

# **Autoplugin Therminal – DX**

**Version 12.8**

**Description  
Installation Manual**

**Rev. A**

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### 1. Description

Autoplugin Therminal-DX is automotive climatic GSM-module intended for heater and ventilation remote control from mobile phones and smartphones. Voice call, SMS or Android/iOS application may be used to access Therminal. The applications use data transfer via proprietary secure internet server. In order to warm up the engine and the interior Therminal can control fuel and electric heaters, to ventilate the interior - climatic module, to cool the interior – engine start module.

### 2. Functionality

- Heater start and stop via SMS, from Therminal application for Android (4.1 and higher) or iOS (9 and higher) based smartphone, by voicecall
- Information about heater start and stop, heater runtime errors, interior

temperature, battery voltage and vehicle location inside the Android/iOS application or by SMS.

- Touch button for quick start and stop of the heater
- Separated heater and ventilation control
- Cooling and ventilation control modes
- Multiuser mode
- Car battery protection from discharge during the heater operation
- Errors reading and resetting for Webasto heaters via w-bus

### 3. Package content

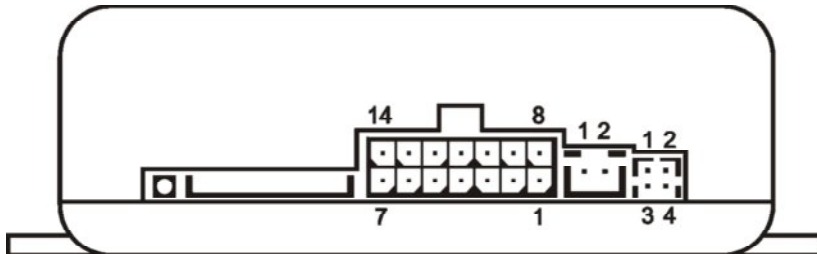
1. GSM-module Autoplugin Thermanal-DXC (0600-0000), Thermanal-DXE (0600-0002) or Thermanal-DXF (0600-0003)
2. Permanent connection cable
3. Outer temperature sensor with cable
4. LED-button with cable
5. Description and installation manual
6. Brief user manual brochure
7. Plug-n-play cable (optional)

### 4. Thermanal Main Functions Review

1. Refer to the **Brief User Manual** to control the heater from a mobile phone or a smartphone
2. To start the heater from the button shortly push and then release the button. The LED, embedded to the button, will light in red, confirming the heating start and stays lit during the heater operation.
3. Pushing the button during the heater operation stops the heating, the LED goes off.
4. For the factory installed heater, controlled via CAN-bus, it is available the heater control from a car's key (depends on car equipment, not for all supported cars). Press 3 times Lock button on the key in order to switch the heater on, press 3 times Unlock button in order to switch the heater off.

## 5. Inputs and Outputs. Signals Description

At the front side of Therminal enclosure there are placed from the right to the left: 4-contacts socket for outer LED button connection, 2-contacts socket for outer thermo sensor connection, 14-contacts socket for car wiring and peripherals connection, and finally the tray for SIM-card holder loading:



Therminal-XE/XF versions also have magenta colored FAKRA-D type connector for external GSM-antenna connection, версия Therminal-XF version additionally - blue colored FAKRA-C connector for external GPS/GLONASS-antenna connection.

Table 1. 14-contact socket signals description

| Contact № | Signal name | Polarity | Wire colour in harness* | Description   |
|-----------|-------------|----------|-------------------------|---|
| 1         | CAN1-H      | +        | Brown                   | Digital bus CAN 1, line High  |
| 2         | CAN2-H      | +        | Green                   | Digital bus CAN 2, line High  |
| 3         | IN-         | -        | Grey                    | Programmable discrete input, negative   |
| 4         | OUT+        | +        | White                   | Programmable discrete output, positive  |
| 5         | OUT2-       | -        | Blue                    | Programmable discrete output, negative  |
| 6         | Power       | +        | Red                     | Permanent battery "+" (12/24 Volts)   |
| 7         | Ground      | -        | Black                   | Permanent battery "-" (0 Volts)   |
| 8         | CAN1-L      | +        | Brown-White             | Digital bus CAN 1, line Low   |
| 9         | CAN2-L      | +        | Green-Yellow            | Digital bus CAN 2, line Low   |
| 10        | IN +        | +        | Orange                  | Programmable discrete input, positive   |
| 11        | LIN         | -        | Yellow                  | Digital bus LIN (w-bus)   |
| 12        | OUT1-       | -        | White-Blue              | Programmable discrete output, negative  |
| 13        | Power       | +        | Red                     | Permanent battery "+" (12/24 Volts) for powering of conjugated with Therminal modules |
| 14        | Ground      | -        | Black                   | Permanent battery "-" (0 Volts) for powering of conjugated with Therminal modules     |

## 6. Connection Schemes

In order to warm up the engine and the interior Thermanal can control fuel and electric heaters, engine start and climatic modules; to ventilate the interior - climatic module; to cool the interior – engine start module.

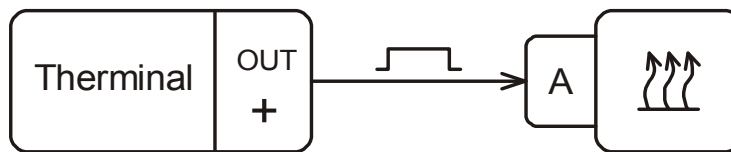
- Power connection

Signal BATTERY+ connects to the “+” vehicle’s battery terminal through 3A fuse, signal BATTERY- connects to the “-” vehicle’s battery terminal or vehicle’s body.

### 6.1. Heater Control by Continuous ‘+’ Signal

Thermanal has got the line OUT+ in order to control a heater by continuous ‘+’ signal. It can be used for control of fuel fired heaters like Eberspacher Hydronic, Webasto Thermo Top and also for electrical heaters like DEFA WarmUp.

- Connection of fuel fired heater or electrical heater of the engine/interior (cabin)



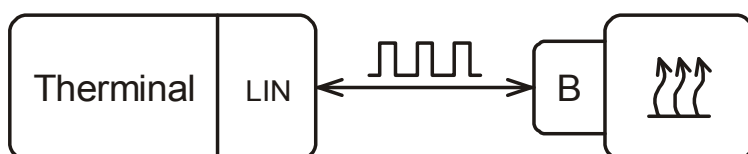
| Heater type                           | Wire colour | Terminal A                                |
|---------------------------------------|-------------|---|
| Webasto Thermo Top C / E <sup>1</sup> | Black       | Connector X1, pin 1                       |
| Eberspacher Hydronic <sup>1</sup>     | Yellow      | Connector B1, pin 7                       |
| DEFA WarmUp <sup>2</sup>              | Yellow      | ⊙ (Multicharger 1203)<br>+ (Plugin Relay) |

<sup>1</sup>Adjustments applied for fuel heater: **set hardware=151,164** (default settings)

<sup>2</sup>Adjustments applied for electrical heater: **set hardware=156,164**

### 6.2. Heater Control via LIN Bus (W-Bus)

Thermanal can control Webasto heaters by digital line W-bus. When Thermanal is connected to Webasto TT-V, Evo, Vevo or Z via w-bus, the heater operation can be determined automatically, without need of additional connections. By default Thermanal determines heater operation by blowing fan status (setting 4.D.3), applies automatic selection of heater start mode (setting 4.C.F), and uses the commands of diagnostic software tool Webasto Thermo Test (setting 4.B.F).



Adjustments applied: **set hardware=251** (default settings)

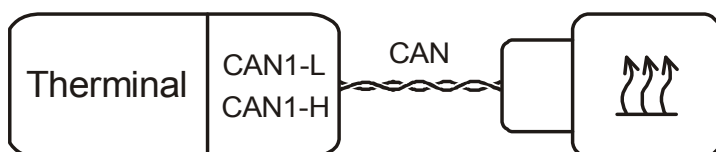
| Heater type   | Wire colour | Terminal B                 |
|---|-------------|----------------------------|
| Webasto Thermo Top<br>C / E / Evo / V / Vevo / Z<br>(aftermarket)           | Yellow      | 6-pins connector X1, pin 2 |
| Webasto Thermo Top<br>Evo / V (factory installed on Ford<br>cars)           |             | 6-pins connector X1, pin 2 |
| Webasto Thermo Top C<br>(factory installed on VW, Audi,<br>Skoda, BMW cars) |             | 6-pins connector X1, pin 1 |
| Webasto Thermo Top V<br>(factory installed on Land Rover cars)              |             | 8-pins connector X1, pin 2 |

For factory installed Webasto heaters it may be necessary to set up the type of control command (4.B.\* settings).

When the auxiliary heater is upgraded to the parking heater with remote control, it may be needed to install the water pump for coolant circulation during the engine is not running. The control of the pump is proceeded by the means of relay connected to free Thermanal output: OUT+,OUT1- or OUT2-, programmed for the heater control by continuous signal.

When Webasto heater is connected via w-bus, the functions of heater errors reading and resetting are available from configuration web-console (**config.autoplugin.m2mgate.net**, *under construction yet*). The login and password for panel accessing can be requested by the SMS sent from administrator's phone: 1234 get webaccess.

### 6.3. Factory Heater Control via CAN Bus



For car models, listed in the table below, Thermanal can control the factory installed heater directly via CAN bus. 2-wire CAN-bus in the car is a bus of two wires twisted in the pair.

In order to control the factory installed heater via CAN connect module's signals CAN1-L and CAN1-H in accordance with the table. Connect the power to the module, wait for network registration complete (5 flashes in series by the LED-button), then switch the ignition on for 30 seconds. The module will recognize the CAN-bus automatically and store CAN program number in the non-volatile memory. You can check the CAN program number by SMS-command:

**1234 get carinfo**

In the received response the field {CAN:} contains the number and the name of selected program, i.e:

**CAN:AUTO;'All v12.0.4 ';#4'Volvo P3/2013 ';R** – means CAN program #4

**CAN:AUTO;'All v12.0.4 ';n/a** – means the CAN program is not selected

When Thermanal is connected to the CAN-bus, the heater status will be read from the bus automatically. New and updated CAN programs can be loaded to the module remotely if necessary.

| Brand/ cars models list (years of production)<br>[#CAN program number]   | CAN1-L wire    | CAN1-H wire  |
|--|----------------|--------------|
|  | (twisted pair) |              |
| *Audi Q7 (2011-2014)[#32]  | Orange-brown   | Orange-green |
| *BMW E65/E66 (2001-2008)[#50]  | Green          | Orange       |
| *BMW E90/E91/E92/E93 (2005-2012)[ #50], E70 (2006-2013)[ #50], E71 (2007-2013)[ #50], F01/F02 (2010-2015)[ #50], F07 (2009-2017)[ #50], F10/F11  | Green          | Orange-green |
| Ford Focus-2 (2005-)[#16], C-Max (2004-)[#16], Kuga (2008-)[#16]   | Blue           | Grey         |
| *Ford Focus-3 (2010-)[#17], C-Max-2 (2010-)[#17], Grand C-Max (2010-)[#17], Kuga-2 (2013-)[#17], Connect (2014-)[#17], Mondeo (2007-)[#18], S-Max (2007-)[#18], Galaxy (2007-) [#18], Transit Custom (2013-)[#19], Tourneo Custom (2013-)[#19], Transit Van (2014-)[#19] | Violet-orange  | Grey-orange  |
| * <sup>1</sup> Mercedes 156 [#60], 166 [#60], 292[#60], 463[#60]   | Brown          | Brown-red    |
| *Volvo S60 (2001-)[#8], V70 (2001-)[#8], XC70 (2001-)[#8], S80 (2001-)[#8], XC90 (2002-)[#8], S60 (2005-)[#9], V70 (2005-)[#9], XC70 (2005-)[#1], S80 (2005-)[#9], XC90 (2005-)[#1]  | Green          | White        |
| * Volvo S60 (2010-)[#2], XC60 (2008-2011)[#2], XC60 (2012)[#3], XC60 (2013-2017)[#4], V70/ XC70 (2007-2011)[#2], V70/ XC70 (2012-2016)[#3], S80 (2007-2013)[#2], S80 (2014-2016)[#3], V40/ V40CC (2012-)[#7]   | Violet-orange  | Grey-orange  |

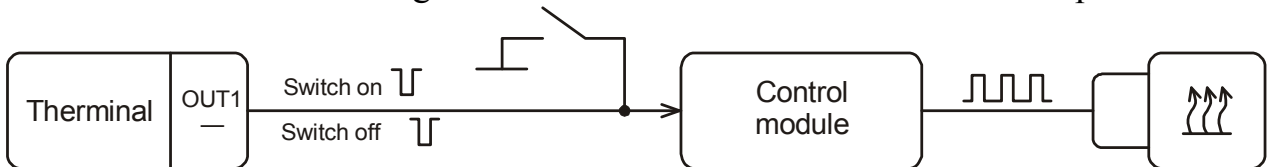
|   |              |               |
|---|--------------|---------------|
| *Volvo XC60 (2017-)[#5], S90 (2017-)[#5], V90 (2017-)[#5], XC90 (2015-)[#5] | Violet-green | Violet-white  |
| *Volvo C30 (2007-)[#6], S40 (2006-)[#6], V50 (2006-)[#6], C70 (2007-)[#6]   | Blue-red     | Grey-red      |
| *Volkswagen Touareg NF/FL (2010-)[#33]                                      | Orange-brown | Orange-violet |

\*- the heater should be configured in the car as parking heater (not a supplemental heater only), with Direct Start function

<sup>1</sup> – the control is available only in cars with the original heater control button placed on the dashboard

## 6.4. Specific Variants of Heater Control

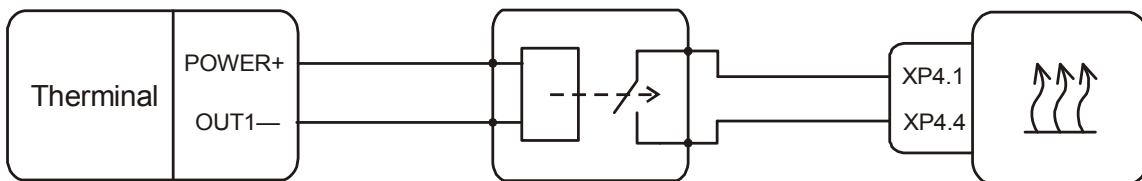
- Connection to the original control button or to the mini-timer's input



Adjustments applied: **set hardware=171,183**

- Binar-5B/D-Compact, Binar-5S heaters

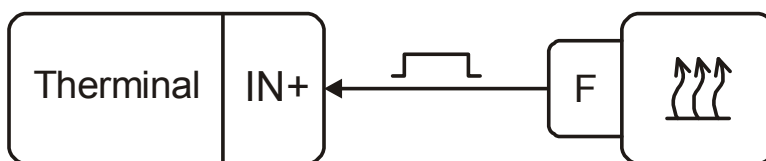
The additional relay needs to be installed for connection:



Adjustments applied: **set hardware=171,184**

## 6.5. Fuel Heater Feedback Connection

By using the scheme below Therminal will notify with actual information about heater startup, stop and runtime errors.





| Heater type  | Wire colour | Terminal F                               |
|--|-------------|--|
| Webasto Thermo Top C / E / Evo <sup>1</sup> / V <sup>1</sup> / Vevo <sup>1</sup> / Z | Blue        | Connector X1, pin 6 (fuel pump)          |
| Webasto Thermo Top Evo <sup>1</sup> / V <sup>1</sup> / Vevo <sup>1</sup>             | Black       | Connector X4, pin 2 (water pump)         |
| Eberspacher Hydronic   | Green       | Connector B1, pin 4 (fuel pump)          |
| Eberspacher Hydronic WS  | Black       | Connector S7, pin B (external fuel pump) |
| Eberspacher Hydronic II S  | Violet      | Connector B1, pin 8 (external fuel pump) |
| Binar-5B/D-Compact, Binar-5S   | Yellow      | XP2.3 Water Pump Control                 |
|  | Red/Black   | XS1.1 Fuel Pump Control                  |

<sup>1</sup> Apply only when feedback via w-bus is switched off (setting 4.D.F adjusted)

Adjustments applied: **set hardware=119,124** (factory setting)

*Note: It is not allowed to combine together several signals and connect them to the input IN+ without использования элементов для развязки*

## 6.6. Separated Interior (Cabin) Warm Up Control

Therminal allows to setup separated heating of the engine and the interior for fuel fired and electrical heaters.

Being started from the button Therminal always switches on the interior warm up at the same time as the heater startup. When the startup source is SMS, voice call or application, the interior warm up will be switched on, if all of conditions listed below are satisfied:

- Ventilation button in the app is active, or SMS start command includes +FAN parameter, or the heater start source is a voice call
- Active signal is present on the Therminal's input, adjusted for ventilation control. Or adjusted and satisfied one of table settings 4.4 or 4.5
- The battery is not discharged (table setting 5.9 is satisfied)

In order to control the interior warm up from Therminal it is necessary to set up in the hardware settings one of the outputs OUT+, OUT1- или OUT2- : select the output's function – interior warm up control, and the type of control signal (impulse, potential or trigger). And connect it in accordance with one of typical connection schemes below.

## 6.7. Engine Start Control

In order to boost the heating process, to restore battery capacity or to cool the interior/cabin the Therminal can control the outer engine start module (ex. Fortin or iDataLink). The engine startup is detected by the battery voltage rising due to the generator operation.

Independently of the heater start method the Therminal activate the engine start in case if battery voltage level lowers to adjusted by setting 4.6 threshold. When the heater startup source is SMS, voice call or application, the engine start will be switched on, if all of conditions listed below are satisfied:

- Engine button in the app is active, or SMS start command includes +ENGINE parameter, or the heater start source is a voice call
- Adjusted and satisfied one of table settings 4.8 or 4.9

Except of heating boost mode the engine start is applied in the following cases:

- Cooling mode is selected and used in the app
- Heating mode is selected and used in the app, but the heater control is switched off by settings of Therminal. In that case the app uses the engine start in order to warm up the engine and the interior/cabin
- SMS-command ENGINE ON was received

In order to control the engine start up from Therminal it is necessary to set up in the hardware settings one of the outputs OUT+, OUT1- или OUT2- : select the output's function – engine start up control, and the type of control signal (impulse, potential or trigger). And connect it to the engine start module in accordance with engine start module documentation.

## 6.8. Interior (Cabin) Ventilation Control

Therminal differentiates interior ventilation and interior warm up modes, allowing to set up different outputs for the modes control. If one ventilation control device is used for both modes (ex. IPCU or Autoplugin Klimat), the outputs can be combined for connection.

When Therminal connects to the factory heater via w-bus or CAN-bus, ventilation mode will be available, if it is supported by car configuration.

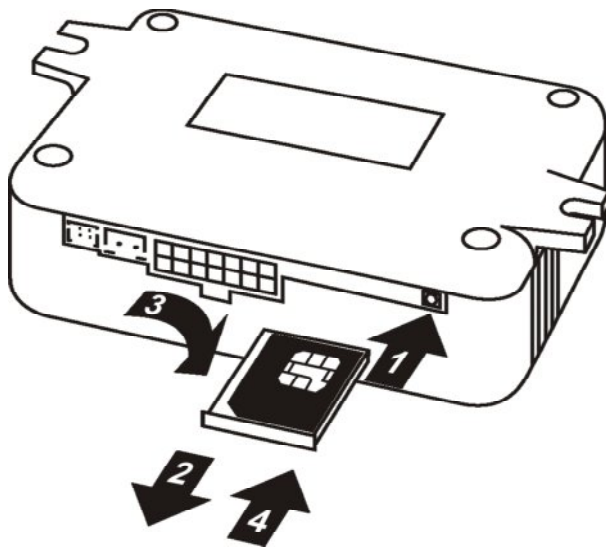
## 7. SIM Installation

SIM-card in Mini-SIM format is required for GSM-module operation and should be purchased separately from local GSM operator (2G network with GPRS tech-

nology support is demanded). *If the operator supports 3G/4G phones only, a SIM-card from the operator can't be used in Terminal.*

Some SIM cards (usually ones produced in 2000s) require some preparing operations to be done:

1. Put the SIM-card to a mobile phone and disable PIN-code request on phone reboot (brand new cards are usually supplied with disabled PIN request).
2. Check for SMS-center number is written in SIM-card memory. All up-to-date SIMs are supplied with SMS-center written. The number may absent for old SIM-cards. Put the SIM-card to a mobile phone, then send SMS to another mobile phone, check for SMS delivery.



Choose tariff plans with non-expensive/pre-paid SMS traffic for control by SMS or with pre-paid mobile data traffic for control via Internet (50-100 Mb per month is enough). Combine phone account with GSM module account if possible.

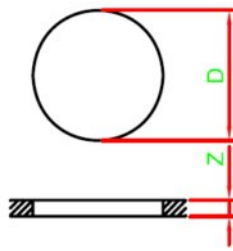
Android application allows use both the mobile data and SMS, iOS application allows use the mobile data only.

Install SIM card into the GSM-module, as shown at the figure. The operation should be performed with unplugged power from the GSM-module. Press with a thin blunt object (phillips screwdriver, pen, etc.) on the SIM-holder ejector pushbutton (1), pull for the SIM-holder and pull the holder out of the housing (2). Then put the SIM into the holder to commit (3) and insert the holder back to the housing up to the stop (4).

## 8. Button Installation

The device is completed by the pushbutton with embedded LED, which can be mounted on the dashboard for one-touch heater start and stop. It is recommended to install the button to a stub of absent dashboard's original button. Drill the hole with diameter D depending on thickness of material Z (see figure below), then pull

the button's cable through the hole, and finally push and fix the button in the hole. Sizes in the table are in millimeters.



| Z         | D         |
|-----------|-----------|
| 1.0 ~ 2.0 | 8.0 ~ 8.2 |
| 2.0 ~ 2.5 | 8.2 ~ 8.4 |
| 2.5 ~ 3.0 | 8.4 ~ 8.6 |

## 9. Temperature Sensor Installation

The device is completed by the sensor for temperature monitoring inside the interior (cabin). The sensor may be mounted near a ventilation canal or on the roof console. Choose an appropriate location for the sensor and fix it with a mounting pad.

## 10. Antenna Installation

Therminal-DXC is equipped with embedded antenna. For the best signal receiving it is necessary to mount the GSM-module as close as possible to the windows line of the vehicle's body (cabin). It is not recommended to install the module inside closed body's niches, because it can lead to unstable GSM-module connection with a network.

Therminal-DXE is completed by external pin type GSM-antenna, which may be mounted on the windshield or on a motionless side window. The antenna's cable length is 1.8 meters. The antenna and its cable also may be mounted under the window's molding or window's pillar trim. But it is important to place the antenna not closer than 3 centimeters from body's metal parts.

Therminal-DXF is completed with 2 external antennas: GPS/GLONASS navigation antenna and pin type GSM-antenna (with cables 1.8 long). It is recommended to place navigation antenna on the top of the dashboard, under the windshield. Be sure the navigation antenna is not covered up by metal parts from the sky.

## 11. Therminal Adjustment

It is necessary to launch the procedure called Quickstart before you get started with Therminal. Refer to the *Brief User Manual* for details.

Therminal adjustment may be performed from web-console or by SMS from a phone or smartphone. Refer to the *Full User Manual* for details.

## 12. Troubleshooting

If a problem exists with the heater startup, try sequentially start the heater from the key, then from the button and finally – from a phone.

If the heater doesn't start from the button, check the connection correctness, the function and signal type of the output control line. Startup from the button operates independently from GSM network status. In case when the heater starts from the button, but doesn't start via GSM (SMS, voice call or app) use GSM-module indication for diagnostics: press and hold the button until the embedded LED flashes from 5 to 10 times, then release the button. GSM-module goes to status indication mode. Status indication mode also becomes active for 2 minutes after boot or re-start. See table below for details.

| Number of flashes in series | GSM-module status                     | User action required  |
|-----------------------------|---------------------------------------|---|
| 2                           | Not available for GSM control         | <ol style="list-style-type: none"> <li>1. Check for presence of SIM in GSM module</li> <li>2. Check that SIM installed correctly</li> <li>3. Install SIM into a phone and disable PIN request</li> <li>4. Check that GSM-module number is active: make a voice call and wait for «busy» tone<sup>2</sup></li> <li>5. Make sure that the GSM-module hasn't went to Shutdown mode by reason of battery discharge</li> </ol> |
| 3                           | Waiting for GSM ready                 | GSM-module is temporary unavailable. No user action required.   |
| 4                           | Waiting for GSM registration complete | GSM-module is temporary unavailable. Possible reasons: no available networks (no signal, roaming prohibited), SIM locked by the provider. Change button indication mode to check GSM signal strength level  |
| 5 or 6                      | Ready for command reception           | No user action required   |

<sup>1</sup>Disconnect GSM-module from power supply before the operation

<sup>2</sup>Heater start will be performed. Make the second voice call to stop the heater

### **13. Technical Characteristics**

Protection: IP44

Operating voltage: 7..30V

Operating temperature (excluding SIM): -40..+85°C

Power consumption in GPRS data transfer mode: up to 1.5W (for a short time)

Power consumption in GSM operation mode: 0.14W

Power consumption in GSM searching mode: 0.4W

Power consumption in Standby mode: 70mW

Power consumption in Powerdown mode: 10mW

### **14. Glossary**

CAN - Control Area Network (digital bus for data transfer in vehicles)

GSM - Global System for Mobile (cellular network standard)

GPRS – General Packet Radio System (packet data transfer standard)

LED - Light Emission Diode

SIM - Subscriber Identification Module

SMS - Short Message Service



