UVR16x2
Freely programmable universal controller
Relay version

Installation instructions
Table of contents

Safety requirements .......................................................................................................................... 4
Maintenance ....................................................................................................................................... 4
Installing the device ........................................................................................................................ 5
  Opening the mounting base ........................................................................................................... 6
  Dimensioned drawings ................................................................................................................... 7
  External dimensions, mounting base ............................................................................................ 7
  Dimensions, mounting base fixings ............................................................................................... 8
  Dimensions, terminal mounting plate ........................................................................................... 8
  Dimensions, controller with terminal mounting plate (= UVR16x2S) ......................................... 9
Sensor installation .......................................................................................................................... 10
Electrical connection ...................................................................................................................... 11
  Termination guide ......................................................................................................................... 12
  Complete overview of terminals ................................................................................................... 13
  Sensor leads ..................................................................................................................................... 14
    Sensor terminal diagram ............................................................................................................. 14
  Data cable for DL BUS ................................................................................................................... 15
    BUS load from DL sensors ......................................................................................................... 15
    Terminal diagram, DL BUS data cable ....................................................................................... 15
  CAN BUS network ....................................................................................................................... 16
    Terminal diagram, CAN BUS cable ........................................................................................... 16
    Guidelines for the topology of a CAN network ........................................................................... 16
      Technical principles .................................................................................................................. 16
      Lightning protection .................................................................................................................. 17
      Examples of different network versions .................................................................................. 17
    Cable selection and network topology ....................................................................................... 19
  24 V= power supply ...................................................................................................................... 22
  Outputs .......................................................................................................................................... 22
    Terminal diagram, outputs ........................................................................................................ 22
    Connection auxiliary relays ....................................................................................................... 23
      HIREL-230V wiring diagram .................................................................................................... 24
      HIREL-PF wiring diagram ........................................................................................................ 24
Technical data UVR16x2 ................................................................................................................... 25
Standard delivery ............................................................................................................................ 26
Tips on troubleshooting ................................................................................................................. 26
  Troubleshooting in the CAN network ............................................................................................ 28
Information on the Eco-design Directive 2009/125/EC ..................................................................... 28
Safety requirements

These instructions are intended exclusively for authorised contractors. All installation and wiring work on the controller must only be carried out in a zero volt state. The opening, connection and commissioning of the device may only be carried out by competent personnel. While doing so, they must observe all local safety requirements.

This device is state of the art and meets all necessary safety regulations. It may only be used in accordance with the technical data and the safety requirements and regulations listed below. When using the device, also observe the statutory and safety regulations apposite to the particular use. Any other use will automatically void all warranty rights.

► The device must only be installed in a dry interior room.
► It must be possible to isolate the controller from the mains using an omnipolar isolating facility (plug/socket or 2-pole isolator).
► Before starting installation or wiring work, the controller must be completely isolated from the mains and protected against reconnection. Never interchange the safety low voltage connections (e.g. sensor connections) with the 230 V connections. Destruction and life threatening voltages at the device and the connected sensors may occur.
► Solar thermal systems can become very hot. Consequently there is a risk of burns. Proceed with caution when fitting temperature sensors.
► For safety reasons, the outputs should only be left in manual mode when testing. In this operating mode, no maximum temperatures or sensor functions are monitored.
► Safe operation is no longer possible if the controller or connected equipment exhibits visual damage, no longer functions or has been stored for lengthy periods in unsuitable conditions. If this is the case, disable the controller and equipment and secure against unintentional use.

Maintenance

If treated and used correctly, the device will not require any maintenance. Use a cloth moistened with mild alcohol (such as methylated spirits) to clean. Never use corrosive cleaning agents or solvents such as chloroethylene or trichloroethylene.

No components relevant to long term accuracy are subject to loading if the device is used correctly. Consequently long term drift is extremely low. The device therefore cannot be calibrated. Thus applying any compensation is impossible.

The design characteristics of the device must not be changed during repairs. Spare parts must correspond to the original spare parts and must be used in accordance with the build version.

Disposal

► Devices no longer in use or beyond a state of repair must be disposed of in an environmentally responsible manner by an authorised collection point. They must never be treated as ordinary household waste.
► We can undertake the environmentally responsible disposal of devices sold by Technische Alternative upon request.
► Packaging material must be disposed of in an environmentally responsible manner.
► Incorrect disposal may result in considerable damage to the environment, as many of the materials used require professional handling.
Standard delivery

UVR16x2-K
- UVR16x2-K controller
- Mounting base
- SD card
- Operating pen
- Operating instructions
- Installation instructions

UVR16x2-S
- UVR16x2-S controller
- Terminal mounting plate with terminals
- SD card
- Operating pen
- Operating instructions
- Installation instructions

Installing the device

The controller can be used as a surface mounted device or as an integrated device:

- **Surface mounted controller with mounting base UVR16x2K**
  Fix the mounting base to the wall at eye level height *(approximately 1.6 m)* using the fixing materials supplied. Cable entries for the 230 V supply and connection lines are at the bottom; for the LV leads they are at the top.

- **Installation with terminal mounting plate UVR16x2S**
  This installation method is intended for mounting inside a distribution board.
  The terminal mounting plate can be mounted either by means of four fixing points or on a top-hat rail (support rail TS35 to standard EN 50022).

  ![Diagram of terminal mounting plate](image)

  The two lateral locking clamps also enable the controller to be clicked into a **sheet steel front plate**.

Conversion of the version with mounting base to an integrated version

The terminal mounting plate is secured in the lower section of the mounting base.
It is removed from the mounting base by undoing both locking clamps using a screwdriver.

![Conversion process](image)
Opening the mounting base

**CAUTION** Always disconnect the mains plug before opening the mounting base.

1. Open the top flap.

2. With two large screwdrivers, push both locking clamps (arrows in the diagram on the left) and lever the device out of the mounting base.

3. After removing the controller, unhook the closures (arrows in the diagram on the left) by pushing them down (using a small screwdriver or the programming stylus) and remove the mounting base cover from the lower section.
Dimensioned drawings
External dimensions, mounting base
Dimensions, mounting base fixings

Unlocking clamps for support rail mounting (top-hat rail TS35)

Dimensions, terminal mounting plate
Dimensions, controller with terminal mounting plate (= UVR16x2S)

Cut-out dimensions for controller UVR16x2S: 138 x 91 mm, installed depth including terminal mounting plate: 70 mm
Sensor installation

Correct arrangement and installation of the sensors is extremely important for correct functioning of the system. To this end, also ensure that they are completely inserted in their sensor wells. The cable fittings provided serve as strain relief. When used outdoors, no water must be allowed to penetrate the sensor wells (risk of frost). The contact sensors must be insulated well to protect them from being influenced by the ambient temperature.

Fundamentally, sensors should not be exposed to moisture (such as condensation) since this can diffuse through the cast resin and damage the sensor. If this happens, heating the sensor to 90 °C for an hour may help. When using sensor wells in stainless steel cylinders or swimming pools, particular attention must be given to their corrosion resistance.

Collector sensor (grey lead with junction box):
- Either insert into a pipe which is brazed or riveted directly to the absorber and protrudes from the collector housing,
- or insert a tee into the flow manifold of the outermost collector into which the sensor well, together with the brass cable fitting (= protection against moisture), can be inserted; then insert the sensor.
- To protect against lightning damage, the junction box has a surge protection (voltage dependent resistor) which is clamped in parallel between the sensor and the extension cable.

Boiler sensor (boiler flow): This sensor is either inserted into a sensor well in the boiler or fitted to the flow line as close to the boiler as possible.

DHW cylinder sensor: The sensor required for the solar thermal system should be used with a sensor well for finned tube heat exchangers just above the exchanger or, if integrated smooth tube heat exchangers are used, in the lower third of the exchanger or the exchanger’s return outlet so that the sensor well protrudes into the heat exchanger tube. The sensor monitoring the heating of the DHW cylinder by the boiler is installed at a level corresponding to the amount of domestic hot water required during the heating season. The supplied cable fitting acts as strain relief. Installation below the associated coil or heat exchanger is not permissible under any circumstances.

Buffer sensor: The sensor required for the solar thermal system is fitted in the lower section of the cylinder just above the solar indirect coil using the sensor well supplied. The supplied cable fitting acts as strain relief. As the reference sensor for the heating system hydraulics, it is recommended to insert the sensor into the sensor well between the centre and upper third of the buffer cylinder, or positioned against the cylinder wall underneath the insulation.

Pool sensor (swimming pool): Fit a tee into the suction line immediately on the pool outlet and insert the sensor with a sensor well. In the process, ensure the material used is corrosion-resistant. A further option would be to fit the sensor as a contact sensor with appropriate thermal insulation against ambient influences.

Contact sensor: Use scroll springs, pipe clips, etc. to attach the contact sensor to the respective line. Ensure the material used is suitable (corrosion, temperature resistance, etc.). Then insulate the sensor thoroughly so that the pipe temperature is captured accurately and ambient temperatures cannot falsify the result.
DHW sensor: A rapid reaction to changes in the water volume is extremely important when using the controller in systems that generate domestic hot water by means of an external heat exchanger and variable speed pump (freshwater module). Therefore fit the DHW sensor directly on the heat exchanger outlet. This ultra-quick sensor (special accessory, type MSP ...) should protrude into the output with the aid of a tee sealed in with an O-ring. The heat exchanger should be installed upright with the DHW outlet at the top.

Radiation sensor: The parallel collector orientation is important in order to obtain a measurement that corresponds to the collector position. Consequently it should be secured to the sheet steel covering or adjacent to the collector on an extension of the mounting rail. To this end, the sensor casing has a blind hole that can be opened at any time. The sensor is also available as a wireless version.

Room sensor: This sensor is intended for installation in the living space (reference room). Do not install the room sensor near a heat source or window. By simply replugging a jumper inside the sensor, each room sensor can also be used exclusively as a remote adjuster (no room temperature influence). It is only suitable for operation in dry rooms. The sensor is also available as a wireless version.

Outside temperature sensor: This sensor is installed on the coldest wall (usually facing north) some two metres above the ground. Avoid temperature influences from nearby air shafts, open windows, cable ways, etc. It must not be subjected to direct insolation.

**Electrical connection**

This must only be carried out by a qualified electrician in accordance with the relevant local regulations.

**Note:** In line with regulations, the system must be equipped with protection against lightning (surge arrester). Sensor failures due to thunderstorms and static electricity are usually the result of missing or incorrect earthing or missing surge protection.

**Caution:** Only work inside the mounting base when the power supply is fully isolated. Assembling the device with the power connected may result in damage.

Connect all sensors and pumps/valves as they are numbered in the respective program.

In the mains voltage range, fine wire cross-sections of 0.75 - 1.5 mm² are recommended, except for the supply cable.

A terminal strip above the cable entries is available for the earth conductors (PE). All cables can be fixed with a locking clamp (= strain relief) immediately after termination. Subsequently, side cutters are required to remove the locking clamps; therefore, more clamps than necessary are provided.
Termination guide

Each controller is supplied with a guide containing the terminal markings, which is clamped between the low voltage and 230 V terminals. After completion of the electrical connection, this guide can either be retained inside the controller or removed.

View with the guide fitted:
Complete overview of terminals

Sensor earth

Switching outputs

Caution: Output A5 is potential-free, i.e. is not connected to the mains power.
Sensor leads
Sensor terminal diagram

Sensors are always connected across the relevant sensor terminal (S1 – S16) and sensor earth (GND). An earth strip is located at the top of the mounting base. A connection is established from this strip to the GND terminal.

In order to prevent measurement fluctuations and ensure perfect signal transmission, sensor leads must not be subject to external negative influences through 230 V cables.

Never run sensor leads together with mains voltage cables in the same conduit.

When using non-screened cables, route sensor leads and 230 V cables either in separate cable conduits or with a minimum clearance of 5 cm.

Sensor leads for PT100 or PT500 sensors must be screened.

If screened cables are used, the screen must be connected to the sensor earth (GND)

All sensor leads with a cross-section of 0.5 mm² can be extended to up to 50 metres. With this lead length and a PT1000 temperature sensor, the measuring error is approximately +1 K. A correspondingly larger cross-section is required for longer leads or a lesser measuring error.

The connection between the sensor and the extension can be made by pushing heat shrink tubing (trimmed to 4 cm) over one core and twisting the bare wire ends. Solder the connection if one of the wire ends has been tin-plated.

Then push the heat shrink tubing over the connection and heat up carefully (e.g. with a lighter) until it sits tightly over the connection.
Data cable for DL BUS

The DL BUS consists of just 2 wires: DL and GND (sensor earth). The DL BUS itself supplies the necessary power for the DL BUS sensors.

Cables can be routed with a star topology but also in serial formation (from one device to the next).

Any cable with a cross-section of 0.75 mm², and measuring up to 30 m in length, can be used as a data link. For lengths greater than 30 m, the use of screened cables is recommended, which increases the reliable length of the cable to 100 m.

If screened cables are used, the screen must be connected to the GND.

Long cable conduits routed closely next to each other for mains and data cables result in faults being induced into the data cables from the mains. We therefore recommend a minimum clearance of 20 cm between two cable conduits or the use of screened cables.

Use separate, screened cables when capturing data from two controllers with a single datalogger. Never run the data cable together with a CAN BUS cable in the same conduit.

BUS load from DL sensors

A 2-pole cable provides both the power supply and the signal transfer from DL BUS sensors. An additional power supply by means of an external power supply unit (such as with the CAN BUS) is not possible.

Take the "BUS load" into consideration as sensors have a relatively high current demand:

The UVR16x2 controller supplies the total BUS load. The BUS loads of the electronic sensors are listed in the technical data of the relevant sensors.

Example: The electronic sensor FTS4-50DL has a BUS load of 25 %. Consequently up to four FTS4-50DL can be connected to the DL BUS.

Terminal diagram, DL BUS data cable
CAN BUS network

Terminal diagram, CAN BUS cable

Sensor earth

Guidelines for the topology of a CAN network

Technical principles

The CAN BUS comprises the cables CAN-High, CAN-Low, GND and one +12 V supply cable for BUS components without their own power supply. The combined total load of all devices with 12 V and 24 V supply must not exceed 6 W.

Design CAN networks in a linear fashion and set a terminator at each network termination. This is ensured by the termination of the end devices.

In the case of larger networks (covering several buildings), problems can occur through electromagnetic interference and potential differences. To avoid or to the greatest extent manage such problems, take the following measures:

- **Cable screening**
  The BUS cable screen must be connected well at every node to provide continuity. For larger networks we recommend including the screen in the equipotential bonding, in line with the examples shown.

- **Equipotential bonding**
  As low an ohm connection as possible to the earth potential is particularly important. Where cables enter buildings, ensure that the cable entries are in the same location where possible and that all are connected to the same equipotential bonding system (Single Entry Single Point principle). The purpose is to create potentials that are as similar as possible, in order to achieve the smallest possible potential difference to adjacent lines in case one line suffers a voltage surge (lightning strike). Also ensure a corresponding clearance between the cable and lightning protection systems.

The equipotential bonding also has positive properties to counteract interferences emitted from linked cables.
**Avoiding earth loops**

Where a BUS cable is routed between several buildings, ensure that earth loops are avoided. The reason for this is that buildings actually have different potentials compared to the earth potential. An earth loop is created when connecting one cable screen in each building directly with the equipotential bonding system. In other words, a current flows from the higher to the lower potential.

For example, if lightning strikes near one of the buildings, the potential of that building will briefly be raised by several kV. In this case, the equalising current flows to earth via the BUS screen and causes an extreme electromagnetic input which can result in the destruction of the BUS components.

**Lightning protection**

Efficient lighting protection is highly dependent on good building earthing that meets the relevant regulations.

An external lightning protection system offers protection against a direct lightning strike.

In order to protect against voltage surges in the 230 V mains supply cable (indirect lightning strike), appropriate lightning conductors and surge arresters compliant with local regulations must be fitted in the upstream distribution systems.

In order to protect the individual components of a CAN network against indirect lightning strike, we recommend the use of surge arresters specifically developed for BUS systems.

**Examples:**
- CAN bus surge arresters CAN-UES from Technische Alternative
- Gas discharge arrester for indirect earthing EPCOS N81-A90X

**Examples of different network versions**

**Key to symbols:**
- ... device with its own power supply (UVR16x2, UVR1611K, UVR1611S, UVR1611E)
- ... device is supplied by the BUS (CAN I/O, CAN-MT, ...)
- ... CAN BUS converter (CAN-BC2)
- ... terminated (end devices)
- ... open termination
- ... CAN BUS surge arrester
- ... gas discharge arrester for indirect earthing

"Small" network (within one building):

Max. cable length: 1000 m at 50 kbit/s

The screen must be continued at each network node and be connected to the device earth (GND). The screen earthing or GND must only be implemented indirectly via a gas discharge arrester. Ensure that no unintentional direct connection of earth or screen and the earth potential is created (e.g. via sensors and the earthed pipework).
Network (across several buildings) without CAN bus converter CAN-BC2:

Max. cable length: 1000 m at 50 kbit/s
The screen must be continued at every network node and earthed at a single point, as close to the cable centre as possible. We recommend earthing the screen indirectly in the other buildings using a gas discharge arrester. The screen is not connected with the earth (GND) of the devices.

Network (across several buildings) with CAN BUS converter CAN-BC2:

Maximum cable length: subject to the set Baud rate CAN-BC2
The screen of the disconnected network is connected at each BUS converter to CAN BUS earth (GND). This screen must not be directly earthed.
Without CAN BUS surge arresters, this version only protects against potential differences up to 1 kV, therefore cannot be considered as lightning protection. In this case, the cable screen must be earthed at a single point between the CAN bus converters, as close to the cable centre as possible. We recommend earthing the screen indirectly in the other buildings using a gas discharge arrester.
A CAN bus converter is similar to a repeater. It receives CAN bus signals and passes them on. Each cable run on either side of the CAN bus converter must therefore be viewed as an independent CAN bus network.
Cable selection and network topology

Screened twisted pairs have proven useful in CANopen networks. These are cables with twisted pairs of conductors and a shared external screen. Such cables are relatively resistant to EMC interference and can still carry 50 kbit/s for up to 1000 m. The CANopen recommendations (CiA DR 303-1) for cable cross-sections are given in the table below.

<table>
<thead>
<tr>
<th>BUS length [m]</th>
<th>Resistance in terms of length [mΩ/m]</th>
<th>Cross-section [mm²]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0...40</td>
<td>70</td>
<td>0.25...0.34</td>
</tr>
<tr>
<td>40...300</td>
<td>&lt; 60</td>
<td>0.34...0.60</td>
</tr>
<tr>
<td>300...600</td>
<td>&lt; 40</td>
<td>0.50...0.60</td>
</tr>
<tr>
<td>600...1000</td>
<td>&lt; 26</td>
<td>0.75...0.80</td>
</tr>
</tbody>
</table>

The maximum cable length also depends on the number of nodes [n] linked with the BUS cable and the cable cross-section [mm²].

<table>
<thead>
<tr>
<th>Cable cross-section [mm²]</th>
<th>Maximum length [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=32</td>
</tr>
<tr>
<td></td>
<td>n=63</td>
</tr>
<tr>
<td>0.25</td>
<td>200</td>
</tr>
<tr>
<td>0.50</td>
<td>360</td>
</tr>
<tr>
<td>0.75</td>
<td>550</td>
</tr>
</tbody>
</table>

BUS rate

In the CAN BUS / CAN settings menu of the UVR16x2, the BUS rate can be set to between 5 and 500 kbit/s, whereby lower BUS rates enable longer cable networks. However, in this case, the cable cross-section must be increased accordingly.

The standard BUS rate of the CAN network is 50 kbit/s (50 kBaud), which is specified for many CAN BUS devices.

Important: All devices in the CAN BUS network must have the same transfer rate in order to be able to communicate with each other.

<table>
<thead>
<tr>
<th>BUS rate [kbit/s]</th>
<th>Maximum permissible total BUS length [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>10000</td>
</tr>
<tr>
<td>10</td>
<td>5000</td>
</tr>
<tr>
<td>20</td>
<td>2500</td>
</tr>
<tr>
<td>50 (standard)</td>
<td>1000</td>
</tr>
<tr>
<td>125</td>
<td>400</td>
</tr>
<tr>
<td>250</td>
<td>200</td>
</tr>
<tr>
<td>500</td>
<td>100</td>
</tr>
</tbody>
</table>

Recommendations

A 2x2-pole, screened twisted pair (twist CAN-L with CAN-H or +12 V with GND) with a cable cross-section of at least 0.5 mm² and a conductor-to-conductor capacity of no more than 60 pF/m and a nominal impedance of 120 ohms. The standard BUS speed of the UVR16x2 is 50 kbit/s. This recommendation corresponds, for example, to cable type Unitrionic®-BUS CAN 2x2x0.5 supplied by Lapp Kabel for permanent installation in buildings or conduits. Theoretically this would enable a BUS length of approx. 500 m to guarantee reliable transmission.

For direct routing underground, earth cable 2x2x0.5 mm² supplied by HELUKABEL, part no. 804269, or earth cable 2x2x0.75 mm² supplied by Faber Kabel, part no. 101465, would be suitable.
Wiring
A CAN BUS network should never have a star topology. Rather, the correct topology is a line from the first device (with terminator) to the second, third and so forth. The last bus device has the termination jumper again.

**INCORRECT**

**CORRECT**

Example: Connection of three network nodes (NWN) with a 2x2-pole cable and termination of the terminal network nodes (network inside one building)

- terminated (termination resistor 120 Ohm)
- termination open

Each CAN network is to be provided with a 120 ohm BUS terminator at the first and last network subscriber (= termination). This is achieved with a plug-in jumper at the back of the controller. Each CAN network therefore always has two terminators (one at each end). Branch cables or a star topology are not permissible for CAN wiring.

R.h. plug = terminated

L.h. plug = not terminated
**Branch cables**

A CAN bus converter is used to provide reliable long branch cables. This means the branch cable is disconnected from the other CAN bus network and can be viewed as an independent CAN bus network.

**Trials at the factory** have shown the following:

1) Branches with a star topology of up to 10 m will not impede transmission.

2) Up to a bus length of 250 m and a transfer rate of 50 kbit/s, data transfer works perfectly with a low number of CAN nodes and an inexpensive J-Y(St)Y EIB KNX 2x2x0.8 KNX bus cable with a characteristic impedance of 75 to 90 ohm.

3) Up to a bus length of 150 m and with only a few nodes, the CAT 5 24AWG cable (typical Ethernet cable in PC networks) can be used.

Changing to cable types with different characteristic impedances is only permitted via signal separation through a CAN bus converter.

However, such networks do not comply with the recommended specification. Technische Alternative RT GmbH therefore cannot guarantee trouble-free operation if one of the three options listed above is applied.
24 V= power supply

This output is available for the supply of external devices with 24 V=. The combined total load of all devices with 12 V and 24 V supply must not exceed 6 W.

Connection to +24 V terminals and sensor earth (GND).

**Outputs**

**Terminal diagram, outputs**

The neutral conductor is looped inside the controller.

- **Mains 230 V 50 Hz**
- **Earth conductor terminal**

![Terminal diagram]

- **Relay output, normally open contact (N/O)**
- **Relay output, normally open + normally closed contact (N/O + N/C)**

For maximum current load of the outputs, see the technical data.
Connection auxiliary relays

Example: Connection HIREL-PF for outputs 12 and 13
Connection HIREL-230V for outputs 14 and 15
Program outputs A12 and A15 as switching outputs.

Sensor earth

Fuse 6.3A fast
Drilled hole

Mains 230 V 50 Hz

The mains connection (L, N) is looped to the controller via the relay module terminals.

x) This connection enables the HIREL-PF relay contacts to switch the phase conductor (230 V) to become conductive. As a consequence the relay outputs are no longer potential-free. They are secured with the fuse of HIREL-230V.
Both relay outputs are protected by the fuse on the relay module. Terminal "W" therefore corresponds to phase conductor "L".

If the fuse is removed, both outputs will be potential-free whilst remaining connected to one another via root "W".

The relay module can be connected to any two outputs between A12 and A16 if these have been programmed as switching outputs.

The auxiliary relay can be connected across any two outputs between A12 and A16 if these are programmed as switching outputs.
## Technical data UVR16x2

<table>
<thead>
<tr>
<th>All inputs</th>
<th>Temperature sensors type PT1000, KTY (2 kΩ/25 °C), KTY (1 kΩ/25 °C), PT100, PT500, Ni1000, Ni1000TK5000 and room sensors RAS or RASPT, radiation sensor GBS01, thermocouple THEL, humidity sensor RFS, rain sensor RES01, pulses max. 10 Hz (e.g. for VSG flow rate transducer), voltage up to 3.3 V DC, resistance (1-100 kΩ), and as a digital input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input 7</td>
<td>Auxiliary voltage (0-10 V DC)</td>
</tr>
<tr>
<td>Input 8</td>
<td>Auxiliary current loop (4-20 mA DC), voltage (0-10 V DC)</td>
</tr>
<tr>
<td>Input 15, 16</td>
<td>Auxiliary pulse input max. 20 Hz, for flow rate transducer VSG or S0 signals, for example</td>
</tr>
<tr>
<td>Outputs 1 – 4, 6 - 11</td>
<td>Relay outputs, partially with N/C and N/O contacts</td>
</tr>
<tr>
<td>Output 5</td>
<td>Relay changeover contact – potential-free</td>
</tr>
<tr>
<td>Outputs 12 - 16</td>
<td>Analogue outputs 0-10 V (max. 20 mA), PWM (10 V/1 kHz) or expansion option as switching outputs with auxiliary relay modules</td>
</tr>
<tr>
<td>Output 16</td>
<td>Additional attribute: stabilised voltage output for supply to external sensors</td>
</tr>
<tr>
<td>Max. BUS load (DL BUS)</td>
<td>100 %</td>
</tr>
<tr>
<td>CAN BUS</td>
<td>Standard data rate 50 kbit/s, adjustable from 5 to 500 kbit/s</td>
</tr>
<tr>
<td>12 V / 24 V DC</td>
<td>Supplies for external devices, in total max. 6 W</td>
</tr>
<tr>
<td>Differential temperatures</td>
<td>Equipped with separate start/stop differential</td>
</tr>
<tr>
<td>Threshold values</td>
<td>With separate start and stop differential or fixed hysteresis</td>
</tr>
</tbody>
</table>
| Temperature measuring range | PT100, PT500, PT1000: -200 °C to +850 °C with a resolution of 0.1 K  
All other temperature sensors: -49.9 °C to +249.9 °C with a resolution of 0.1 K |
| Temperature accuracy | Typ. 0.4 K, max. ±1 K within a range of 0 - 100 °C for PT1000 sensors |
| Voltage accuracy | Typ. 1 %, max. 3 % of maximum input measuring range |
| Resistance accuracy | max. 1.6% at 100kΩ (measured variable: Resistance, process variable: Resistance) |
| Output 0-10V accuracy (A12-A15) | max. -2% to +6% |
| Max. breaking capacity | Relay outputs: 230 V / 3 A each |
| Connection | 100 - 230 V, 50-60 Hz, (outputs A1 – A11 and device are fused jointly with 6.3 A (fast)) |
| Supply cable | 3x 1 mm² H05VV-F to EN 60730-1 (cable with standard plug included in the standard sensor pack) |
| Power consumption | 3.0 – 4.5 W, subject to the number of active switching outputs |
| IP rating | IP40 |
| Protection rating | II – protective insulation |
| Permissible ambient temperature | +5 to +45 °C |
**Standard delivery**

**UVR16x2K**: Device with mounting base and terminal mounting plate for wall mounting, wall fixing materials, strain relief fittings, operating instructions

**UVR16x2S**: Device with terminal mounting plate for installation in a distribution panel, operating instructions.

**Tips on troubleshooting**

*No display* points to a power failure. Therefore, initially check the fuse (6.3 A, (fast)) that protects the device and the outputs (pumps, valves, etc.) from short circuits and from voltage surges in connection with the integrated surge protection. The **glass tube fuse** is located at the rear of the controller behind a screw cap.

![Glass tube fuse 20x5 mm, 6.3 A (fast)](image)

**Realistic temperatures but faulty operation of the outputs** indicates incorrect settings or termination. The device is in good order if it is possible to switch the outputs ON and OFF in manual mode; check all settings and termination.

- Do constant running and idle periods at the output result in a corresponding response? In other words, does this pump really run if the solar pump is activated manually, or does the heating circuit pump start instead of the solar pump?
- Are all of the sensors connected at the appropriate terminals (heat up the sensor using a lighter and check the temperature display)?

If you still cannot find any faults in the system, we recommend installing a datalogger (C.M.I. or D-LOGG) and recording the temperature curves and switching states. If the DL BUS is used for data logging, enable "data output" in "DL settings".

**Incorrect temperatures** could be the result of the following:

- Values such as -9999.9 in the case of a sensor short circuit or 9999.9 in the case of a sensor lead break may not be the result of a material or termination error. Is the correct sensor type selected in the input menu (KTY, PT1000, RAS, GBS, etc.)?
- A sensor can also be checked without a tester simply by swapping the sensor that is probably faulty with one that works at the terminal strip and checking the temperature display. If the error is reproduced, the problem is the sensor. However, if the problem remains on the same input of the device, the fault is either due to the sensor type setting or the input itself is faulty (such as faulty surge protection).
## Resistance tables for various sensor types

<table>
<thead>
<tr>
<th>Temp. °C</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT1000 Ω</td>
<td>1000</td>
<td>1039</td>
<td>1078</td>
<td>1097</td>
<td>1117</td>
<td>1155</td>
<td>1194</td>
<td>1232</td>
<td>1271</td>
<td>1309</td>
<td>1347</td>
<td>1385</td>
</tr>
<tr>
<td>KTY (2 kΩ) Ω</td>
<td>1630</td>
<td>1772</td>
<td>1922</td>
<td>2000</td>
<td>2080</td>
<td>2245</td>
<td>2417</td>
<td>2597</td>
<td>2785</td>
<td>2980</td>
<td>3182</td>
<td>3392</td>
</tr>
<tr>
<td>KTY (1 kΩ) Ω</td>
<td>815</td>
<td>886</td>
<td>961</td>
<td>1000</td>
<td>1040</td>
<td>1122</td>
<td>1209</td>
<td>1299</td>
<td>1392</td>
<td>1490</td>
<td>1591</td>
<td>1696</td>
</tr>
<tr>
<td>PT100 Ω</td>
<td>100</td>
<td>104</td>
<td>108</td>
<td>110</td>
<td>112</td>
<td>116</td>
<td>119</td>
<td>123</td>
<td>127</td>
<td>131</td>
<td>135</td>
<td>139</td>
</tr>
<tr>
<td>PT500 Ω</td>
<td>500</td>
<td>520</td>
<td>539</td>
<td>549</td>
<td>558</td>
<td>578</td>
<td>597</td>
<td>616</td>
<td>635</td>
<td>654</td>
<td>674</td>
<td>693</td>
</tr>
<tr>
<td>Ni1000 Ω</td>
<td>1000</td>
<td>1056</td>
<td>1112</td>
<td>1141</td>
<td>1171</td>
<td>1230</td>
<td>1291</td>
<td>1353</td>
<td>1417</td>
<td>1483</td>
<td>1549</td>
<td>1618</td>
</tr>
<tr>
<td>Ni1000 Ω</td>
<td>1000</td>
<td>1045</td>
<td>1091</td>
<td>1114</td>
<td>1138</td>
<td>1186</td>
<td>1235</td>
<td>1285</td>
<td>1337</td>
<td>1390</td>
<td>1444</td>
<td>1500</td>
</tr>
</tbody>
</table>

If the sensor is faulty, note the sensor type when replacing. While it is possible to use a different type of sensor, the parameters for that input also have to be set to suit the type of sensor used.

The current standard type used by Technische Alternative is PT1000.

KTY (2 kΩ) was the standard type until 2010/2011.

### Not possible to manually switch an output:

- Ensure that output 5 is generally potential-free and therefore does not carry live voltage. Auxiliary relay outputs may also be potential-free. It is thus only possible to directly switch a 230 V consumer when the appropriate wiring has been implemented.
- If it is not possible to switch the output ON or OFF in manual mode, an message may be active at that moment which switches the corresponding output dominantly ON or OFF (red frame around the output symbol; indication of the message in the upper status bar). Subject to programming and user status, manual mode is not possible in this case.

### Troubleshooting – hardware

In a clear case of a hardware fault, please return the device to your retailer or the manufacturer for repair. In this case it is essential to include a fault description with the device (simply stating "the device does not work, please repair" is insufficient). Processing is accelerated if an RMA number is requested via our homepage [www.ta.co.at](http://www.ta.co.at). The defect must be clarified with our technical support beforehand.
Troubleshooting – programming
The manufacturer can assist you in troubleshooting if you have the correct documentation and sufficient data to hand. The following are indispensable for this:

♦ a hydraulic scheme via fax or email (WMF, JPG),
♦ the complete program via TAPPS file or at least the function data (*.dat file) by email,
♦ operating system version and controller serial number,
♦ all existing log files or at least the (temperature) values of the inputs at the time the system malfunctioned,
♦ telephone contact for describing the problem – in most cases a written fault description is not enough.

Troubleshooting in the CAN network
To isolate the error we recommend shutting down part of the network and monitoring when the error disappears.

General tests:

♦ Node numbers – no node number must be assigned twice
♦ Power supply to BUS subscribers (if necessary use the CAN-NT power supply unit)
♦ Setting of the Baud rate (even when using the CAN BUS converter CAN-BC2)

Wiring test:

All nodes must be switched off for this test.

♦ Resistance across CAN-H and CAN-L
  o If this is in excess of 70 Ω, it indicates incorrect termination.
  o If the resistance is below 60 Ω, look for too many terminations or short circuits between cables/leads.
♦ Check for short circuits across GND or screen and the signal cables.
♦ Check for earth loops – for this the screen is undone at each node and the current tested. If there is a current flow, an earth loop has been created by an unwanted earth connection.

Information on the Eco-design Directive 2009/125/EC

<table>
<thead>
<tr>
<th>Product</th>
<th>Class(^1,2)</th>
<th>Energy efficiency(^3)</th>
<th>Standby max. [W]</th>
<th>Power consumption typ. [W](^4)</th>
<th>Max. power consumption [W](^4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UVR16x2(^5)</td>
<td>max. 8</td>
<td>max. 5</td>
<td>3.0</td>
<td>2.54 / 4.07</td>
<td>3.0 / 4.5</td>
</tr>
</tbody>
</table>

\(^1\)Definitions according to Official Journal of the European Union C 207 dated 03/07/2014
\(^2\) The classification applied is based on optimum utilisation and correct application of the products. The actual applicable class may differ from the classification applied.
\(^3\) Contribution of the temperature controller to seasonal central heating efficiency in percent, rounded to one decimal place
\(^4\) No output active = standby / all outputs and display active
\(^5\) The class is defined on the basis of the programming of the heating circuit controller, in accordance with the Ecodesign Directive.

Subject to technical modifications © 2018
EU Declaration of conformity

Document- Nr. / Date: TA17023 / 02/02/2017
Company / Manufacturer: Technische Alternative RT GmbH
Address: A- 3872 Amaliendorf, Langestraße 124

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Product name: UVR16x2K, UVR16x2S, UVR16x2-DE, UVR16x2-DE-I, UVR16x2-NP, UVR16x2-NP-I
Product brand: Technische Alternative RT GmbH
Product description: Freely programmable universal controller

The object of the declaration described above is in conformity with Directives:

- 2014/35/EU Low voltage standard
- 2014/30/EU Electromagnetic compatibility
- 2011/65/EU RoHS Restriction of the use of certain hazardous substances
- 2009/125/EC Eco-design directive

Employed standards:
- EN 60730-1: 2011 Automatic electrical controls for household and similar use – Part 1: General requirements
- EN 61000-6-3: 2007 Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
  + A1: 2011
  + AC2012
- EN 61000-6-2: 2005 Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
  + AC2005
- EN 50581: 2012 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Position of CE - label: On packaging, manual and type label

Issuer: Technische Alternative RT GmbH
A- 3872 Amaliendorf, Langestraße 124

This declaration is submitted by

Dipl.-Ing. Andreas Schneider, General manager,
02/02/2017

This declaration certifies the agreement with the named standards, contains however no warranty of characteristics.
The security advices of included product documents are to be considered.
Guarantee conditions

Note: The following guarantee conditions do not limit the legal right to a warranty, but rather expand your rights as a consumer.

1. Technische Alternative RT GmbH provides a two-year guarantee from the date of purchase for all the devices and parts which it sells. Defects must be reported immediately upon detection and within the guarantee period. Technical support can supply the correct solution for almost every known problem. In this respect, contacting us immediately will help to avoid unnecessary expense and effort in troubleshooting.

2. The guarantee includes free repair (but not the cost of on-site fault finding, removal, refitting and shipping) due to operational and material defects which impair operation. In the event that a repair is not economical in the opinion of Technische Alternative for reasons of cost, the goods will be replaced.

3. Not included is damage resulting from the effects of a voltage surge or abnormal ambient conditions. Likewise, no liability can be accepted if the device defect is due to: transport damage for which we are not responsible, incorrect assembly and installation, incorrect use, failure to observe the operating and installation instructions or incorrect maintenance.

4. The guarantee will become void if repairs or actions are carried out by people who are not authorised to perform them or have not been so authorised by us or if our devices are operated with spare parts, auxiliary parts or accessories that are not considered to be original parts.

5. The defective parts must be returned to our factory with a copy of the proof of purchase and a precise fault description. Processing is accelerated if an RMA number is requested via our homepage www.ta.co.at. The defect must be clarified with our technical support beforehand.

6. Services provided under guarantee result neither in an extension of the guarantee period nor in a commencement of a new guarantee period. The guarantee period for fitted parts ends with the guarantee period of the whole device.

7. Further or other claims, especially those for compensation for damage other than to the device itself, insofar as a liability is not legally required, are excluded.

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