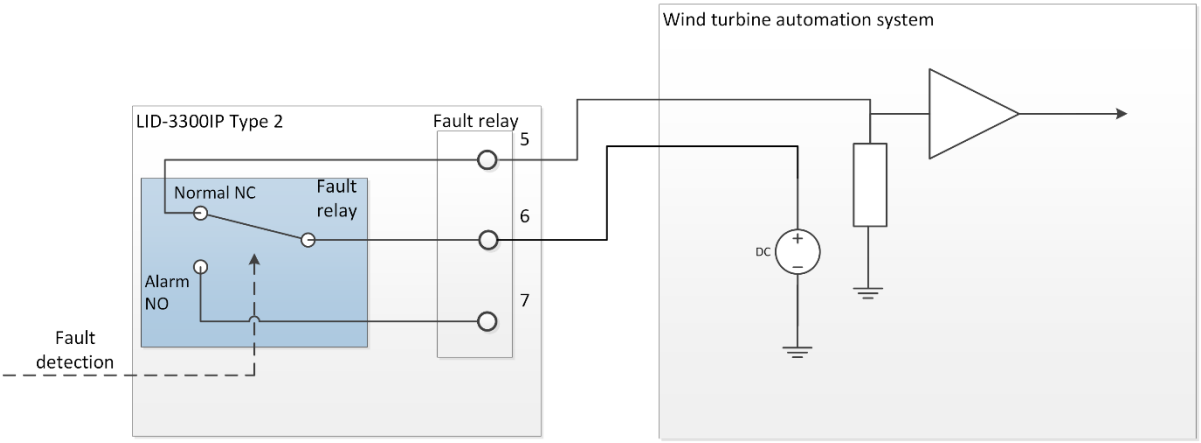
Two-wire connection is recommended only for old installations where LID-3300IP Type 2 is used to replace a LID-3300IP. The connection can be made:

a) See the figure below. Pin 9 (ice alarm relay) is used for the relay common contact, and pin 8 is connected to the automation system. The figure represents normal operating status, where no ice has been detected. When ice is detected relay state changes to NO.

b) In case the automation can be reprogrammed, it is recommended to use pin 9 (CC) for the common contact and pin 10 (NC) is connected to the automation system. Thus, ice detection is activated if the control unit or cable is faulty.



In two-wire mode, fault relay should always be connected from pins 5 and 6. Pin 5 is the input to automation, and pin 6 is the output from automation. When connected this way, fault signal is activated e.g. when cable is removed. See the figure below. The figure represents normal operating status, where there are no faults active. If a fault occurs, relay state changes to NC.



3.4 Analog outputs

Ice level can be read from the analog output, but this configuration is not validated as Safety function. See connections from chapter 3 or *Appendix D*.

3.5 Serial interfaces: RS-232 maintenance and optical fiber interface

LID is equipped by default with an RS-232 serial communication interface for configuration and maintenance connection.

Also, an optical fiber serial interface is available as an option for configuration and connection to SCADA systems. This requires an additional RS2O Converter module to be installed inside LID (item 5 in the picture in chapter 3).

Connection of RS-232:

1. Connect cable:
    - RS-232 cable to RS-232 D-connector (item 7 in the picture in chapter 3)
2. Connect RS-232 cable to system.

Connection of optical fiber interface:

1. Switch off the power from LID
2. Open the cover of LID
3. Connect cable:
    - Optical fibers to RS2O Converter module through the right-side cable gland on LID
4. Close the cover of LID
5. Connect optical fibre to system
6. Switch on the mains power.

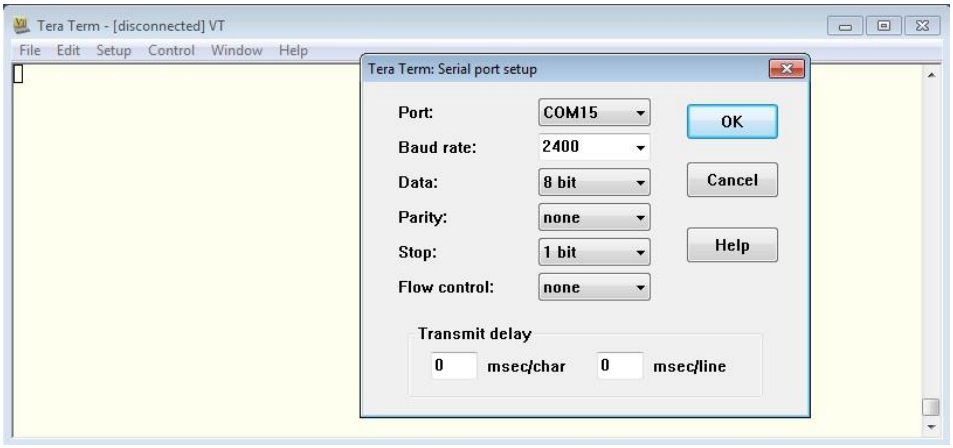
3.5.1 RS-232 Terminal Settings

Ice signal value, eventual alarms and fault diagnostics can be obtained by using a PC equipped with an ordinary terminal program e.g. Tera Term. It's also possible to change operational parameters with the terminal program. The following procedure describes serial port setting using freeware 'Tera Term' - terminal program.

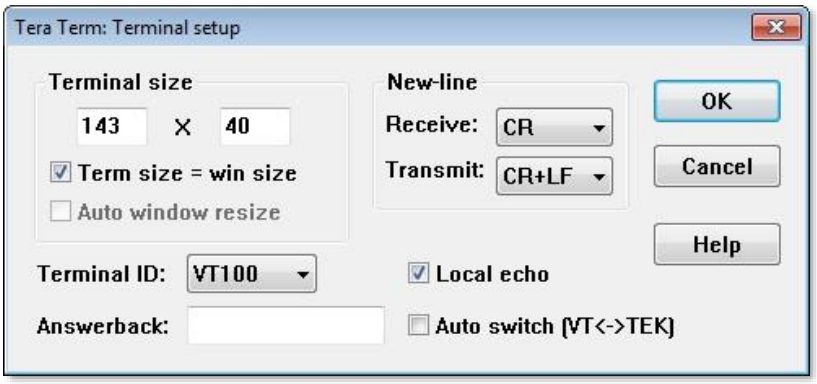
1. Connect the RS-232 port of your PC to the RS-output D-connector on the LID-3300IP control unit. Use USB-to-RS converter if your PC is not equipped with an RS-232 port.

2. Start the terminal program and select **Setup > Serial Port**. Select the RS-232 (COM) port of your PC where the serial cable is connected.

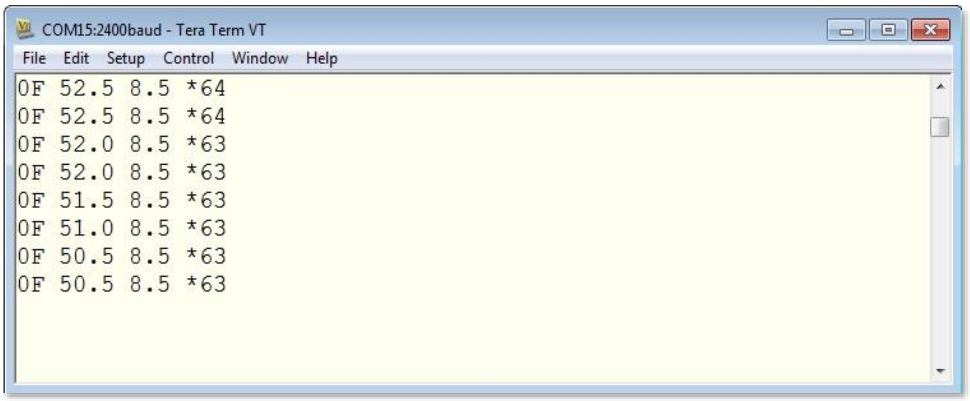
3. Make port settings as below and press **OK**.



4. Select **Setup > Terminal** and set **Local echo** and **New-line** settings as described below. Press **OK**.



LID should start communicating with your PC as seen below.



Finally change the terminal font from menu: **Setup > Font**.

Choose e.g Courier New, regular, Size 9, to view as much text as possible in one window at a time.

Now all the settings are ready for communication.

5. You can save the session for further use. Select **Setup > Save setup… TERATERM.**

3.5.2 Serial Output - Streaming Mode Format

Right after the connection to RS-232 serial output has been established, Ice Detector starts to send a data format through the connection. New values are reported once every 4 seconds.

Example (variable length format with two temperature sensors):

08 -5.0 -5.5 *100
08 -5.5 -5.5 *100
08 -6.0 -6.0 *100
…

There are three different output formats:

- Variable length format (`RSFORMAT 0`)
- Constant length format (`RSFORMAT 1`)
- LID-3210 format (`RSFORMAT 2`)

The output format is read with command `RSFORMAT` and set with command `RSFORMAT <x>`.

More detailed definitions of the output formats are presented in *Appendix A*.

3.5.3 Serial Output – Measurement and Configuration Menu

RS-232 streaming mode can be interrupted at any time by pressing the Enter key. The following menu structure opens with self-explaining instructions.

RS-232 output returns to streaming mode either by pressing ‘q’ or automatically after 60 seconds.

ENTERING COMMANDS

All commands in the menus can be given in capital or small letters.

In addition to the commands listed in the menus, e.g. the following commands are available. They can be entered in any menu view.

- `TEST`

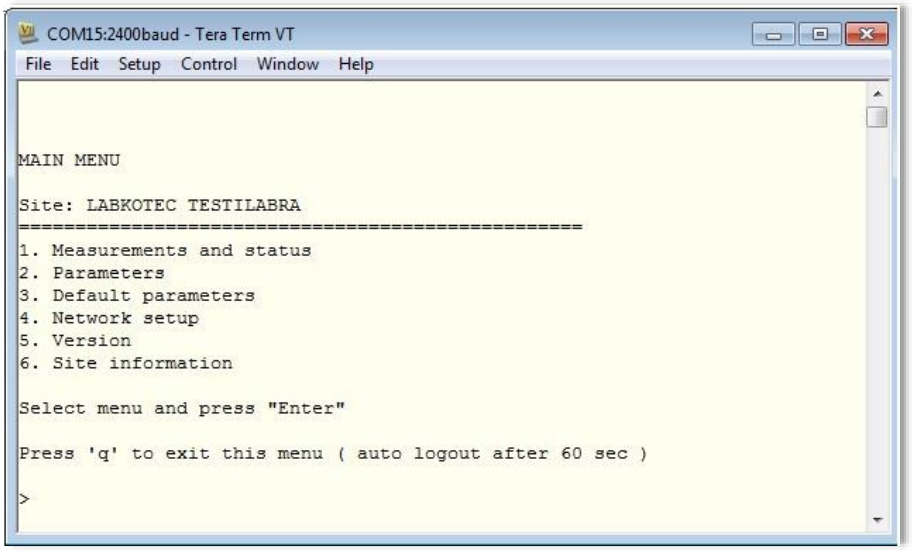
  The test command starts a manual ice alarm test.

- `HEAT`

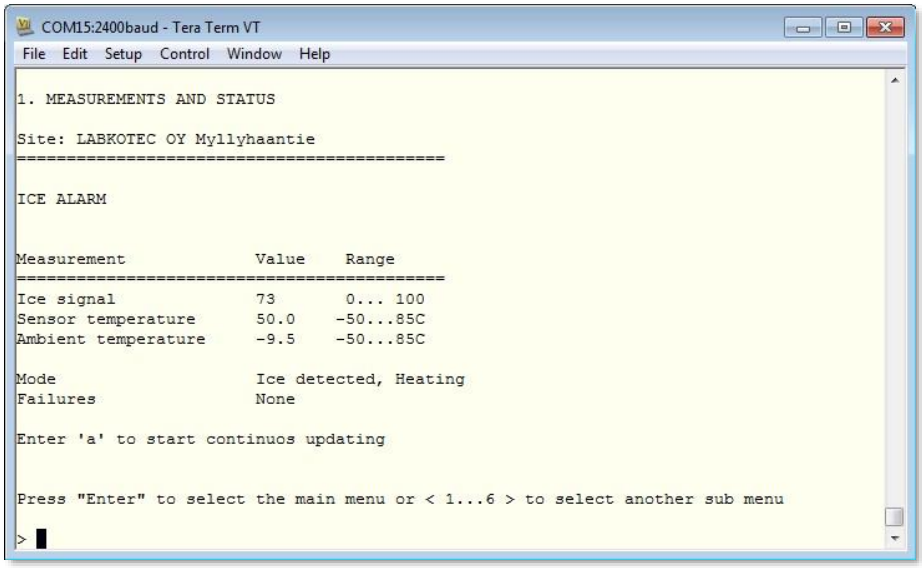
  The heat command starts manual heating.

See *Appendix C* for a complete list of terminal commands.

MAIN MENU



MENU 1. MEASUREMENTS AND STATUS



MENU 2. PARAMETERS

The complete list of parameters is presented in *Appendix B. Parameters*.

To read a parameter, type: `RP<param nbr>`

Example: `RP0`

To change a parameter, type: `SP<param nbr> <value>` and press Enter.

Example: `SP0 50`

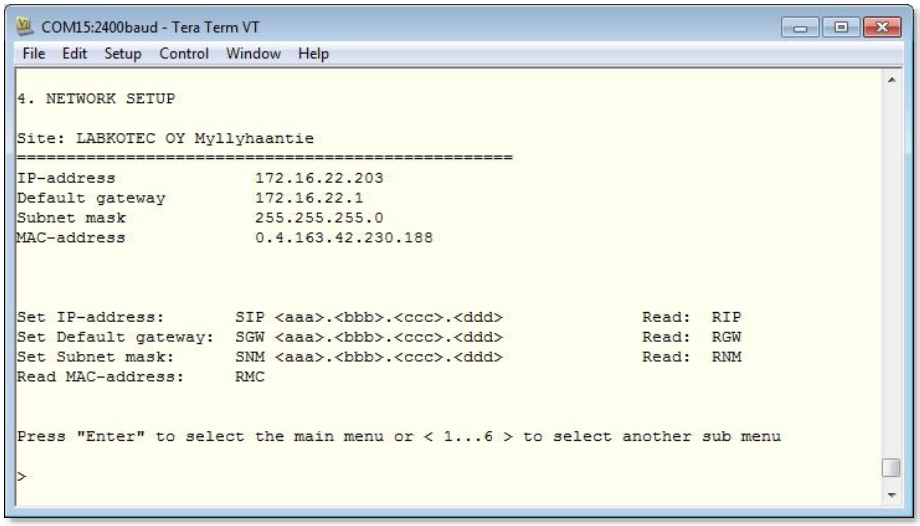
MENU 3. DEFAULT PARAMETERS

The complete list of parameters is presented in *Appendix B. Parameters*.

In case of problems, it might be useful to compare the actual parameter values with the default parameter values.

Default parameter values can be restored with command `SDF`.

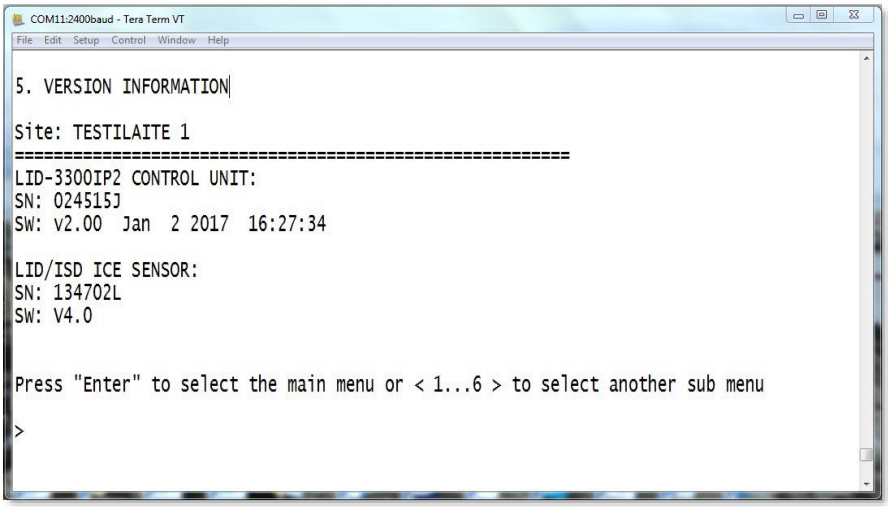
MENU 4. NETWORK SETUP



When LID is connected to Internet or Intranet, the following settings can be done via this menu: IP-address, Default gateway and Subnet mask. LID has a unique MAC address which is also visible through this menu.

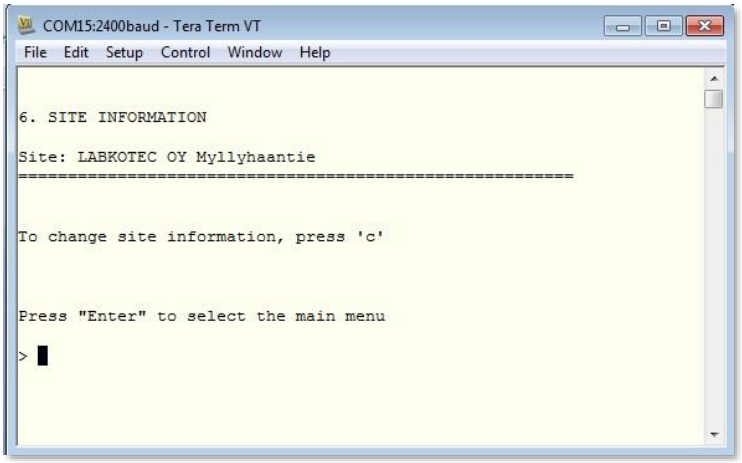
MENU 5. VERSION INFORMATION

Version information of LID-and ice sensor can be seen from this menu.



MENU 6. SITE INFORMATION

Site name can be changed through this menu. Site information is visible in every menu and in the Web user interface.



3.6 Ethernet interface

Ethernet connection is used to monitor and control the device over the web user interface. More information in the chapter 6. LID also has a Modbus server for reading icing related measurements and diagnostic data. More information in document DOC001735 LID-3300IP Type 2 ETHERNET MODBUS TCP/IP SPECIFICATION.

4 COMMISSIONING AND SYSTEM VALIDATION

LID is ready for operation when ice sensor and control unit are connected together, the relay outputs are connected to the automation systems and power is switched on in the control unit.

The following things shall be done right after the installation, in order to validate the installation.

1) Check device parameters either via web or serial user interface and make sure they are according to factory settings. Adjust parameters if needed.
2) Define network settings for internet access via MENU 4 in serial interface.
3) Set site name via web or serial interface.
4) Generate an ice alarm with test button or cooling spray, and validate that the Ice alarm is generated
5) Power device off to validate that the Fault alarm is generated.

5 LID-3300IP TYPE 2 ICE DETECTOR IN OPERATION

This chapter explains the basic operation of LID-3300IP Type 2 ice detection system. Serial and Web user interfaces are explained in different chapters.

5.1 Operating modes

LID-3300IP Type 2 ice detection system operates in different modes which are explained below.

START MODE

When the Ice detection system is started, Fault relays are ON, until the control unit receives reasonable data from the sensor. If the system is working ok and the data is correct, Fault relays will be deactivated after measurement data is correct.

SENSING MODE

LID continuously measures the signal level of the ice sensor. The maximum signal amplitude value can be defined by the user by parameter 2. By default, the signal value varies between 0 and 100.

Ice signal value is visible in serial and web user interfaces, and available as continuous current message in the analog output.

In sensing mode, LID is asking the Ice sensor for measurement data. Ice sensor is replying to this message by sending the measurement data for ice, internal temperature and external temperature.

ICE DETECTED MODE

When ice signal goes below a defined alarm level (set by parameter 0), LID goes to Ice detected –mode and gives an ice alarm. The delay of an ice alarm can be set by parameter 3.

Ice alarm is visible in the Ice alarm LED of the front panel as well as serial and web interfaces. Ice relay energizes and closes contacts 8 and 9.

Ice alarm and ice detected mode are active during the heating and cooling phases that follow an ice alarm.

Parameter 22 can be used to set a delay for ice alarm deactivation. It will keep the ice alarm active after the heating and cooling phase for the duration of the time delay. This is to prevent repetitive alarms during a long icing event.

HEATING PHASE

Right after the ice alarm is detected, ice sensor starts to heat itself to get rid of the accumulated ice. It is also possible to disable heating by parameter 12. The whole heating process can be controlled with parameters 12 – 18, 23 and 24. Default heating parameters shoud be useful enough for most weather conditions.

Automatic heating is used to remove soft ice which has slowly accumulated over the ice sensor in light icing conditions. It does not generate an ice alarm. Automatic heating is controlled with parameters 23 and 24.

COOLING PHASE

When ice sensor is heated to the maximum heating temperature, LID moves to cooling phase. Ice signal value is measured all the time and it should be close to the maximum after the heating phase.

Cooling phase has ended when sensor temperature is close to ambient temperature (parameter 20), or maximum cooling time (parameter 19) has exceeded, or sensor temperature has gone below 0 °C.

Ice alarm is released after the cooling period if ice signal value is above the alarm level.

FAULT MODE

LID indicates a fault or failure if there are problems in ice measurement, temperature measurements, heating or in other operations of the unit.

Fault indication is visible in the fault LED in the front panel, serial and web user interfaces and in the fault relay output.

Please note that the fault relay is normally energized, providing thus a fail-safe operation.

Depending on the fault, LID may continue operating otherwise normally or indicates a critical failure. E.g. ice measurement error is a critical failure but heating failure is not.

Explanation of the fault codes in the serial interface are presented in *Appendix A*.

5.2 Manual Ice alarm test

The operation of ice detector system can be tested manually using a test button in web-user interface or in icedetector's front panel. This test simulates real ice alarm conditions and the system generates ice alarm and proceeds normal ice detecting process according to parameter settings.

5.3 Manual sensor heating

Sensor heating can be started manually using a heating button in web-userinterface or typing a terminal command. The heating cycle is then driven once according to heating parameters P13, P17 and P18.

NOTE! During manual ice alarm test or manual sensor heating possible real icing conditions will not be detected. Also, resetting system manually when detector is in heating mode might activate 'sensor overheat' – failure when the device restarts.

5.4 LID-3300IP Type 2 Front Panel

Indicator / button	Meaning
POWER	Green light (flashing) means power is on. No light means no power.
ICE ALARM	Red light means ICE ALARM. No light means NO ICE ALARM.
HEATING	Red light means HEATING is ON. No light means HEATING is NOT ON.
FAULT	Red light means FAULT is ON. No light means FAULT is NOT ON.
TEST BUTTON	To test ice alarm, push the TEST button (about 3 s) until the ICE ALARM led starts to flash. Wait until ICE ALARM led stops to flash and stays on. Ice alarm is now activated. Wait until ICE ALARM led goes out. Ice alarm test is now completed. To reset (restart) device, push the TEST button continuously (about 10 s) until the device is restarting.

5.5 Use of different parameter settings

Functionality of LID-3300IP Type 2 Ice Detector system is configurable as described in chapter 5.1. All parameters as well as their default and valid values are described in *Appendix B*. “Parameters”.

In general, parameters can be grouped to following categories:

- Ice detection parameters (P0 - P6, P22)
- Heating parameters (P12 - P20, P23, P24)
- I/O parameters (P7 - P9)

Default parameter values are configured to every device before delivery and they suite perfectly for most of the cases.

Since icing is very different in different locations globally or even locally and in different times of the year, user may want to change parameter values to better suite his application. If parameter values are changed, Labkotec recommends to apply the following guidelines:

Use case	**Recommended parameter values**
Stop wind turbine due to safety risk	P0 = 30 - 70, P1 = P0 + 10
Start blade heating (anti-icing)	P0 = 70 - 80, P1 = P0 + 10 P16, P17, P18 close to maximum
Extreme icing conditions	P0 > 60, P1 = P0 + 10 P16, P17, P18 close to maximum

Please consult Labkotec when defining parameters for your application.

6 INTERNET WEB ACCESS

LID is equipped with a built-in web server which provides an easy-to-use web-based user interface for Ice Detector measurement data, status and parameters over the Internet.

Depending on the configuration of the IT network, the web user interface is available only locally in the local area network (LAN), more widely through wide area network (WAN) or from everywhere e.g. through VPN connections. From the software version 2.20 onwards it is possible to use https communication instead of http. See DOC001900 “Labkotec LID-3300IP Type 2 HTTPS” for information how to configure https-communication. However, default factory setting for the web communication is http.

Please note that the IP address, Default gateway and Subnet mask settings must be set through the RS-232 interface or through direct web access between PC and LID (see chapter 6.5) before the Internet access is possible at all.

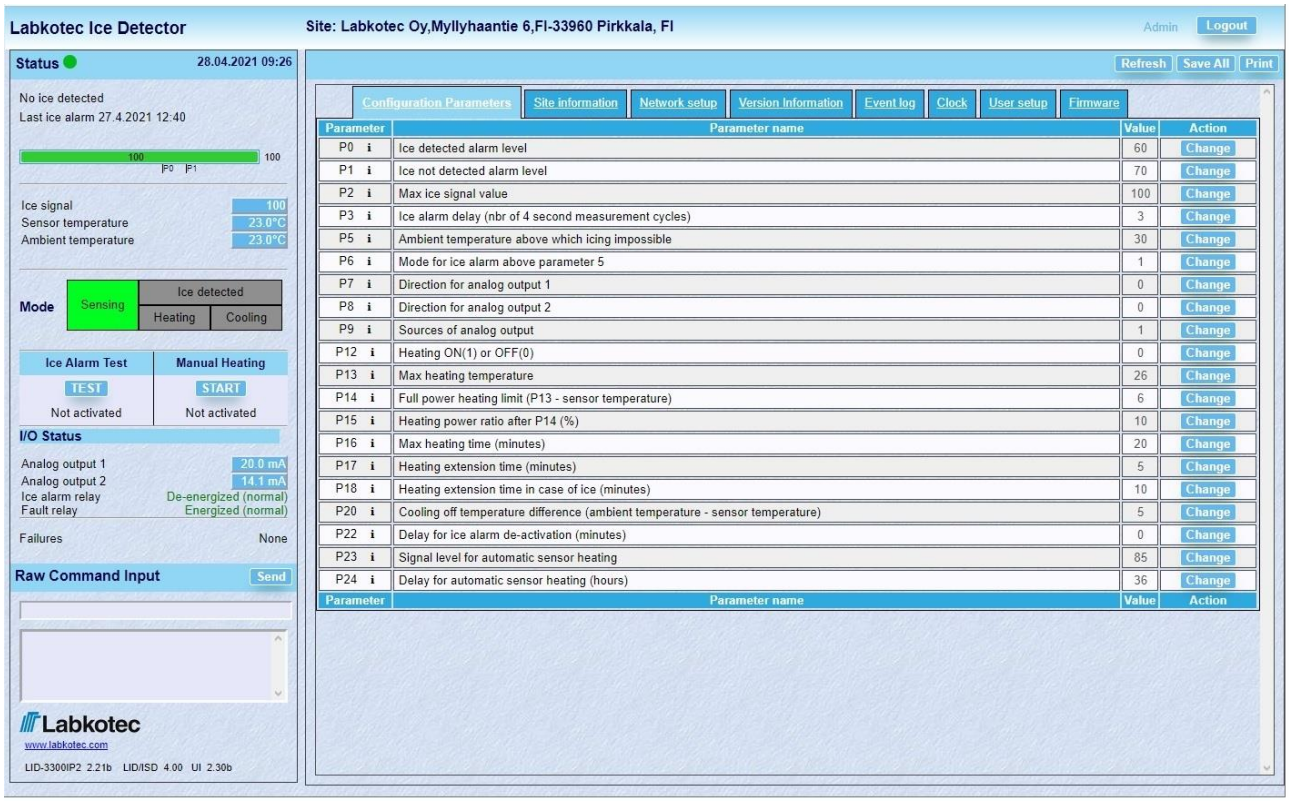
Once the network settings are set, open a web browser and type the IP address of the ice detector to the address field of the browser.

Please note that the functionality of the web user interface may vary between different software versions of LID.

LID supports most of the available web browsers. However, the look-and-feel may vary a little bit between different browsers.

When connecting to the device, the login prompt will be displayed. Login as administrator to get full access to the system. (See 6.4 for default passwords and password settings.) From the software version 2.20 onwards completely new usernames and passwords are needed. CAUTION, old usernames and passwords are disappearing and no longer in use.

After successful login the main display shown below will be downloaded.



Web user interface is divided into four sections:

1. Header
2. Status (upper left corner)
3. Raw command Input (lower left corner)
4. Settings (right side of the view)

Each section is explained in more details in the following chapters.

6.1 Web UI - Header

The header section of the web user interface starts with the text **Labkotec Ice Detector**.

In the center of the header, there is space for the individual site name, place or other identification of the Ice Detector. This text can be modified in Site information Tab of the Settings section.

Information on the current user is shown in the upper right corner.

6.2 Web UI – Status

Status section is updated automatically every four seconds with the latest measurement and status data, including

- Status of Ice Detection
    - No ice detected
    - ICE ALARM
    - CRITICAL FAILURE
    - NO ICE DETECTED (HEATING STARTED BY USER)
    - ICE ALARM (TEST)
    - AUTOMATIC SENSOR HEATING
- Measurements:
    - Ice signal strength
    - Sensor temperature
    - Ambient temperature
- Mode of operation
- Ice alarm test/cancel button
- Manual heating start/cancel button
- Status of I/O:
    - Analog output current values
    - Relay output states
- Present failures

6.3 Web UI - Raw command input

It is possible to give the same commands, with a couple of exceptions, to LID as through the menus of RS-232 serial interface.

6.4 Web UI - Settings

LID parameters and settings can be viewed and changed through this interface. Settings are divided into different tabs as follows:

Configuration parameters

All parameters are visible in one view. To change a parameter, click **Change**, type the new value and press **Save**.

Information about each parameter is available by clicking the parameter number.

Site information

In the Site information window it is possible to define the name and additional information of the site where this Ice Detector locates. Site name becomes visible in the header of web user interface and in all menus of RS-232 interface.

Network setup

Network setup information is visible here. An administrator is able to change the IP address, default gateway address and netmask address.

Note that the connection is lost if the IP address is changed.

Version information

Version information of control unit and ice sensor is available here.

User setup

From the software version 2.20 onwards completely new usernames and passwords are needed. CAUTION, old usernames and passwords are disappearing and no longer in use.

User privileges have four different levels:

- **Visitor** is only able to view the status and parameter values. Visitor cannot change own account settings (username and password).
- **Tester** is able to activate Ice Alarm Test and Manual Heating and edit their own account settings (username and password.)
- **User** is able to change parameter values, start an ice alarm test, manual heating and edit their own account settings (username and password). User cannot change network or SNTP settings.
- **Administrator** is able to access all functionality of the system. Administrator is only person who has access to all user account settings and can add, delete or edit them.

The default administrator username is **Defadmin** and password **Defadmin_1**. All passwords must contain at least 8 chars and there must be at least one **number**, one **capital letter** and one **special char**. Maximum password length is 24 chars. Username must be 8…32 chars long, there are now other restrictions for that.

The following letters and special chars are allowed in login data:

Letters: **A**…**Z** and **a**…**z**

Special chars: **! " # $ % & ' ( ) * + , - . / : ; < = > ? @ [\ ] ^ _ { | } ~**

In case a user makes three consequent failed login attempts, there will be a short time delay which blocks all further attempts from that ip-address.

If the administrator password is changed and forgotten, it is possible to restore the default administrator password through RS-232 interface (see *Appendix C. Terminal commands*).

Event log

Event log shows history of various events in chronological order. Ice detector saves 500 last events of four different type of events:

- ALARMS shows history of ice alarms
- FAULTS shows various fault events
- SETTINGS shows parameter changes made by users
- OTHER shows general events
- SYSTEM shows system data and state, e.g version, parameters, system and sensor calibration data, supply voltages etc.
- SAVE saves events displayed in the message window as a text file to your PC.

Complete list of log messages is available in *Appendix E*. Event log messages.

NOTE! System clock must be set to enable event logging. See paragraph Clock below for more information.

Clock

Ice detector's real time clock can be set here.

Only an administrator is able to change the settings of system clock.

Clock can be set either

- manually by selecting ***Change*** and setting time in format <DD.MM.YYYY hh:mm>, where
  - DD is date
  - MM is months
  - YYYY is year and
  - hh and mm are hours and minutes, respectively.
- by using ***Sync with PC*** you can set time directly from your PC-computer.
- by using ***SNTP*** protocol. More information below (*).

Manual Daylight Saving Time setting changes the time one hour ahead or back at the moment when value is changed.

(*) More information about SNTP

System clock can also be synchronised with network time stations using a built-in SNTP-client. SNTP uses UDP-protocol on port 123.

To activate SNTP-client, set first primary and alternative SNTP-server domain names (or IP-addresses), your current time zone related to UTC (Universal Time Coordinated) and finally set SNTP Client ON/OFF – switch to '1'. SNTP-client makes then first time synchronization attempt and updates system time then at intervals of 15 hours.

The following SNTP domain names are used as default:

- Primary SNTP-server time.google.com
- 1st alternative SNTP-server time.nist.gov
- 2nd alternative SNTP-server time2.google.com

The primary SNTP-server is normally used. In case the primary server is not responding then alternative server(s) will be used.

SNTP-client uses built-in domain name server system (DNS) to get ip-address of selected SNTP-servers. DNS runs on UDP-port 53. Normally it is not necessary to change these ip-addresses, but it's possible to change them using web UI- raw command window or RS-232 interface (see *Appendix C*. Terminal commands).

Default ip-addresses and service providers used for DNS are:

- Primary DNS-server 8.8.8.8 Google
- 1st alternative DNS-server 156.154.70.1 DNS advantage
- 2nd alternative DNS-server 4.2.2.1 Google

In case of power failure, the clock has a reserve runtime of approximately 10 days. When connecting the control unit to mains power after a long service break etc, check that the system clock is running if you are not using SNTP to synchronize the clock. If the system clock is stopped, event logging is also disabled and an alert text 'CLOCK IS OUT OF TIME - LOGGING DISABLED!!' will be displayed above the clock display in web UI. You have to set the

clock to enable event logging again.

Firmware

Firmware of the ice detector control unit can be updated through the web user interface. *Firmware* tab becomes visible when an administrator is logged in.

To update the firmware, select the new firmware file (.bin) from your laptop or desktop and upload it to the device. Ice detector will restart in couple of minutes after the file upload.

Firmware update is also possible by using a Telnet connection.

More information about the update procedure is available in document DOC001786 “Firmware update instructions”.

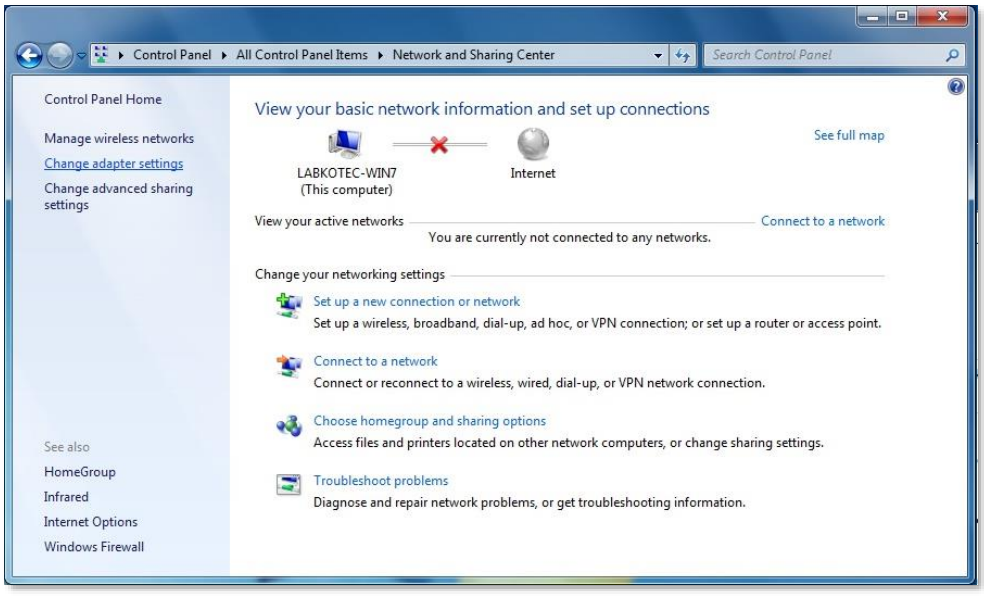
6.5 Logging out

To close the web interface properly, click Logout-button and wait until the login prompt appears again. However, if the web interface is closed without first logging out, there will be an automatic logout after couple of minutes.

6.6 Direct Web Access between PC and LID

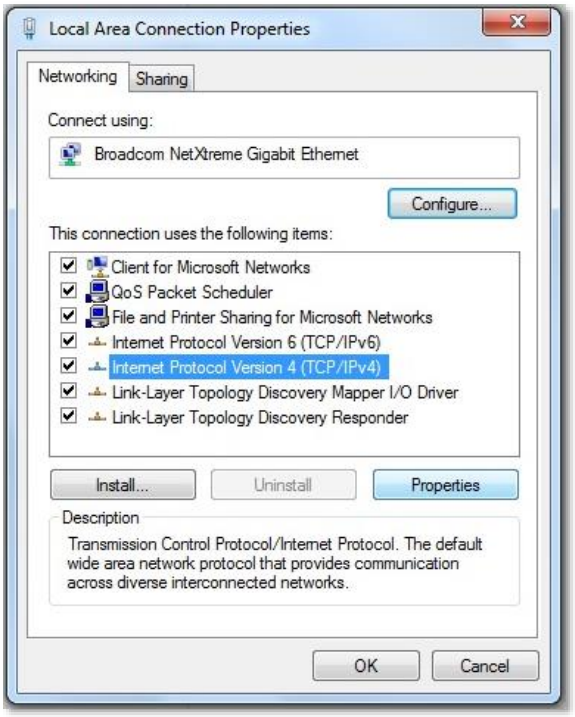
Web user interface can be accessed also directly from a PC by connecting the PC and LID directly with an Ethernet cable. Direct web access can be especially useful during the start-up of LID. The IP address of the PC must be changed as described below.

1. Go to Network Connections menu of your PC e.g. from Windows **Start** menu **> Control Panel > Network and Sharing Centre.** The following window opens.



2. From left panel select **Change adapter settings** and from opening window choose **Local Area Connection -> Properties.**

3. Choose **Internet Protocol Version 4 (TCP/Ipv4)** from the Local Area Connection Properties list and click **Properties**.

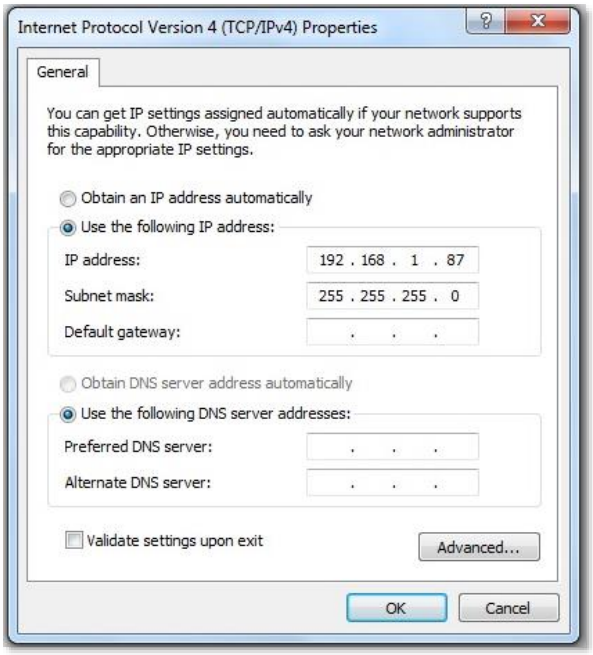


4. Choose **Use the following IP address** and give your PC an IP address which is next to the IP address of the LID.

   The default IP address of LID is 192.168.1.88.

   If you have not changed it, give your PC e.g. the address: 192.168.1.89.

   Now your PC and LID are in the same network and you may open a web browser and connect to the IP address of LID.



7 TECHNICAL SPECIFICATION

LID-3300IP Type 2 Ice Detector Control Unit	
Enclosure	Dimensions: 125 x 175 x 75 mm (h x w x d) Weight: 800 g. Material: Polycarbonate Degree of protection: IP 65.
Operating environment	Temperature: -30 ºC …+55 ºC Max. altitude above sea level: 4000 m Relative humidity RH 100% Suitable for indoor and outdoor use (protected from direct rain).
Power supply	230 VAC ±10%, 50/60 Hz. Recommended fuse size in the supply line is 10 A, maximum 16 A.
Power consumption	Normally 7 VA. Max 350 W during sensor heating.
Fuses	(1) 50 mAT, (2) and (3) 4 AF min breaking capacity 1500A @ 250Vac, IEC 127 5 x 20 mm (Appendix D).
Analog outputs (source)	2 pcs, active and galvanic isolated current output 4-20 mA to max. 1 kΩ load (for Ice signal and temperature). Connector numbers 11 – 14.
Relay outputs	2 pcs (Ice alarm and fault), potential free relay output. Connector numbers 5 – 10. U_{max} = 120VDC (ripple-free) or 50VAC I_{max} = 1A
Front panel	LED indication for Power, Ice Alarm, Heating and Fault. Test button to simulate Ice Alarm.
Serial outputs (one RS-232 and one TTL/Optical fibre)	Galvanic isolated RS-232 serial output for configuration and maintenance.
	Optical fibre serial output for configuration and automatic reading (optional, requires an additional RS2O Converter module): RS2O Converter module is CLASS 1 LASER PRODUCT RS2O Converter module transmitter: HFBR-1522ETX RS2O Converter module receiver: HFBR-2522ETZ Connector for optical fiber in RS2O converter module: HFBR4531 or equivalent Cable type: POF (1 mm) up to 45m.
Ethernet	Integrated Web server and web based user interface for remote access to Ice Detector via Internet. Galvanic isolated standard RJ-45 connector. Network settings can be configured via RS-232. Default IP address: 192.168.1.88 Modbus TCP/IP and HTTPS options.
Electrical Safety (LVD)	EN/IEC 61010-1, Class I, CAT II, POLLUTION DEGREE 2 EN/IEC 60204-1 UL 61010-1 CAN/CSA-C22.2 NO. 61010-1-12.
EMC	EN IEC 61000-6-4 (Emission) EN IEC 61000-6-2 (Immunity).
Functional Safety	LID-3300IP Type 2 ice detector system fullfills the requirements of PLd according to ISO 13849-1. The safety function is validated through relay outputs.
Approvals	US and Canada Certificate SGSNA/17/HEL/00043 / 00044. In the USA and Canada the product is intended to be installed with a 230 Vac wind turbine power system only. Component certificate according to GL-IV-1:2010, Guideline for the Certification of Wind Turbines, Certificate No.: CC-GL-IV-1-03644-2.

LID/ISD Type 2 Ice Sensor	
Dimensions	350 x 100 x 25 mm (h x w x d).
Weight	1.3 kg (1.7 kg with standard mounting kit).
Material	Aluminum.
Degree of protection	IP 65.
Operating environment	Temperature: -40 ºC …+60 ºC Max. altitude above sea level 4000 m Relative humidity RH 100% Suitable for outdoor use.
Cable diameters	Signal cable: 7.5 mm Heating cable: 11.5 mm.
Approvals	US and Canada Certificate SGSNA/17/HEL/00043 / 00044. In the USA and Canada the product is intended to be installed with a 230 Vac wind turbine power system only. Component certificate according to GL-IV-1:2010, Guideline for the Certification of Wind Turbines, Certificate No.: CC-GL-IV-1-03644-2.

8 REPAIR AND SERVICE

Fuses 1, 2 and 3 in *Appendix D* can be changed to another fuse 5 x 20 mm fuses complying EN/IEC 60127-2/3. See the correct value of the fuses from Technical specification table.

Before opening the cover make sure that the main supply is switched off. In permanent supply cable installation, turn off the isolation switch. When supply cable is equipped with plug, disconnect it from socket outlet.

For more information, contact Labkotec Oy's service.

9 MAINTENANCE

Maintenance is instructed in the following sections.

Manual proof test:
The manual proof test should be done twice a year.

The proof test instructions:

1) Press web-UI ice alarm test button or type command `TEST` in the RS-232 interface
2) Check that the Ice value goes under the alarm level
3) Confirm that the Ice alarm is activated

If the ice alarm is activated, the test is passed. Test result must be logged to a test report.

LID should now go through the normal operating modes: Ice detected, heating, cooling and finally to sensing.

Ice alarm test:
Additionally to the manual proof test, an annual icing test must be done with help of a cold spray or similar method. In this test, ice is formed to the surface of the sensor, and an ice alarm shall be activated.

If the ice alarm is activated, the test is passed. Test result must be logged to a test report.

Dirt and dust:
Check that the ice sensor is not covered with dirt or dust and that ice sensor wire moves freely. In case of dirt or dust, clean up the ice sensor gently e.g. with water and a brush.

Ice signal strength:
Check the ice signal strength in weather conditions where icing should not be possible. If the signal has become attenuated (the signal value is not the maximum), there could be a need to calibrate the ice signal (see below).

Semi-automatic ice sensor field calibration:
If the ice sensor's signal strength has become attenuated, the sensor can be calibrated in the field.

Before calibrating the sensor, the following requirements must be fulfilled:

- The ice sensor is clean and dry.
- Icing and rain is not allowed during calibration.

Calibration can be started remotely from the web user interface using the raw command input. The calibration procedure is the following:

- Start calibration by typing a command '**naccal yyyy**', where yyyy is the administrator password.
- When calibration starts, **'SENSOR CALIBRATION ONGOING'**- text appears in the status window of the web user interface. The text will be displayed as long as the calibration is ongoing.
- When calibration has finished, ice detector will move back to normal detecting mode and the text **'ICE NOT DETECTED'** will appear in the status window.

The calibration cannot be done if the sensor signal has been degraded to a level where it is not possible to gain max signal level anymore. In this case the calibration is not started and text "**SENSOR CANNOT BE CALIBRATED ANYMORE**" is displayed in raw command window.

The calibration result can be checked from the event log. Please refer to *Appendix E "Event log messages" – sensor field calibration log messages*.

For more information, contact Labkotec Oy's service.

10 FAULT STATES

If there are failures active, they are presented in web-UI and logged in event log.

Please refer to *Appendix E* fault events and remarks.

11 INSTALLATION MODIFICATION

When ice detector installation is modified, e.g. when sensor or control unit is replaced or firmware is updated, the same validation procedures as in the first installation, must be taken. See chapter 4.

12 REPLACEMENT

ISO13849-1 requires that the Mission time for a safety device is 20 years. Therefore, the LID-3300IP Type 2 and LID/ISD Type 2 must be replaced every 20 years from the installation.

13 RECYCLING

To recycle an old LID-3300IP Type 2 and LID/ISD Type 2, please take them to applicable collection points, in accordance with your national legislation or directives.

APPENDIX A. STREAMING MODE OF SERIAL OUTPUT

LID reports the measurement data and status in the serial output as explained before in chapter 3.5.2. This chapter explains the formats in more detail.

There are three different output formats. The format can be read by command `RSFORMAT`.

Format 0: variable length

Command `RSFORMAT 0` sets the variable length format.

The output format consists of the following information:

Fail	Mode	Sensor temperature	Ambient temperature	Ice signal amplitude

The different fields are delimited with a space character. Fail and Mode characters have no space between them. Negative temperature values have a '-'-sign in front of the value, positive values do not. Ice signal amplitude has an asterisk (*) in front of the value.

- Example (one temperature sensor):

  ```
  0F 15.0 *68
  ```

  No fail, Mode: detecting, ice sensed, heating on, Sensor temperature 15.0°C, ice signal amplitude 68.

- Example (two temperature sensors):

  ```
  0F 15.0 -5.0 *68
  ```

  No fail, Mode: detecting, ice sensed, heating on, Sensor temperature 15.0°C, ambient temperature -5.0°C, ice signal amplitude 68.

Format 1: constant length

Command `RSFORMAT 1` sets the constant length format.

The output format consists of the following information:

Fail	Mode	Sensor temperature with sign mark (+/-) and leading zeros	Ambient temperature with sign mark (+/-) and leading zeros	Ice signal amplitude with leading zeros	Rsformat (= 1)	16-bit checksum

The different fields are delimited with a space character. Fail and Mode characters have no space between them. Temperature values start with zeros and have a '+' or '-' sign in front of the value. Ice signal amplitude has an asterisk (*) in front of the value. The checksum consist of ASCII coded hex ' 0…F' and is calculated from all preceding bytes (including space characters) by adding them together.

- Example (one temperature sensor):

  ```
  0F +015.0 ----.- *068 1 04B8
  ```

  No fail, Mode: detecting, ice sensed, heating on, Sensor temperature 15.0°C, ice signal amplitude 68, rsformat 1, checksum 04B8.

- Example (two temperature sensors):

  ```
  0F +015.0 -005.0 *068 1 04C9
  ```

  No fail, Mode: detecting, ice sensed, heating on, Sensor temperature 15.0°C, ambient temperature -5.0°C, ice signal amplitude 68, rsformat 1, checksum 04C9.

Format 2: LID-3210 format

Command `RSFORMAT 2` sets the output format identical to what was used in LID-3210 Ice Detector.

The output format consists of the following information:

Fail	Mode	Sensor temperature with sign mark (+/-) and leading zeros	Ambient temperature with sign mark (+/-) and leading zeros	Ice signal amplitude with leading zeros

The different fields are delimited with a space character. Fail and Mode characters have no space between them. Temperature values start with zeros and have a '+' or '-' sign in front of the value. Ice signal amplitude has an asterisk (*) in front of the value.

- Example (one temperature sensor):

  ```
  0F +015.0 *068
  ```

  No fail, Mode: detecting, ice sensed, heating on, Sensor temperature 15.0°C, ice signal amplitude 68.

- Example (two temperature sensors):

  ```
  8F -005.0 -005.0 *048
  ```

  Heating failed, Mode: detecting, ice sensed, Sensor temperature -5.0°C, ambient temperature -5.0°C, ice signal amplitude 48.

Fail and Mode Characters

The reason for failure can be interpreted from the Fail character as follows:

Fail character	Meaning			
	Heating	EEPROM	Temperature sensors	Ice sensing
0	OK	OK	OK	OK
1	OK	OK	OK	Failed
2	OK	OK	Failed	OK
3	OK	OK	Failed	Failed
4	OK	Failed	OK	OK
5	OK	Failed	OK	Failed
6	OK	Failed	Failed	OK
7	OK	Failed	Failed	Failed
8	Failed	OK	OK	OK
9	Failed	OK	OK	Failed
A	Failed	OK	Failed	OK
B	Failed	OK	Failed	Failed
C	Failed	Failed	OK	OK
D	Failed	Failed	OK	Failed
E	Failed	Failed	Failed	OK
F	Failed	Failed	Failed	Failed

The operation mode of the LID can be interpreted from the Mode character in table below.

Mode character	Meaning				
	Power-up Mode	Sensing Mode	Detecting Mode	Heating	Ice sensed
0…7	YES	-	-	-	-
8	NO	YES	NO	OFF	NO
C	NO	NO	YES	OFF	NO
D	NO	NO	YES	OFF	YES
E	NO	NO	YES	ON	NO
F	NO	NO	YES	ON	YES

APPENDIX B. PARAMETERS

Par. nbr	Name of the parameter and explanation	Default value	Valid values
0	Ice detected alarm level Ice alarm activates when ice signal goes below this level.	60	10 – (P1 -1)
1	Ice not detected alarm level When ice signal goes above this level, ice is no longer detected. Note! Ice alarm will deactivate after the sensor is heated and cooled down close to ambient temperature	70	15 – (P2 -1)
2	Maximum ice signal value Maximum ice signal level can be adjusted according to user needs. This is useful e.g. when the same maximum signal level (255), that used to be in the older Ice Detectors, is required. Please note that the alarm levels should be adjusted accordingly when maximum ice signal level is changed.	100	100 OR 255
3	Ice alarm delay (nbr of 4 second measurement cycles) Ice signal must remain below ice detected alarm level for the duration of the entire delay before ice alarm activates. Delay is set as a multiple of 4 second intervals.	3	0-25
4	Nbr.of temperature sensors Parameter is not used in LID-3300IP Type 2 - icedetector. There must always be 2 temperature sensors.	-	-
5	Ambient temp above which icing is impossible (°C or F) Temperature limit above which icing should not be possible. This parameter prevents or notifies of possible false ice alarms. Ice detector operation in case of ice above this temperature is determined by parameter 6. This parameter is ignored when performing an ice alarm test.	5	0-50
6	Mode for ice alarm above parameter 5 In case an ice alarm is detected above the temperature set by parameter 5, ice detector behaves the following way according to the parameter value: 1 = Only fault alarm is activated 2 = Only ice alarm is activated 3 = Both ice alarm and fault are activated Note! When P6 is 1 or 3, the fault alarm will be generated after 2 minutes delay.	1	1-3
7	Direction of analog output 1 0 = Minimum measurement value equals 4 mA and maximum measurement value equals 20 mA. 1 = Maximum measurement value equals 4 mA and minimum measurement value equals 20 mA. By default ice signal 0 equals 4 mA and ice signal 100 equals 20 mA.	0	0-1
8	Direction of analog output 2 0 = Minimum measurement value equals 4 mA and maximum measurement value equals 20 mA. 1 = Maximum measurement value equals 4 mA and minimum measurement value equals 20 mA. By default temperature value -40C equals 4 mA and +60C equals 20 mA.	0	0-1
9	Sources of analog outputs It is possible to choose which measurements are driving analog outputs. 0 = Ice signal in analog output 1, sensor temperature in analog output 2 1 = Ice signal in analog output 1, ambient temperature in analog output 2 2 = sensor temperature in analog output 1, ambient temperature in analog output 2 3 = sensor temperature in analog output 1, sensor temperature in analog output 2 4 = ambient temperature in analog output 1, ambient temperature in analog output 2	1	0-5

	5 = Ice signal in analog output 1, Ice signal in analog output 2		
10	Not in use at the moment.		
11	Not in use at the moment.		
12	Heating ON (1) or OFF (0) Based on this parameter, heating is either started (1) or not started (0) when ice signal goes below the alarm level. By default, heating is started to melt the ice so that the sensor is capable of measuring the icing situation again. If heating is not started, ice alarm deactivates only after the ice melts naturally away from the sensor.	1	0-1
13	Maximum heating temperature (degrees) Sensor is heated to the temperature set by this parameter to melt the ice during an ice alarm. The parameter value must be set either in Celcius or in Farenheit, depending on the selected unit of temperature. By default, the unit of temperature is Celcius. For safety reasons, there is also a thermostat inside the sensor to stop heating after about +65C (+149F).	50	0-55
14	Full power heating temperature (P13 - sensor temperature) Sensor is heated with a maximum power up to this limit, after which heating power is reduced in order not to exceed the defined maximum heating temperature. Parameter value represents the temperature difference between maximum heating limit and actual sensor temperature.	3	0-30
15	Heating power ratio after P14 (%) Heating power is reduced to the degree set by this paramater after the Full power heating limit (P14).	100	0-100
16	Max heating time (minutes) Maximum heating time in basic heating phase is limited with this parameter. Heating will advance to the extended heating phases, if the maximum heating temperature (P13) is not reached after the time set in this parameter. Normally this parameter need not to be changed from the default value.	20	1-120
17	Heating extension time (minutes) In very cold and windy atmosphere it might be useful to extend the heating time after the maximum heating temperature is reached in order to melt the ice completely. Sensor temperature is kept in max heating temperature (P13) for an extra time set by this parameter.	0	0-60
18	Heating extension time in case of ice (minutes) If ice is still detected right after the heating and/or heating extension time (P17), heating is extended for the extra time set by this parameter.	10	0-60
19	Cooling off time (minutes) This parameter is not used anymore in LID-33000IP Type 2. The cooling phase will be controlled only according to parameter 20.	-	-
20	Cooling off temp difference (ambient temperature - sensor temperature) Sensor must cool down after the heating in order to be able to measure icing conditions. Ice alarm is released after the cooling period. Cooling will be stopped according to this parameter when sensor temperature is close to ambient temperature.	5	0-20
21	System parameter (do not change)		
22	Delay for ice alarm deactivation (minutes) Delay for ice alarm deactivation is used to prevent repetitive ice alarms in case of long-term icing conditions. Ice alarm will remain active after the cooling period of the sensor during the time delay specified by this parameter. If the ice signal is below the alarm level (P0) after the delay, ice alarm remains active and a new heating and cooling cycle is started. Ice alarm is deactivated if ice signal is above parameter P1 after the delay.	0	0-120
23	Signal level for automatic sensor heating	85	0 –

	Automatic heating of the sensor is used to remove the soft ice which has slowly accumulated over the sensor in light icing conditions. Automatic heating is started when ice signal remains constantly below the value of this parameter for a longer time than what is specified by parameter P24. Automatic heating does not generate an ice alarm. The functionality is not in use when parameter value is 0.		(P2 -1)
24	Delay for automatic sensor heating (hours) Automatic sensor heating is activated when ice signal remains constantly below the value of parameter P23 for a longer time than what is specified by this parameter. The automatic sensor heating can be tested by setting this value temporarily to 0. Normally this parameter value should be > 0.	24	0 (testing) 1 - 100

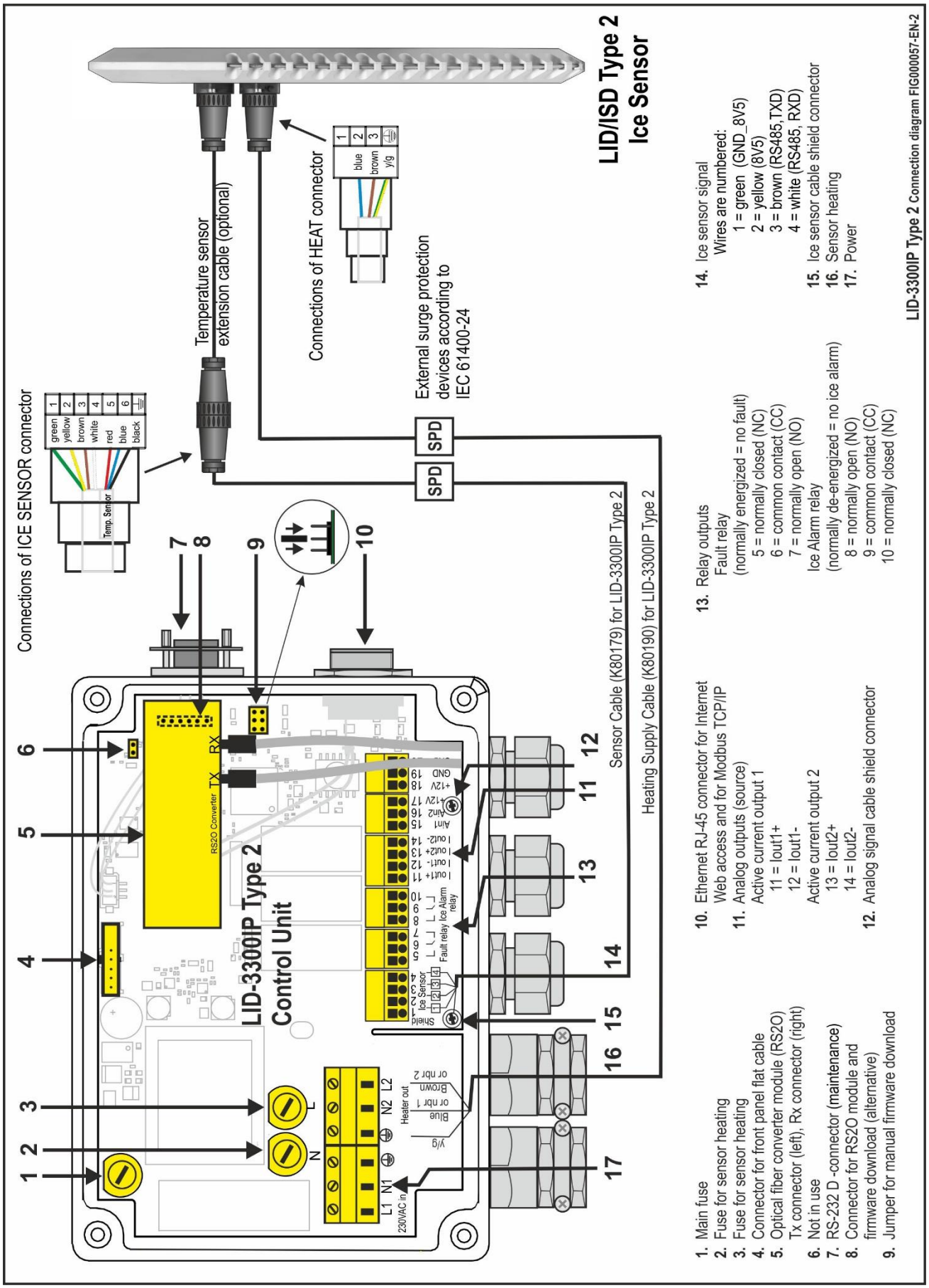
APPENDIX C. TERMINAL COMMANDS

Comm. nbr	Command	Description	Command parameters	Example	Access from web UI raw command window
1	SP<nr> <xxx>	Set parameter value	<nr> = parameter number, <xxx> = value	SP1 20	yes
2	RP<nr>	Read parameter value	<nr> = parameter number	RP1	yes
3	SAOL <xxx>	Set scaling for 4mA output, ice sensor channel	<xxx> = scaling value for 4mA output	SAOL 10	yes
4	SAOH <xxx>	Set scaling for 20mA output, ice sensor channel	<xxx> = scaling value for 20mA output	SAOH 100	yes
5	RAOL	Read ice sensor 4mA scaling value	None	RAOL	yes
6	RAOH	Read ice sensor 20mA scaling value	None	RAOH	yes
7	SWR	Software reset	None	SWR	yes
8	SUOT <x>	Set temperature degree unit	C = Celsius, F = Fahrenheit	SUOT C	yes
9	RUOT	Read temperature degree unit	None	RUOT	yes
10	SDF	Set default values for parameters	None	SDF	yes
11	HEAT	Start manual heating	None	HEAT	yes
12	HEAT0	Stop/abort manual heating	None	HEAT0	yes
13	TEST	Start manual ice alarm test	None	TEST	yes
14	TEST0	Stop/abort manual ice alarm test	None	TEST0	yes
15	SDNW	Set network settings to default values	None	SDNW	yes
16	SDPW	Set admin password to the default factory value.	None	SDPW	no
17	SIP <XXX>	Set control unit IP-address	<xxx> = IP-address in format aaa.bbb.ccc.ddd	SIP 192.168.11.28	no
18	RIP	Read control unit IP-address	None	RIP	no
19	SGW <xxx>	Set unit default gateway IP-address	<xxx> = IP-address in format aaa.bbb.ccc.ddd	SGW 192.168.1.1	no
20	RGW	Read default gateway IP-address	None	RGW	no

21	SNM <xxx>	Set subnet address mask	<xxx> = subnet mask in format aaa.bbb.ccc.ddd	SNM 255.255.255.0	no
22	RNM	Read subnet mask	None	RNM	no
23	RMC	Read control unit MAC-address	None	RMC	no
24	RSFORMAT <x>	Set RS-232 communication format	0 = variable length, 1 = constant length, 2 = LID-3210	RSFORMAT 1	yes
25	RSFORMAT	Read RS-232 communication format	None	RSFORMAT	yes
26	ST2LOCK	Lock / unlock updating the value of ambient temperature (T2) during heating and cooling phases.	0 = unlock T2 update 1 = lock T2 update	ST2LOCK 0 ST2LOCK 1	yes
27	RT2LOCK	Read ambient temperature (T2) lock state	None	RT2LOCK	yes
28	SDNS<x>< > <aaa.bbb.ccc.ddd>	Set Domain Name Server ip-address	< x> = 1 – 3 < > = space 1 = primary DNS 2 = 1st alt. DNS 3 = 2nd alt. DNS aaa.bbb.ccc.ddd = DNS IP-address	SDNS1 8.8.8.8	yes
29	SDDNS	Restore Domain Name Server ip-addresses to factory default values.	None	SDNS	yes
30	SNTP<x>< > <abcdefghijkl>	Set network time server name string	<x> = 1 – 3 < > = space 1 = primary NTP 2 = 1st alt. NTP 3 = 2nd alt. NTP abcdefghijkl = server name string	SNTP1 time1.google.com	yes
31	SDNTP	Restore network time server name strings to factory default values.	None	SDNTP	yes
32	STZN <x>	Set local time zone related to UTC (Universal Time Coordinated). Needed only when SNTP-client is in use.	<x> = integer -12…+12	STZN 2	yes
33	SNWT <x>	Set SNTP- client ON/OFF	< x> = 0 -> OFF < x> = 1 -> ON	SNWT 1	yes
34	SCLOCK< > <DD>.<MM>. <YY><><hh>: <mm>:<ss>	Set system time	< > = space <DD> = date 0-31 <MM> = months 0-12 <YY> = years 0-99 <hh> = hours 0-23	SCLOCK 09.06.14 10:05:00	yes

			<mm> = minutes 0-59 <ss> = seconds 0 -59		
35	RLOG <x>	Print event log segment to RS-232 terminal.	<x> = 1 - 5 log segment to print. 1 = Alarms 2 = Faults 3 = User settings 4 = General events 5 = All	RLOG 2	no
36	FTEST	Test manually fault relay de-energisation	none	FTEST	yes
37	SHTTPS <x>	Turn HTTPS on/off	0 = https OFF 1 = https ON	SHTTPS 1	yes
38	RHTTPS	Read HTTPS state	None	RHTTPS	yes
39	RCALIB	Reread ice sensor parameters	None	RCALIB	yes
40	SENRST	Reset sensor without booting whole system	None	SENRST	yes
41	STCPDEL <x>	Set transfer delay for tcp packets when sending files	x = 50…1000, unit is milliseconds. Default is 50 and suitable for most cases	STCPDEL 100	yes
42	RTCPDEL	Read tcp transfer delay	None	RTCPDEL	yes
43	FILE PAR	Send parameter file or SSL certificate file from the serial port	Selected file to be sent	FILE PAR	no

APPENDIX D. SYSTEM CONNECTION DIAGRAM



LID-3300IP Type 2 Connection diagram FIG000057-EN-2

APPENDIX E. EVENT LOG MESSAGES

Remarks-column includes a description only when the event text does not explain itself.

Alarm events	Remarks
Ice alarm ON, T(amb)=-2.5,P0=60	Ice alarm, ambient temp -2.5 when alarm starts and P0 = 60
Ice alarm OFF,T(amb)=1.0,P1=70	Ice alarm off, ambient temp 1.0 when alarm ends and P1 = 70
Ice TEST alarm ON, T(amb)=5.0,P0=60	Ice alarm manual test on
Ice TEST alarm OFF,T(amb)=5.0,P1=70	Ice alarm manual test off
Fault events	**Fault description and procedures** In all cases when a fault is active, performing a user reset is recommended. If fault state continues to occur, contact Labkotec Oy's service.
Sensor T(sens) fault ON	Ice sensor surface temperature sensor fault is active.
Sensor T(sens) fault OFF	
Sensor T(amb) fault ON	Ambient temperature sensor fault is active.
Sensor T(amb) fault OFF	
Ice sensor fault ON	Ice measurement value is out of range.
Ice sensor fault OFF	
Ice alarm above P5-fault ON	Ice have been detected when ambient temperature Tamb is above parameter P5 value.
Ice alarm above P5-fault OFF	
Ice alarm active 10 days-fault ON	Ice have been detected continuously longer than 10 days.
Ice alarm active 10 days-fault OFF	
Parameter memory CRC-error ON	Checksum calculation of the process parameters has revealed an error. That kind of errors results from interference during parameter read / write process. To clear the error, change and restore some parameter P0...P24 value and reset the system.
Parameter memory CRC-error OFF	
Sensor comm failure ON	The controll unit cannot communicate with the ice sensor. Check that the ice sensor cable is not loose or broken.
Sensor comm failure OFF	
Sensor frame error ON	This indicates, that communication between the control unit and the ice sensor have been corrupted by noise and interference. Check sensor cabling and cable guarding.
Sensor frame error OFF	
Heater fault ON	Check that the heater cable is not loose or broken or heating circuit fuses are not blown.
Heater fault OFF	
Heating on when sensing fault ON	This indicates that system is in sensing mode but the ice sensor temperature is too high to detect real icing conditions. The reason for this can be that the system has been previously in heating mode and a user / power-up / watchdog reset have occurred. In this case the fault will be cleared when sensor cools down and its temperature decreases below (Tamb + P20) or < 0°C. If the temperature will not decrease the heater controller might be faulty.

Heating on when sensing fault OFF	
Ice relay feedback fault ON	The state of the ice alarm relay conflicts with ice detectection state. This fault activates, if there is an active ice alarm but ice relay is not active or vice versa.
Ice relay feedback fault OFF	
Fault relay 1 feedback fault ON	The state of the fault relay 1 conflicts with system's fault status. This fault activates, if there are any active faults but fault relay 1 is not in fault state and vice versa. NOTE!: There is only one fault relay output signal which is a logic combination from fault relay 1 and fault relay 2 states.
Fault relay 1 feedback fault OFF	
Fault relay 2 feedback fault ON	Feedback fault for fault relay 2. Operation is similar to fault relay 1 feedback error.
Fault relay 2 feedback fault OFF	
Runtime CRC-check error found	System diagnostics has found a run-time parameter checksum error. This could be due to short time electric failure or interference.
Fault relay oscillation ON	If fault relays are observed to change their states often and too frequently this may indicate faulty relay or relay controller.
Fault relay oscillation OFF	
Manual fault relay TEST ON	This indicates, that fault was due to manual fault relay test, not an actual fault.
Manual fault relay TEST OFF	
System initialisation failed	The starting the system after reset failed and ice detecting process is not running.
Sensor parameter P2 fault ON Sensor parameter P21 fault ON	If a new ice sensor has been attached to the system, this indicates that it has a different configuration for parameters P2 or P21 than control unit. If the fault is related to parameter P2, read first your parameter P2 value from web- or terminal user interface. If you use P2 = 100, change it first to 255 and then back to 100. (In case you use P2=255, set-> 100 -> 255) Wait for 15 seconds and restart the system. If the fault relates to P21, contact Labkotec service for further instructions.
Safety guard reported error x	An internal safety guard processor have found an error and reported it. Error code x can be between 1 and 32.
System error xx	Internal error, xx is an error number between 1 and 32. These errors refers to system's internal communication failures.
Setting events	**Remarks**
P23 changed to 85, old: 90,('xxx')	User xxx changed parameter P23 value to 85, previous value was 90, (see #2).
IP-settings changed	ip-address, default router ip-address or network mask was edited.
'xxx' edited account #y username	User xxx edited username field of user account number y, (see #1).
'xxx' disabled account #y	User xxx disabled user account number y. Admin can disable all user's account, other privileges can disable only their own account, (see #1).
'xxx' edited account #y password	User xxx edited password of user account number y. Admin can edit all user's password, other privileges only their own password, (see #1).

Default passwords restored ('local')	Default passwords restored. This can be done only from the serial port.
Default P0-P24 restored (‘xxx’)	User xxx restored default parameters, (see #1).
Default network settings restored	
Sensor field calibrated, cf: 0.95	Sensor has been field calibrated successfully and new correction factor is 0.95.
Sensor field calib. FAILED, cf: 0.7	Sensor calibration failed because the output signal did not gain the maximum value. The sensor operates normally but the output value will still be lower than P2.
General events	**Remarks**
Detecting ON	ice detector state has changed to ‘Detecting’, (see #1).
Heating ON (ice alarm)	ice detector state has changed to ‘Heating’, (see #1).
Heating OFF,cooling ON	ice detector has finished heating and advanced to ‘Cooling’, (see #1).
Returning to sensing	ice alarm expired and ice detector returned to sensing state, (see #1).
‘xxx’ logged IN from aaa.bbb.ccc.ddd	user xxx logged in from ip-address aaa.bbb.ccc.ddd, (see #2).
‘xxx’ logged OUT	As above, user logged out.
Logins rejected from ip aaa.bbb.ccc.ddd	Logins was rejected from ip aaa.bbb.ccc.ddd because too many failed attempts were observed.
System reset by user (‘xxx’)	user xxx reset system, (see #2).
Power-up reset	System started after mains power connected.
Watchdog-reset occurred	System built-in watchdog reseted central unit.
System reset for firmware programming	System made autorestart to program a new firmware.
Automatic defrost activated	
Automatic defrost expired	
New sensor found: S/N: 1234567	Ice sensor was changed to another unit.
SW changed to version v2.20	Example message for software update. Central unit SW updated to version v2.20.
Manual heating started ('xxx')	User xxx has commanded manual heating, (see #2).
Manual heating expired	Manual heating phase run through.
Manual heating aborted by a user ('xxx')	User xxx has aborted manual heating, (see #2).
Manual TEST-run started ('xxx')	User xxx initiated ice alarm test, (see #2).
Manual TEST-run cancelled ('xxx')	User xxx cancelled ice alarm test manually, (see #2)
Manual TEST-run ended	
FAULT RELAY tested manually	FTEST- command was given to test fault relay operation.

#1 These messages are generated only in case when a real ice alarm exists. Ice alarm test or manual heating does not generate these messages.

#2 xxx is a user indication. Depending on command, it can be ‘admin’, ‘user1-4’, ‘tester1-3’, ‘visitor1-2’ or ‘local’ for serial port user and ‘modbus’ for Modbus TCP/IP.

APPENDIX F. FUNCTIONAL SAFETY DATA SHEET

Labkotec
INDUTRADE GROUP

DOC001461-EN-3

Functional Safety Data Sheet

Manufacturer:	Labkotec Oy Myllyhaantie 6 FI-33960 Pirkkala FINLAND
Products:	LID-3300IP Type 2 Ice Detector System incl. - LID-3300IP Type 2 Control Unit - LID/ISD Type 2 Ice Sensor
Basis for testing and analysis:	EN ISO 13849-1:2015
Report:	EUFI29-20001742-I1

Functional safety characteristics

EN ISO 13849 category:	2
Diagnostic coverage (DC):	0.62
Mean time to dangerous failure ($MTTF_D$):	122 years
Fit for use in PL:	d

Notes from data

1. Failure Modes Effects and Diagnostic Analysis (FMEDA), and Component FMEA & MTTF – analysis are made in order to estimate Diagnostic coverage (DC) and Mean Time To Dangerous Failure ($MTTF_d$) of the system.
2. Only relay outputs are considered as safety outputs. Other outputs are possible and most suitable for certain purposes but their safety features are not included in this data sheet.
3. Complete list of ice detector parameters is available in the Installation and Operating Instructions. Following rules for parameter values need to be followed in order to fulfil the stated safety requirements: P0 < P1 < P2, P21 = 12.
4. Additionally, the installation and validation must be done according to the manual (DOC001181) in order to fulfil the stated safety requirements.

Signature

The authorized signatory to this declaration, on behalf of the manufacturer, and the Responsible Person based within the EU, is identified below.

Pirkkala 28.05.2020

Place and date

Janne Uusinoka, CEO
Labkotec Oy

Labkotec Oy Myllyhaantie 6, FI-33960 Pirkkala, Finland
Tel. +358 29 006 260, fax +358 29 006 1260

APPENDIX G. DECLARATION OF CONFORMITY

Labkotec
INDUTRADE GROUP

EU DECLARATION OF CONFORMITY

We hereby declare that the product named below has been designed to comply with the relevant requirements of the referenced directives and standards.

Product

Ice Detector for Wind Turbines and Meteorological Stations
LID-3300IP Type 2 Ice Detector, including
LID-3300IP Type 2 Control Unit and
LID/ISD Type 2 Ice Sensor

Manufacturer

Labkotec Oy
Myllyhaantie 6
FI-33960 Pirkkala
Finland

Directives

The product is in accordance with the following EU Directives:

2014/30/EU	Electromagnetic Compatibility Directive (EMC)
2014/35/EU	Low Voltage Directive (LVD)
2011/65/EU	Restriction of Hazardous Substances Directive (RoHS)

Standards

The following standards were applied:

EMC:	EN IEC 61000-6-4:2019 EN IEC 61000-6-2:2019
LVD:	EN 61010-1:2010 / A1 :2019 / AC :2019-04 EN 60204-1:2018
RoHS:	EN IEC 63000:2018

The product is CE-marked since 2018.

Signature

This declaration of conformity is issued under the sole responsibility of the manufacturer. Signed for and on behalf of Labkotec Oy.

Pirkkala 04.08.2021

Janne Uusinoka, CEO
Labkotec Oy