We develop your product – custom-made, if you wish!

Our hardware development division designs circuit boards for our and our customer's products. Thus, your individual wishes can be implemented directly in order to establish the optimum basis for your product.

Our standard softwares offer a large and versatile range of functions. If you wish for additional or adapted features, be it differing factory settings or whole new functions, our software developers will be pleased to program them for you.

State-of-the-art production lines and controls after each individual manufacturing step warrant a 100% quality assurance.

All products are tested in our in-house EMC and hydraulics laboratories.

We can also pre-connect sensors and cables to suit your requirements, up to a complete plug-and-play version.

All our products can be adapted to your Corporate Design and to your target markets. Contact us to learn more about your customised sales material.

Benefit from our experience. Contact us!
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Solar and system controllers

Solar thermal systems are operated and controlled by solar controllers. RESOL differential temperature controllers are used in solar, heating and air-conditioning systems to initiate switching processes depending on thermal, hydraulic and environmental conditions.

Apart from these basic functions, RESOL controllers offer a variety of options and functions for the optimum use of individual solar and heating systems.
In the context of energy labelling, space heaters, water heaters, hot water stores and packages must fulfill new information requirements from 26 September 2015. Our controllers and pump stations are part of a package.

Further information can be found in the technical data of our controllers and pump stations in our catalogue and on our website. Upon request we will provide you with a table containing the ErP values of our products.

**Package label calculation**

With the configurator at [www.label-pack-a-plus.eu](http://www.label-pack-a-plus.eu) you can easily combine the components of your individual package. Just enter all ErP values of your components; calculations, if necessary, will be automatically carried out. This free-of-charge platform helps you save time when creating offers, data sheets and energy labels for your package.

RESOL also offers suitable ErP kits including a room control unit and the room temperature sensors required. Thus, complying with the ErP classes becomes even easier.

**New:**

The approved DeltaTherm® HC heating controller, for example, reaches the temperature controls class VIII and has many new features:

- Modulating heating control with 0-10 V boiler control
- Weather-compensated control with room influence or demand-based room control with up to 5 room temperature sensors
- Remote access with a room control unit or the VBus®Touch HC App
- Controller ErP kits incl. a room control unit and the room temperature sensors required
- Your advantage for energy labelling: Energy efficiency contribution of up to 5%
### Survey of solar controllers: Hardware

<table>
<thead>
<tr>
<th>Hardware</th>
<th>DeltaSol® A / AX HE</th>
<th>DeltaSol® A / AL E HE</th>
<th>DeltaSol® BS2, BS4</th>
<th>DeltaSol® CS2, CS4</th>
<th>DeltaSol® SLL</th>
<th>DeltaSol® BS Plus</th>
<th>DeltaSol® CS Plus</th>
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<tr>
<td><strong>Max. number of collector fields</strong></td>
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<td><strong>Max. number of stores</strong></td>
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<tr>
<td><strong>Weather-compensated heating circuits</strong></td>
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<td>-</td>
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<td><strong>External heat exchanger</strong></td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Speed control of standard pumps</strong></td>
<td>-</td>
<td>✓ [AL E HE]</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Speed control of HE pumps</strong></td>
<td>✓ [AX HE]</td>
<td>✓ [AL E HE]</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>via integrated PWM output</strong></td>
<td>✓ [AX HE]</td>
<td>✓ [AL E HE]</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>via VBus® / PWM adapter</strong></td>
<td>-</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td><strong>Temperature sensor inputs</strong></td>
<td>2</td>
<td>3 [AL], 4 [AL E HE]</td>
<td>4</td>
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<td>Pt1000, Pt500, KTY</td>
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<td><strong>Input for CS10 irradiation sensor</strong></td>
<td>-</td>
<td>-</td>
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<td>-</td>
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<tr>
<td><strong>Impulse inputs for V40 flowmeter</strong></td>
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<td>-</td>
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<td>1</td>
<td>-</td>
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<tr>
<td><strong>Relay outputs in total</strong></td>
<td>1</td>
<td>1 [AL], 3 [AL E HE]</td>
<td>1 [BS/2], 2 [BS/4]</td>
<td>1 [CS/2], 2 [CS/4]</td>
<td>3</td>
<td>2</td>
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<tr>
<td><strong>semiconductor relays (speed control)</strong></td>
<td>-</td>
<td>1 [AL E HE]</td>
<td>1 (1) [BS/2], 2 (1) [BS/4]</td>
<td>1 (1) [CS/2], 2 (1) [CS/4]</td>
<td>2 (2)</td>
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<tr>
<td><strong>electromechanical relay</strong></td>
<td>1</td>
<td>1 [AL]</td>
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<td>-</td>
<td>-</td>
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<tr>
<td><strong>potential-free relay with changeover contact</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td><strong>potential-free relay with normally open contact</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>potential-free high-current relay</strong></td>
<td>-</td>
<td>2 [AL E HE]</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td><strong>PWM outputs</strong></td>
<td>1 [AX HE]</td>
<td>1 [AL E HE]</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>2</td>
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<tr>
<td><strong>convertible to 0-10 V</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td><strong>Real-time clock</strong></td>
<td>-</td>
<td>✓ [AL E HE]</td>
<td>✓ [BS/4]</td>
<td>✓ [CS/4]</td>
<td>✓</td>
<td>✓</td>
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<td><strong>Data interface</strong></td>
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<td>VBus®</td>
<td>VBus®</td>
<td>VBus®</td>
<td>VBus®</td>
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<tr>
<td><strong>Energy-efficient SMPS</strong></td>
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<td>✓</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td><strong>Power supply</strong></td>
<td>220 ... 240 V~ / 115 V~</td>
<td>100 ... 240 V~</td>
<td>100 ... 240 V~</td>
<td>100 ... 240 V~</td>
<td>100 ... 240 V~</td>
<td>100 ... 240 V~</td>
<td>100 ... 240 V~</td>
</tr>
</tbody>
</table>

1 system-dependent
2 via EM Extension module(s) in total
3 via HKM3 Heating circuit extension module(s) in total
4 via convertible impulse inputs
## CONTROLLERS FOR SOLAR THERMAL AND COMBINED SYSTEMS

<table>
<thead>
<tr>
<th>DeltaSol® SL</th>
<th>DeltaSol® BX</th>
<th>DeltaSol® ES</th>
<th>DeltaSol® BX</th>
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<tr>
<td>2</td>
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<td>-</td>
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<td>✓</td>
<td>✓</td>
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ΔeltaSol® SLT | ΔeltaSol® E | ΔeltaSol® BX Plus | ΔeltaSol® MX |
<table>
<thead>
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<td>2</td>
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<td>1 (4)</td>
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### Survey of Solar- and System Controllers

<table>
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<tr>
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<th>Pt1000, Pt500, KTY</th>
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<tr>
<td>Pt1000, Pt500, KTY</td>
<td>analogue</td>
<td>-</td>
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<td>Pt1000, Pt500, KTY</td>
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<td>Pt1000, Pt500, KTY</td>
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<td>Pt1000, Pt500, KTY</td>
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<td>Pt1000, Pt500, KTY</td>
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</table>

VBus®, MicroSD card | VBus®, SD card | VBus® | VBus®, SD card |
<table>
<thead>
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<tr>
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100 ... 240 V~ | 100 ... 240 V~ | 100 ... 240 V~ | 100 ... 240 V~
## Survey of solar controllers: Software

<table>
<thead>
<tr>
<th></th>
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<tr>
<td>Heat quantity measurement</td>
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</tr>
<tr>
<td>■ with flowmeter</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓†</td>
<td>✓†</td>
</tr>
<tr>
<td>■ with V40 flowmeter</td>
<td>-</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>■ with Grundfos Direct Sensors™</td>
<td>-</td>
<td>✓ [AL E HE]</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>VFD</td>
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<td>Software functions</td>
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<td>Antifreeze function for solar circuit</td>
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<td>✓</td>
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<tr>
<td>Collector minimum limitation</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓†</td>
<td>✓†</td>
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<td>Collector emergency shutdown</td>
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<td>✓†</td>
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<td>Store maximum limitation</td>
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<td>✓</td>
<td>✓</td>
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<td>Store set temperature</td>
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<td>✓</td>
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<tr>
<td>Store emergency shutdown</td>
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<td>✓</td>
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<td>✓†</td>
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<tr>
<td>Drainback option</td>
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<td>✓†</td>
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<tr>
<td>Tube collector function</td>
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<td>✓ [BS/4]</td>
<td>✓ [BS/4]</td>
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<td>✓</td>
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<tr>
<td>■ with adjustable time frame, interval</td>
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<td>✓ [AL E HE]</td>
<td>✓ [BS/4]</td>
<td>✓ [CS/4]</td>
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<td>Additional ΔT control</td>
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<td>✓ [CS/4]</td>
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<td>Heat dump function</td>
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<td>✓ [CS/4]</td>
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</tr>
<tr>
<td>Store loading in layers</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>✓[†]</td>
<td>✓†</td>
</tr>
<tr>
<td>Priority loading</td>
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<td>-</td>
<td>-</td>
<td>-</td>
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<td>✓†</td>
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<tr>
<td>/// Parallel loading</td>
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<td>-</td>
<td>-</td>
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<td>✓[†]</td>
<td>✓†</td>
</tr>
<tr>
<td>/// Store sequence control</td>
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<td>-</td>
<td>-</td>
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<td>/// Progressive loading</td>
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<td>/// Successive loading</td>
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<td>/// Spreaded loading</td>
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<td>✓[†]</td>
<td>✓†</td>
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† system-dependent
### Controllers for Solar Thermal and Combined Systems

<table>
<thead>
<tr>
<th>DeltaSol® SL</th>
<th>DeltaSol® BX L</th>
<th>DeltaSol® ES</th>
<th>DeltaSol® BX</th>
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<tr>
<td>✓</td>
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<td>VFS</td>
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### System Controllers

<table>
<thead>
<tr>
<th>DeltaSol® SLT</th>
<th>DeltaSol® E</th>
<th>DeltaSol® BX Plus</th>
<th>DeltaSol® MX</th>
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</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>VFS</td>
<td>VFD</td>
<td>VFS / VFD</td>
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</tbody>
</table>

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**Survey of Solar- and System Controllers**

The table above lists the controllers for solar thermal and combined systems, along with the system controllers, showing the features they support. Each controller is represented by a checkmark (✓) or a dash (-) indicating the presence or absence of a feature such as VFS or VFD.
### Software functions

<table>
<thead>
<tr>
<th>Function</th>
<th>DeltaSol® AX/AX HE</th>
<th>DeltaSol® AL/AL EHE</th>
<th>DeltaSol® BS/BS4</th>
<th>DeltaSol® CS/CS4</th>
<th>DeltaSol® SLL</th>
<th>DeltaSol® BS Plus</th>
<th>DeltaSol® CS Plus</th>
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<tbody>
<tr>
<td>Solar circuit bypass</td>
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<td>Irradiation-dependent bypass</td>
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<td>Irradiation switch</td>
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<tr>
<td>Backup heating suppression</td>
<td>-</td>
<td>✓ [AL E HE]</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Parallel relay</td>
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<td>Twin pump for solar circuit</td>
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<td>Cooling functions and cooling mode</td>
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<td>✓</td>
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<td>✓</td>
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<td>Flow rate monitoring</td>
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<td>Error relay</td>
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<tr>
<td>DHW hygiene functions</td>
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<td>✓ [AL E HE]</td>
<td>✓</td>
<td>✓ [CS/4]</td>
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<tr>
<td>DVGW legionella protection</td>
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<tr>
<td>Thermal disinfection</td>
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<td>✓ [AL E HE]</td>
<td>✓ [BS/4]</td>
<td>✓ [CS/4]</td>
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<td>DHW heating</td>
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<td>✓ [AL E HE]</td>
<td>✓ [BS/4]</td>
<td>✓ [CS/4]</td>
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<td>Heating circuit return preheating</td>
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<td>Solid fuel boiler</td>
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<td>Mixer control weather-compensated</td>
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<td>Mixer control with target temperature</td>
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<td>Heating circuit antifreeze function</td>
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<td>Chimney sweeper function for the heating circuit</td>
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</table>

1 system-dependent
2 via EM Extension module(s)
## Survey of Solar- and System Controllers

### Controllers for Solar Thermal and Combined Systems

<table>
<thead>
<tr>
<th>DELTA SOL® SL</th>
<th>DELTA SOL® BX L</th>
<th>DELTA SOL® ES</th>
<th>DELTA SOL® BX</th>
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<tr>
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<tr>
<th>DELTA SOL® SLT</th>
<th>DELTA SOL® E</th>
<th>DELTA SOL® BX Plus</th>
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</tr>
</tbody>
</table>

- VDI 2169
  - VDI 2169
  - VDI 2169

**Note:** The table indicates which controllers support solar thermal and combined systems, as well as solar energy systems, with symbols indicating the level of support.
DeltaSol® A series

The DeltaSol® A, DeltaSol® AX and DeltaSol® AX HE controllers are the simplest solution for all differential controls. The version DeltaSol® A is equipped with an adjustable temperature difference and an antifreeze function.

The DeltaSol® AX presents an extended version which is additionally equipped with an adjustable target temperature for minimum or maximum temperature limitation.

Equipped with an electromechanical relay and a PWM output, the DeltaSol® AX HE controller manages the speed control of a high-efficiency pump.

The enclosed silicone sealing cord guarantees a protection against dripping water.

Customised and OEM versions are available on request. Please contact our sales team.

Differential temperature controller for solar, heating & air conditioning systems

- Adjustable temperature difference 2 ... 16 K, hysteresis 1.6 K
- Antifreeze function adjustable by jumper/DIP switch
- Maximum or minimum temperature limitations adjustable by DIP switches (DeltaSol® AX/AX HE)
- Protection against dripping water
- Speed control of a high-efficiency pump with adjustable minimum speed (DeltaSol® AX HE)

Manuals available:

RESOL DeltaSol® A
Price bracket A | Article no.: 115 211 23 99.00 €
RESOL DeltaSol® A – Full kit
Incl. 2 Pt1000 sensors (1 x FKP6, 1 x FRP6)
Price bracket A | Article no.: 115 211 33 120.00 €
As above, but with minimum or maximum temperature limitation:
RESOL DeltaSol® AX
Price bracket A | Article no.: 115 211 73 115.80 €
RESOL DeltaSol® AX – Full kit
Incl. 2 Pt1000 sensors (1 x FKP6, 1 x FRP6)
Price bracket A | Article no.: 115 211 83 136.80 €
As above, but with a PWM output for speed control of a high-efficiency pump:
RESOL DeltaSol® AX HE
Price bracket A | Article no.: 115 213 43 123.20 €
RESOL DeltaSol® AX HE – Full kit
Incl. 2 Pt1000 sensors (1 x FKP6, 1 x FRP6)
Price bracket A | Article no.: 115 213 53 144.20 €
TECHNICAL DATA

- Inputs: 2 Pt1000 temperature sensors
- Outputs: 1 electromechanical relay (changeover), 1 PWM output (DeltaSol® AX HE)
- PWM frequency: 1000 Hz (DeltaSol® AX HE)
- PWM voltage: 11.0 V (DeltaSol® AX HE)
- Switching capacity: 4 (1) A 240 V~ (electromechanical relay)
- Total switching capacity: 4 A 240 V~
- Power supply: 220 ... 240 V~ (50 ... 60 Hz), 100 ... 240 V~ (50 ... 60 Hz) (DeltaSol® AX HE)
- Supply connection: type Y attachment
- Standby: 1.35 W (DeltaSol® A), 1.36 W (DeltaSol® AX), 0.39 W (DeltaSol® AX HE)
- Mode of operation: type 1.B action
- Rated impulse voltage: 2.5 kV
- Functions: antifreeze function, DeltaSol® AX / AX HE additionally with maximum or minimum temperature limitation
- Housing: plastic, PC-ABS and PMMA
- Mounting: wall mounting
- Indication / Display: 1 operating control LED
- Operation: 1 potentiometer and 1 jumper (DeltaSol® A), 2 potentiometers and 4 DIP switches (DeltaSol® AX), 3 potentiometers, 4 DIP switches and 1 jumper (DeltaSol® AX HE)
- Ingress protection: IP 20 / EN 60529 (with IP 22 seal)
- Protection class: II
- Ambient temperature: 0 ... 40°C
- Pollution degree: 2
- Dimensions: Ø 139 mm, depth 45 mm

ACCESSORIES

- HR230 Auxiliary relay
  - Single-phase, suitable for all RESOL controllers (see page 52)
  - Price bracket A | Article no.: 280 002 60 34.40 €
- HR230/3 Auxiliary relay
  - Three-phase, suitable for all RESOL controllers (see page 52)
  - Price bracket A | Article no.: 280 033 50 84.00 €
- RESOL SP10
  - Sensor overvoltage protection (see page 92)
  - Price bracket A | Article no.: 180 110 70 17.50 €
The DeltaSol® AL solar controller is a temperature differential controller that offers all the vital functions for a standard solar thermal system. The controller is equipped with the comprehensive System-Monitoring-Display, which shows the system parameters quickly and easily.

For data communication, the controller has a VBus®. Operation and function control are simple as usual.

Customised and OEM versions are available on request. Please contact our sales team.

RESOL DeltaSol® AL
Price bracket A | Article no.: 115 212 63 251.30 €

RESOL DeltaSol® AL – Full kit
Incl. 2 Pt1000 sensors (1 x FKP6, 1 x FRP6)
Price bracket A | Article no.: 115 212 73 272.30 €

Manuals available:

The cTUVus certification confirms that the controller is certified to UL 60730-1:2009 and CSA B60730.1:2002.
**ELECTRICAL CONNECTION**

**RESOL KM1 Communication module**
For visualisation via VBus.net, incl. network cable, mains adapter and VBus® cable pre-connected (see page 56)
Price bracket A | Article no.: 180 011 30 255.00 €

**RESOL VBus®/LAN interface adapter**
Network connection set for RESOL controllers with VBus® incl. Service CD (see page 57)
Price bracket B | Article no.: 180 008 80 106.50 €

**RESOL VBus®/USB interface adapter**
PC connection set for RESOL controllers with VBus® incl. Service CD
Price bracket B | Article no.: 180 008 50 58.90 €

**RESOL AM1**
Alarm module for signalling system failures (see page 62)
Price bracket B | Article no.: 180 008 70 67.00 €

**RESOL SP10**
Sensor overvoltage protection (see page 92)
Price bracket A | Article no.: 180 110 70 17.50 €

For a survey of accessories see page 50!

**EXAMPLES**

Solar system with 1 store
Solar system with swimming pool
Heating circuit return preheating
Heat exchange control
Solid fuel boiler

**TECHNICAL DATA**

Inputs: 3 Pt1000 temperature sensors
Outputs: 1 electromechanical relay (changeover)
Switching capacity: 4 A 240 V− (electromechanical relay)
Total switching capacity: 4 A 240 V−
Power supply: 100 ... 240 V− (50 ... 60 Hz)
Supply connection: type Y attachment
Standby: 0.33 W
Mode of operation: type 1.B action
Rated impulse voltage: 2.5 kV
Data interface: RESOL VBus®
VBus® current supply: 35 mA
Functions: function control, operating hours counter, tube collector function and heat quantity measurement
Housing: plastic, PC-ABS and PMMA
Mounting: wall mounting, mounting into patch panels is possible
Indication/Display: System-Monitoring-Display for visualisation, 16-segment display, 7-segment display, 8 symbols for system states, background illumination and operating control LED
Operation: 3 push buttons and 1 slide switch
Ingress protection: IP 20/EN 60529
Protection class: II
Ambient temperature: 0 ... 40 °C
Pollution degree: 2
Dimensions: 144 x 208 x 43 mm

A table with the current consumption values of all VBus® accessories can be found on page 63!
DeltaSol® AL E HE

The DeltaSol® AL E HE controller is especially designed for standard solar systems with a high-efficiency pump and an electric backup heating.

It is equipped with a PWM output and two high-current relays to which an electric immersion heater of up to 3 kW (230 V~) can be connected. The heater can be directly connected to the controller without the need of auxiliary relays.

For data communication, the controller has a RESOL VBus®.

Customised and OEM versions are available on request. Please contact our sales team.

The simple solution for your DHW supply!

- Direct connection of an electric immersion heater up to 3 kW (230V~)
- DHW heating with rapid heat-up and thermal disinfection
- Time and temperature control of the electric backup heating
- Solar backup heating suppression
- Heat quantity measurement via VFD Grundfos Direct Sensor™
- PWM output for the speed control of a high-efficiency pump
- Quick access to the holiday and the manual modes
- Status display for a bidirectional HE pump
- Drainback option and tube collector function
- Commissioning menu

Manuals available:

RESOL DeltaSol® AL E HE
Price bracket A | Article no.: 115 325 93 | 286.50 €

RESOL DeltaSol® AL E HE – Full kit
Incl. 3 Pt1000 sensors (1 x FKP6, 2 x FRP6)
Price bracket A | Article no.: 115 326 03 | 317.50 €
**ELECTRICAL CONNECTION**

Solar system with electric backup heating (application example)

**TECHNICAL DATA**

Inputs:
- for 4 Pt1000 temperature sensors, thereof 1 x RCTT, 1 x Grundfos Direct Sensor™, 1 x PWM feedback

Outputs:
- 1 semiconductor relay, 2 high-current relays for electric immersion heater, 1 PWM output

PWM frequency: 512 Hz

PWM voltage: 10 V

Switching capacity:
- 1 (1) A 240 V~ (semiconductor relay)
- 14 (3) A 240 V~/24 V (potential-free high-current relay)

Power supply: 100 ... 240 V~ (50 ... 60 Hz)

Supply connection: type Y attachment

Standby: 0.67 W

Temperature controls class: I

Energy efficiency contribution: 1 %

Mode of operation: type 1.B.Y action

Rated impulse voltage: 2.5 kV

Data interface: RESOL VBus®

VBus® current supply: 35 mA

Functions:
- function control, operating hours counter, tube collector function, heat quantity measurement, time-controlled thermostat function, DHW heating with rapid heat-up, thermal disinfection, holiday mode and backup heating suppression

Housing: plastic, PC-ABS and PMMA

Mounting: wall mounting, mounting into patch panels is possible

Indication/Display: System-Monitoring-Display for visualisation, 16-segment display, 7-segment display, 8 symbols for system states, background illumination and operating control LED

Operation: 3 push buttons and 1 slide switch

Ingress protection: IP 20/EN 60529

Protection class: I

Ambient temperature: 0 ... 40 °C

Pollution degree: 2

Dimensions: 144 x 208 x 43 mm

A table with the current consumption values of all VBus® accessories can be found on page 63!
DeltaSol® BS series

The RESOL controllers for standard solar thermal systems. The DeltaSol® BS series provides a clear operating concept.

The intuitive commissioning menu leads you through the initial configuration in only a few steps.

The system selected is shown on the display, the status of the individual components is indicated by means of flashing codes.

The DeltaSol® BS series is available in 3 versions, depending on the demands. Details concerning the number of the relays as well as additional functions are shown in the technical data.

Customised and OEM versions are available on request. Please contact our sales team.

User-friendly and versatile!

DeltaSol® BS series

- Drainback option
- Heat quantity measurement
- Function control
- Commissioning menu
- Unit °C and °F selectable
- HE pump control via adapter

DeltaSol® BS/4, BS Plus

- 3 basic system layouts (DeltaSol® BS/4), 10 basic system layouts (DeltaSol® BS Plus) to choose from
- Tube collector function, thermal disinfection function, time-controlled thermostat function

RESOL DeltaSol® BS
Price bracket A | Article no. BS/2: 115 412 33 229.20 €
Price bracket A | Article no. BS/4: 115 425 13 240.40 €

RESOL DeltaSol® BS – Full kit
Incl. 3 Pt1000 sensors (1 x FKP6, 2 x FRP6)
Price bracket A | Article no. BS/2: 115 412 43 260.20 €
Price bracket A | Article no. BS/4: 115 425 23 271.40 €

RESOL DeltaSol® BS Plus
Price bracket A | Article no. BS/2: 115 422 03 289.10 €

RESOL DeltaSol® BS Plus – Full kit
Incl. 4 Pt1000 sensors (2 x FKP6, 2 x FRP6)
Price bracket A | Article no. BS/2: 115 422 13 331.90 €

Visit www.resol.de/videos for a product video about this controller

*The cTUVus certification confirms that the controller is certified to UL 60730-1:2009 and CSA B60730:1:2002.
INPUTS

- 4 Pt1000 temperature sensors

OUTPUTS

- 1 semiconductor relay (BS/2), 2 semiconductor relays (BS/4, BS Plus)
- Switching capacity: 1 (1) A 240 V~ (semiconductor relay)
- Total switching capacity: 1 A 240 V~ (BS/2), 2 A 240 V~ (BS/4, BS Plus)
- Power supply: 100 ... 240 V~ (50 ... 60 Hz)
- Supply connection: type Y attachment

STANDBY

- 0.45 W (BS/2), 0.74 W (BS/4), 0.38 W (BS Plus)

TEMPERATURE CONTROLS CLASS

- I (BS/4, BS Plus)

ENERGY EFFICIENCY CONTRIBUTION

- 1 % (BS/4, BS Plus)

MODE OF OPERATION

- type 1.C.Y action

RATED IMPULSE VOLTAGE

- 2.5 kV

DATA INTERFACE

- RESOL VBus®
- VBus® current supply: 35 mA
- Functions: function control, operating hours counter, tube collector function (BS/4, BS Plus), heat quantity measurement and pump speed control

HOUSING

- plastic, PC-ABS and PMMA
- Mounting: wall mounting, mounting into patch panels is possible

INDICATION/DISPLAY

- System-Monitoring-Display for visualisation of systems, 16-segment and 7-segment display, 8 symbols for indication of system status and operating control LED

OPERATION

- 3 push buttons at the front

INGRESS PROTECTION

- IP 20 / EN 60529
- Protection class: II
- Ambient temperature: 0 ... 40 °C
- Pollution degree: 2
- Dimensions: 172 x 110 x 49 mm

A table with the current consumption values of all VBus® accessories can be found on page 63!
DeltaSol® CS series

The controllers of the DeltaSol® CS series are used for speed control of a HE pump in small standard solar thermal and heating systems.

They are equipped with a PWM output as well as with an input for a VFD Grundfos Direct Sensor™ which enables precise heat quantity measurement. The commissioning menu ensures an easy and quick configuration.

Customised and OEM versions are available on request. Please contact our sales team.

High-efficiency even for small systems!

DeltaSol® CS series

- 1 input for a VFD Grundfos Direct Sensor™
- Heat quantity measurement
- Commissioning menu
- Drainback option

DeltaSol® CS/4, CS Plus

- 3 basic system layouts (DeltaSol® CS/4), 10 basic system layouts (DeltaSol® CS Plus) to choose from
- Tube collector function, thermal disinfection function

DeltaSol® CS Plus bidirectional

- Status display possible with a bidirectional HE pump
- 2 PWM feedback inputs

RESOL DeltaSol® CS
Price bracket A | Article no. CS/2: 115 004 73 229.20 €
Price bracket A | Article no. CS/4: 115 004 53 240.30 €

RESOL DeltaSol® CS – Full kit
Incl. 3 Pt1000 sensors (1 x FKP6, 2 x FRP6)
Price bracket A | Article no. CS/2: 115 004 63 260.90 €
Price bracket A | Article no. CS/4: 115 004 43 272.00 €

RESOL DeltaSol® CS Plus
Price bracket A | Article no. CS Plus: 115 003 13 289.00 €

RESOL DeltaSol® CS Plus – Full kit
Incl. 4 Pt1000 sensors (2 x FKP6, 2 x FRP6)
Price bracket A | Article no. CS Plus: 115 003 03 331.90 €

A PWM adapter cable is included with the controller. For our range of Grundfos Direct Sensors™ see page 90!

RESOL DeltaSol® CS Plus bidirectional
Price bracket A | Article no. CS Plus bidirectional: 115 005 43 295.00 €

RESOL DeltaSol® CS Plus bidirectional – Full kit
Incl. 4 Pt1000 sensors (2 x FKP6, 2 x FRP6)
Price bracket A | Article no. CS Plus bidirectional: 115 005 53 337.90 €

2 PWM adapter cables are included with the controller.
ELECTRICAL CONNECTION

EXAMPLES

RESOL Moisture-proof housing (IP 66/67)
Moisture-proof housing for controller installation outdoors or in highly humid locations (without controller)
Price bracket B | Article no.: 290 028 70 65.00 €

VFD Grundfos Direct Sensor™
Digital sensors in different versions (see page 90)
from 92.00 €

RESOL SP10
Sensor overvoltage protection (see page 92)
Price bracket A | Article no.: 180 110 70 17.50 €

RESOL AM1
Alarm module for signalling system failures (see page 62)
Price bracket B | Article no.: 180 008 70 67.00 €

RESOL VBus®/USB interface adapter
PC connection kit for RESOL controllers with VBus® incl. Service CD (see page 57)
Price bracket B | Article no.: 180 008 50 58.90 €

RESOL KM1
Communication module
For visualisation via VBus.net, incl. network cable, mains adapter and VBus® cable pre-connected (see page 56)
Price bracket A | Article no.: 180 011 30 255.00 €

For a survey of accessories see page 50!

ACCESSORIES

TECHNICAL DATA

Inputs: 4 Pt1000 temperature sensors, 1 VFD Grundfos Direct Sensor™, 2 PWM feedback inputs (CS Plus bidirectional)
Outputs: 1 semiconductor relay, 1 PWM output (CS/2), 2 semiconductor relays, 1 PWM output (CS/4), 2 semiconductor relays, 2 PWM outputs (CS Plus)
PWM frequency: 512 Hz
PWM voltage: 10.5 V
Switching capacity: 1 (1) A 240 V~ (semiconductor relay)
Total switching capacity: 1 A 240 V~ (CS/2), 2 A 240 V~ (CS/4, CS Plus)
Power supply: 100 ... 240 V~ (50 ... 60 Hz)
Supply connection: type Y attachment
Standby: 0.58 W (CS/2), 0.60 W (CS/4, CS Plus), 0.61 W (CS Plus bidirectional)
Temperature controls class: I (CS/4, CS Plus)
Energy efficiency contribution: 1 % (CS/4, CS Plus)
Mode of operation: type 1.C.Y action
Rated impulse voltage: 2.5 kV
Data interface: RESOL VBus®
VBuS® current supply: 35 mA
Functions: tube collector function and thermostat function (CS/4, CS Plus), function control, operating hours counter, speed control, drainback option and heat quantity measurement
Housing: plastic, PC-ABS and PMMA
Mounting: wall mounting, mounting into patch panels is possible
Indication/Display: System-Monitoring-Display for visualisation of systems, 16-segment and 7-segment display, 8 symbols for indication of system status
Operation: 3 push buttons
Ingress protection: IP 20 / EN 60529
Protection class: I
Ambient temperature: 0 ... 40 °C
Pollution degree: 2
Dimensions: 172 x 110 x 46 mm

A table with the current consumption values of all VBus® accessories can be found on page 63!
DeltaSol® SLL

The RESOL DeltaSol® SLL is the smallest controller of the SL series. Its equipment is optimised for small and medium-sized solar thermal and heating systems. 10 pre-configured basic systems are available. The DeltaSol® SLL is also the first controller of its category to offer the automatic function control according to the VDI 2169 directive.

Additionally, it is equipped with a potential-free extra-low voltage relay for backup heating demand and a V40 flowmeter input for heat quantity measurement.

■ Microbuttons for quick access to the manual mode and the holiday function
■ 3 relay outputs (incl. 1 potential-free extra-low voltage relay)
■ 4 inputs for Pt1000, Pt500, or KTY temperature sensors
■ 1 V40 impulse input
■ 2 PWM outputs for the speed control of high-efficiency pumps
■ 10 basic system layouts to choose from
■ Automatic function control according to VDI 2169

Versatile and easy to operate!

RESOL DeltaSol® SLL
Price bracket A | Article no. 115 431 53 277.40 €

RESOL DeltaSol® SLL – Full kit
Incl. 3 Pt1000 sensors (1 x FKP6, 2 x FRP6)
Price bracket A | Article no. 115 431 63 308.40 €

Customised and OEM versions are available on request. Please contact our sales team.

Manuals available:
ELECTRICAL CONNECTION

Inputs:
- 4 inputs for Pt1000, Pt500 or KTY temperature sensors
- 1 V40 impulse input

Outputs:
- 2 semiconductor relays
- 1 potential-free extra-low voltage relay
- 2 PWM outputs

PWM frequency: 1000 Hz
PWM voltage: 10.5 V
Switching capacity:
- 1 (1) A 240 V~ (semiconductor relay)
- 1 (1) A 30 V (potential-free relay)
Total switching capacity: 2 A 240 V~

Power supply:
- 100 ... 240 V~ (50 ... 60 Hz)

Supply connection: type Y attachment

Standby: 0.67 W

Temperature controls class: I
Energy efficiency contribution: 1%
Mode of operation: type 1.B.C.Y action
Rated impulse voltage: 2.5 kV

Data interface: RESOL VBus®

VBus® current supply: 60 mA

Functions:
- operating hours counter
- tube collector function
- thermostat function
- pump speed control
- heat quantity measurement
- adjustable system parameters and optional functions (menu-driven)
- balance and diagnostics function
- function control according to VDI 2169

Housing: plastic, PC-ABS and PMMA

Mounting: wall mounting, mounting into patch panels is possible

Indication / Display:
- System-Monitoring-Display
- 16-segment-display
- 8 symbols for indication of the system status
- operating control LED (Lightwheel®)

Operation:
- 4 push buttons and 1 adjustment dial (Lightwheel®)

Ingress protection: IP 20 / EN 60529

Protection class: I

Ambient temperature: 0 ... 40 °C
Pollution degree: 2
Dimensions: 110 x 166 x 47 mm

EXAMPLES

Solar system with 1 store
Solar system with 1 store and heat exchange control
Solar system with 1 store and thermostatic backup heating
Solar system with store loading in layers

Solar system with 2 stores, valve logic
Solar system with 2 stores, pump logic
Solar system with east-/west collectors and 1 store
Solar system with 1 store and solid fuel boiler

ACCESSORIES

RESOL KM1 Communication module
For visualisation via VBus.net, incl. network cable, mains adapter and VBus® cable pre-connected (see page 56)

Price bracket A | Article no.: 180 011 30 | 255.00 €

RESOL V40
V40 flowmeter in different versions (see page 84)
from 110.40 €

RESOL SP10
Sensor overvoltage protection (see page 92)

Price bracket A | Article no.: 180 110 70 | 17.50 €

RESOL AM1
Alarm module for signalling system failures (see page 62)

Price bracket B1 | Article no.: 180 008 70 | 67.00 €

For a survey of accessories see page 50!

A table with the current consumption values of all VBus® accessories can be found on page 62!
**DeltaSol® SL**

With its versatile software, the RESOL DeltaSol® SL can control even complex systems easily and reliably: 27 pre-configured system layouts with up to 3 hydraulic variants each facilitate the commissioning and enable the adaptation to the individual system requirements.

The operation via 2 main buttons and 1 adjustment dial, the Lightwheel®, still follows the well-known operating concept.

The manual mode and the holiday function can be activated by pressing a single button.

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Modern design, many application possibilities!

- Integrated MicroSD card slot
- 4 relay outputs (incl. 1 potential-free extra-low voltage relay)
- 4 inputs for Pt1000, Pt500 or KTY temperature sensors
- Inputs for 1 analogue Grundfos Direct Sensor™ and 1 FlowRotor
- 1 V40 impulse input (also usable as a Pt1000, Pt500 or KTY temperature sensor input)
- 2 PWM outputs for the speed control of high-efficiency pumps
- 27 basic system layouts with up to 3 hydraulic variants each to choose from
- Automatic function control according to VDI 2169

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RESOL DeltaSol® SL
Price bracket A | Article no. 115 003 33 307.00 €

RESOL DeltaSol® SL – Full kit
Incl. 4 Pt1000 sensors (2 x FKP6, 2 x FRP6)
Price bracket A | Article no. 115 003 43 349.00 €

Customised and OEM versions are available on request. Please contact our sales team.

Manuals available:

- DE
- FR
- IT
- ES
- NL
**ELECTRICAL CONNECTION**

- **Inputs:**
  - 4 inputs for Pt1000, Pt500 or KTY temperature sensors,
  - 1 analogue Grundfos Direct Sensor™,
  - 1 FlowRotor,
  - 1 V40 impulse input (also usable as a Pt1000, Pt500 or KTY temperature sensor input)

- **Outputs:**
  - 3 semiconductor relays,
  - 1 potential-free extra-low voltage relay,
  - 2 PWM outputs (switchable to 0-10 V)

- **PWM frequency:** 512 Hz
- **PWM voltage:** 10.8 V

- **Switching capacity:**
  - 1 (1) A 240 V~ (semiconductor relay)
  - 1 (1) A 30 V / 240 V~ (potential-free relay)

- **Total switching capacity:** 3 A 240 V~

- **Power supply:** 100 ... 240 V~ (50 ... 60 Hz)

- **Supply connection:** type Y attachment

- **Standby:** 0.72 W

- **Temperature controls class:** I

- **Energy efficiency contribution:** 1 %

- **Mode of operation:** type 1.B.C.Y action

- **Rated impulse voltage:** 2.5 kV

- **Data interface:** RESOL VBus®, MicroSD card slot

- **VBus® current supply:** 60 mA

- **Functions:**
  - operating hours counter,
  - tube collector function,
  - thermostat function,
  - pump speed control,
  - heat quantity measurement,
  - adjustable system parameters and optional functions (menu-driven),
  - balance and diagnostics function,
  - function control according to VDI 2169

- **Housing:** plastic, PC-ABS and PMMA

- **Mounting:** wall mounting, mounting into patch panels is possible

- **Indication / Display:** System-Monitoring-Display,
  - for visualisation of the systems,
  - 16-segment display,
  - 8 symbols for indication of the system status,
  - operating control LED (Lightwheel®)

- **Operation:**
  - 4 push buttons and 1 adjustment dial (Lightwheel®)

- **Ingress protection:** IP 20 / EN 60529

- **Protection class:** I

- **Ambient temperature:** 0 ... 40 °C

- **Pollution degree:** 2

- **Dimensions:** 110 x 166 x 47 mm

A cable with the current consumption values of all VBus® accessories can be found on page 63!

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**EXAMPLES**

- Solar system with 1 store
- Solar system with 1 store and heat exchange control
- Solar system with 1 store and thermostatic backup heating
- Solar system with store loading in layers
- Solar system with store loading in layers and solid fuel boiler
- Solar system with 1 store, heating circuit return preheating and thermostatic backup heating
- Solar system with multi-layer store and heating circuit return preheating
- Solar system with east-/west collectors and 2 stores (valve logic)

**ACCESSORIES**

- **RESOL DL2 Datalogger**
  - For visualisation via VBus.net, incl. SD card and network cable, mains adapter and VBus® cable pre-connected (see page 54)
  - Price bracket A | Article no.: 180 007 10 | 309.00 €

- **VFS/RPS Grundfos Direct Sensor™**
  - Analogue sensors in different versions (see page 90)
  - from 38.00 €

- **RESOL AM1**
  - Alarm module for signalling system failures (see page 62)
  - Price bracket B | Article no.: 180 008 70 | 67.00 €

- **MicroSD card**
  - MicroSD card, 4 GB memory capacity, incl. adapter
  - Price bracket C | Article no.: 180 007 41 | 6.70 €

- **RESOL SP10**
  - Sensor overvoltage protection (see page 92)
  - Price bracket A | Article no.: 180 110 70 | 17.50 €

For a survey of accessories see page 50!
DeltaSol® BX/BX L

The DeltaSol® BX is equipped with 26 pre-programmed basic systems for a broad range of 1- and 2-store systems. Pre-defined functions facilitate system parameterisation.

The DeltaSol® BX L has been especially developed as an economical solution for multi-store solar thermal systems. It features pre-programmed system layouts for a range of 2- and 3-store systems and special functions such as an extended priority and loading logic.

With the integrated SD card slot, system data can easily be logged and transferred to a computer.

Customised and OEM versions are available on request. Please contact our sales team.

Complex systems simply mastered!

- 4 relay outputs and 5 Pt1000 temperature sensor inputs
- 2 inputs for analogue Grundfos Direct Sensors™ (DeltaSol® BX)
- 2 PWM outputs for the speed control of high-efficiency pumps
- 26 basic systems to choose from (DeltaSol® BX), 9 basic systems (DeltaSol® BX L)
- For 2- and 3-store systems (DeltaSol® BX L)
- Drainback option (DeltaSol® BX)
- Thermal disinfection function, heat dump function
- Unit °C and °F selectable

RESOL DeltaSol® BX
Price bracket A | Article no. 115 450 03 334.70 €

RESOL DeltaSol® BX – Full kit
Incl. 5 Pt1000 sensors (2 x FKP6, 3 x FRP6)
Price bracket A | Article no. 115 450 13 386.70 €

RESOL DeltaSol® BX L
Price bracket A | Article no. 115 000 03 320.30 €

RESOL DeltaSol® BX L – Full kit
Incl. 5 Pt1000 sensors (2 x FKP6, 3 x FRP6)
Price bracket A | Article no. 115 000 13 372.30 €

An SD card is included with the controller. For our range of Grundfos Direct Sensors™ (DeltaSol® BX only) see page 90!

*cTUVus certified!™

The cTUVus certification confirms that the controller is certified to UL 60730-1:2009 and CSA B60730.1:2002.
**ELECTRICAL CONNECTION**

DeltaSol® BX

Example DeltaSol® BX

**EXAMPLES**

- Solar system with store loading in layers and solid fuel boiler
- Solar system with 1 store, heating circuit return preheating and thermostatic backup heating
- Solar system with 1 store and thermostatic backup heating
- Solar system with store loading in layers
- 3-store solar system with valve logic and heat exchange control
- 3-store solar system with pump logic and heat exchange control
- Solar system with store loading in layers and 2 stores
- Solar system with east-/west collectors and 2 stores (valve logic)

**TECHNICAL DATA**

**Inputs:**
- 5 Pt1000 temperature sensors, 1 V40 impulse input, 2 Grundfos Direct Sensors™ (analogue; DeltaSol® BX only)

**Outputs:**
- 3 semiconductor relays, 1 electromechanical relay and 2 PWM outputs

**PWM frequency:** 512 Hz

**PWM voltage:** 10.8 V

**Switching capacity:**
- 1 (1) A 240 V~ (semiconductor relay)
- 2 (1) A 240 V~ (electromechanical relay)

**Total switching capacity:** 4 A 240 V~

**Power supply:** 100 ... 240 V~ (50 ... 60 Hz)

**Supply connection:** type Y attachment

**Standby:**
- 0.50 W (DeltaSol® BX), 0.58 W (DeltaSol® BX L)

**Temperature controls class:** I

**Energy efficiency contribution:** 1 %

**Mode of operation:** type 1.B.C.Y action

**Rated impulse voltage:** 2.5 kV

**Data interface:** RESOL VBus®, SD card slot

**VBus® current supply:** 35 mA

**Functions:**
- ∆T control, pump speed control, heat quantity measurement, operating hours counter for the solar pump, tube collector function, thermostat function, store loading in layers, priority logic, heat dump function, thermal disinfection function, function control

**Housing:** plastic, PC-ABS and PMMA

**Mounting:** wall mounting, mounting into patch panels is possible

**Indication/Display:**
- System-Monitoring-Display for system visualisation, 16-segment display, 7-segment display, 8 symbols, operating control LED (directional pad) and background illumination

**Operation:**
- 7 push buttons

**Ingress protection:** IP 20/EN 60529

**Protection class:** I

**Ambient temperature:** 0 ... 40 °C

**Pollution degree:** 2

**Dimensions:** 198 x 170 x 43 mm

A table with the current consumption values of all VBus® accessories can be found on page 63!
The DeltaSol® SLT effortlessly controls even complex systems. 27 pre-configured system layouts with numerous pre-programmed optional functions such as thermal disinfection or zone loading enable adaptation to the individual system requirements.

The operation via 2 main buttons and 1 adjustment dial, the Lightwheel®, still follows the well-known operating concept.

The manual mode and the holiday function can be activated by pressing a single button.

DeltaSol® SLT

Freely configurable compact-class controller

- 4 relay outputs (incl. 1 potential-free extra-low voltage relay)
- 4 inputs for Pt1000, Pt500 or KTY temperature sensors
- Inputs for 1 analogue Grundfos Direct Sensor™ and 1 FlowRotor
- 1 V40 impulse input (also usable as a Pt1000, Pt500 or KTY temperature sensor input)
- 2 PWM outputs for the speed control of high-efficiency pumps
- 27 basic system layouts to choose from
- Numerous pre-programmed optional functions
- Automatic function control according to VDI 2169

Menu languages:
**ELECTRICAL CONNECTION**

![Electrical Connection Diagram]

**EXAMPLES**

- Solar system with 1 store
- Solar system with 1 store and heat exchange control
- Solar system with 1 store and thermostat control
- Solar system with store loading in layers
- Solar system with store loading in layers and solar fuel boiler
- Solar drainback system with booster*

* Application examples

**ACCESSORIES**

- **RESOL DL2 Datalogger**
  - For visualisation via VBus.net, incl. SD card and network cable, mains adapter and VBus® cable pre-connected (see page 54)
  - Price bracket A | Article no.: 180 007 10  309.00 €

- **RESOL DL3 Datalogger**
  - For visualisation via VBus.net, incl. SD card, mains adapter, network and VBus® cable (see page 55)
  - Price bracket A | Article no.: 180 009 90  672.00 €

- **VFS/RPS Grundfos Direct Sensor™**
  - Analogue sensors in different versions (see page 90)
  - from 38.00 €

- **RESOL SP10**
  - Sensor overvoltage protection (see page 92)
  - Price bracket A | Article no.: 180 110 70  17.50 €

- **MicroSD card**
  - MicroSD card, 4 GB memory capacity, incl. adapter
  - Price bracket C | Article no.: 180 007 41  6.70 €

- **RESOL V40**
  - V40 flowmeter in different versions (see page 84)
  - from 110.40 €

For a survey of accessories see page 50!

**TECHNICAL DATA**

**Inputs:**
- 4 inputs for Pt1000, Pt500 or KTY temperature sensors
- 1 analogue Grundfos Direct Sensor™
- 1 FlowRotor
- 1 V40 impulse input (also usable as a Pt1000, Pt500 or KTY temperature sensor input)

**Outputs:**
- 3 semiconductor relays
- 1 potential-free extra-low voltage relay
- 2 PWM outputs (switchable to 0-10 V)

- **PWM frequency:** 512 Hz
- **PWM voltage:** 10.8 V
- **Switching capacity:**
  - (1) A 240 V~
  - (1) A 30 V / 240 V~
- **Total switching capacity:** 3 A 240 V~

**Power supply:**
- 100 ... 240 V~ (50 ... 60 Hz)

**Supply connection:**
- type Y attachment

**Standby:**
- 0.68 W (without LAN interface), 1.32 W (with LAN interface)

**Temperature controls class:**
- 1 %

**Mode of operation:**
- type 1.B.C.Y action

**Rated impulse voltage:**
- 2.5 kV

**Data interface:**
- RESOL VBus®, MicroSD card slot, LAN interface (optional), mini-USB port

**VBus® current supply:**
- 60 mA

**Functions:**
- Operating hours counter, tube collector function, zone loading, heat exchange, speed control, heat quantity measurement, adjustable system parameters and optional functions (menu-driven), balance and diagnostics function, function control according to VDI 2169

**Housing:**
- plastic, PC-ABS and PMMA

**Mounting:**
- wall mounting, mounting into patch panels is possible

**Indication/Display:**
- full graphic display, operating control LED (Lightwheel®)

**Operation:**
- 4 push buttons and 1 adjustment dial (Lightwheel®)

**Ingress protection:**
- IP 20/EN 60529

**Protection class:**
- 1

**Ambient temperature:**
- 0 ... 40 °C

**Pollution degree:**
- 2

**Dimensions:**
- 110 x 166 x 47 mm

A cable with the current consumption values of all VBus® accessories can be found on page 63!
DeltaSol® E

Inputs: 10 sensor inputs for Pt1000, 1 CS10, 1 V40
Outputs: 6 semiconductor relays, 3 of them for pump speed control, 1 potential-free relay and 3 PWM outputs (convertible to 0-10V signal outputs)
PWM frequency: 512 Hz
PWM voltage: 10.5 V
Switching capacity:
1 (1) A 240 V~ (semiconductor relay)
2 (1) A 24 V~ (potential-free relay)
Total switching capacity: 4 A 240 V~
Power supply: 100 ... 240 V~ (50 ... 60 Hz)
Supply connection: type Y attachment
Standby: 0.98 W
Temperature controls class: III
Energy efficiency contribution: 1.5 %
Mode of operation: type 1.B.C.Y action
Rated impulse voltage: 2.5 kV
Data interface: RESOL VBus®
VBus® current supply: 35 mA
Functions: heating circuit backup, heat exchange control, thermostatic backup heating, solid fuel boiler, heat quantity measurement, collector cooling function, tube collector function, antifreeze function, minimum limitation, speed control, screed drying, function control
Housing: plastic, PC-ABS and PMMA
Mounting: wall mounting, mounting into patch panels is possible
Indication/Display: 4-line LC text display, illuminated, menu-driven (multilingual)
Operation: 3 push buttons at the front
Ingress protection: IP 20/EN 60529
Protection class: II
Ambient temperature: 0 ... 40 °C
Pollution degree: 2
Dimensions: 227 x 156 x 62 mm

System controller for up to 4 heating circuits!

- 10 sensor inputs and 7 relay outputs
- 7 basic systems to choose from
- Pump speed control, solar operating hours counter and heat quantity measurement
- Up to 4 weather-compensated heating circuits with HKM3 modules
- Extended manual mode with minimum and maximum speed
- 3 PWM/0-10V outputs for the speed control of high-efficiency pumps
- Standard PWM characteristic curves for solar and heating pumps
- Commissioning menu
- DHW heating and screed drying functions
- VBus® menu for configuring remote displays, e.g. SDFK

RESOL DeltaSol® E
Price bracket A | Article no.: 115 661 23
425.50 €

RESOL DeltaSol® E – Full kit
Incl. 6 Pt1000 sensors (2 x FKP6, 4 x FRP6)
Price bracket A | Article no.: 115 661 33
487.50 €

Menu languages:

Examples

- Solar system with 4 stores, pump logic
- Solar system with combined store, external heat exchanger, weather-compensated heating circuit, return preheating and backup heating

Customised and OEM versions are available on request.
Please contact our sales team.
DeltaSol® ES

Inputs: 8 sensor inputs for Pt1000, 1 CS10, 1 V40

Outputs: 6 semiconductor relays, 3 of them for pump speed control and 1 potential-free relay

Switching capacity:
1 (1) A 240 V~ (semiconductor relay)
2 (1) A 24 V~/240 V~ (potential-free relay)

Total switching capacity: 4 A 240 V~

Power supply: 100 ... 240 V~ (50 ... 60 Hz)

Supply connection: type Y attachment

Standby: 0.48 W

Temperature controls class: I

Energy efficiency contribution: 1 %

Mode of operation: type 1, B, C, Y action

Rated impulse voltage: 2.5 kV

Data interface: RESOL VBus®

VBus® current supply: 30 mA

Functions: 2-store systems, east-/west collectors, heating circuit backup, heat exchange control, thermostatic backup heating, solid fuel boilers, adjustable functions and options as heat quantity measurement, collector cooling function, tube collector function, antifreeze function, minimum temperature limitation, pump speed control, balance and diagnostics functions, function control

Housing: plastic, PC-ABS and PMMA

Mounting: wall mounting, mounting into patch panels is possible

Indication/Display: System-Monitoring-Display for visualisation of systems, 16-segment and 7-segment display, 8 symbols for indication of system status and operating control LED

Operation: 3 push buttons

Ingress protection: IP 20 / EN 60529

Protection class: II

Ambient temperature: 0 ... 40 °C

Pollution degree: 2

Dimensions: 227 x 156 x 62 mm

36 pre-programmed system layouts!

- Illuminated System-Monitoring-Display
- 8 sensor inputs and 7 relay outputs
- 36 basic systems to choose from
- Pump speed control
- Solar operating hours counter
- Heat quantity measurement

Customised and OEM versions are available on request. Please contact our sales team.

RESOL DeltaSol® ES
Price bracket A | Article no. 115 660 93 376.50 €

RESOL DeltaSol® ES – Full kit
Incl. 5 Pt1000 sensors (2 x FK6, 3 x FRP6)
Price bracket A | Article no. 115 661 03 428.50 €

Manuals available:

EXAMPLES

Solar system with east-/west collectors and store loading in layers

Solar system with 1 store, heating circuit return preheating and thermostatic backup heating
The RESOL DeltaSol® BX Plus is a system controller for multi-store solar and heating systems. The intuitive commissioning menu leads you through the system configuration by requiring the most important adjustments directly after connecting the controller.

For an optimum overview, all sensor and relay allocations are listed in the service menu.

Customised and OEM versions are available on request. Please contact our sales team.

Visit www.resol.de/videos for a product video about this controller.
**ELECTRICAL CONNECTION**

![Electrical Connection Diagram]

**EXAMPLES**

- 2-store system with valve logic, 1 pump, 3 sensors and 3-port valve
- 2-store solar system with valve logic and heat exchange control
- Solar system with 3 stores, 3-port valve logic and heat exchange control
- 3-store solar system with pump logic and heat exchange control
- Solar system with east-/west collectors and 2 stores (valve logic)
- Solar system with east-/west collectors, 2 stores and external heat exchanger, 3-port valve control
- Solar system with 2 stores and external heat exchanger, pump logic
- 1 mixed heating circuit with solid fuel boiler and backup heating (demand)

**ACCESSORIES**

- **RESOL DL2 Datalogger**
  - For visualisation via VBus.net, incl. SD card and network cable, mains adapter and VBus® cable pre-connected (see page 54)
  - Price bracket A | Article no.: 180 007 10 | 309.00 €

- **RESOL DL3 Datalogger**
  - For visualisation via VBus.net, incl. SD card, mains adapter, network and VBus® cable (see page 55)
  - Price bracket A | Article no.: 180 009 90 | 672.00 €

- **VFD/RPD Grundfos Direct Sensor™**
  - Digital sensors in different versions (see page 90)
  - Price bracket A | Article no.: from 38.00 €

- **RESOL EM**
  - Sensor and relay Extension module with 5 outputs and 6 inputs (see page 37)
  - Price bracket A | Article no.: 145 440 80 | 212.40 €

- **RESOL SD3/SDFK Smart Display**
  - (see page 61)
  - Price bracket A | Article no. SD3: 180 004 90 | 182.00 €
  - Price bracket A | Article no. SDFK: 180 010 90 | 182.00 €

- **RESOL SP10**
  - Sensor overvoltage protection (see page 92)
  - Price bracket A | Article no.: 180 110 70 | 17.50 €

For a survey of accessories see page 50!

**TECHNICAL DATA**

Inputs: 8 (9) inputs for Pt1000, Pt500 or KTY temperature sensors, 1 V40 impulse input, inputs for 2 digital Grundfos Direct Sensors™, 1 input for a CS10 irradiation sensor

Outputs: 4 semiconductor relays, 1 potential-free relay, 2 PWM outputs

- PWM frequency: 512 Hz
- PWM voltage: 11.0 V

Switching capacity: 1 (1) A 240 V~/ (potential-free relay)

- Total switching capacity: 4 A 240 V~

Power supply: 100 ... 240 V~/50 ... 60 Hz

Supply connection: type Y attachment

Standby: 0.76 W

Temperature controls class: I

Energy efficiency contribution: 1 %

Mode of operation: type 1.B.C.Y action

Rated impulse voltage: 2.5 kV

Data interface: RESOL VBus®, SD card slot

VBus® current supply: 60 mA

Functions: ∆T control, pump speed control, heat quantity measurement, operating hours counter for the solar pump, tube collector function, thermostat function, store loading in layers, priority logic, drainback option, booster function, heat dump function, thermal disinfection function, PWM pump control, function control according to VDI 2169

Housing: plastic, PC-ABS and PMMA

Mounting: wall mounting, mounting into patch panels is possible

Indication/Display: full graphic display, operating control LED (directional pad) and background illumination

Operation: 7 push buttons at the front

Ingress protection: IP 20 / EN 60529

Protection class: I

Ambient temperature: 0 ... 40 °C

Pollution degree: 2

Dimensions: 198 x 170 x 43 mm

For the digital inputs, the following sensor combinations are possible:

- 1 x RPD, 1 x VFD
- 2 x VFD but with different measuring ranges only

A table with the current consumption values of all VBus® accessories can be found on page 63!
DeltaSol® MX

The DeltaSol® MX is the most versatile system controller for complex solar and heating systems in our product range. It is ideal to control a combination of solar and non-solar parts of the system.

Easy combination and parameterisation of pre-programmed functions for several millions of hydraulic variants.

Customised and OEM versions are available on request. Please contact our sales team.

The all-rounder

- 14 relay outputs and 12 inputs for Pt1000, Pt500 or KTY temperature sensors
- Up to 5 extension modules via RESOL VBus® (45 sensors and 39 relays in total)
- Inputs for analogue and digital Grundfos Direct Sensors™ as well as 1 FlowRotor
- Integrated control of up to 4 high-efficiency pumps via PWM outputs
- Data logging, transfer of adjustments and firmware updates via SD memory card
- Cooling over the heating circuit with condensation detection by means of a dew point switch (beginning with version 2.0)
- Simplified timer, 0-10 V boiler control and DHW preheating (beginning with version 2.0)
- Basic solar systems also for 3 collector fields (beginning with version 2.0)

RESOL DeltaSol® MX
Price bracket A | Article no.: 115 992 03 572.10 €

RESOL DeltaSol® MX – Full kit
Incl. 6 Pt1000 sensors (2 x FKP6, 4 x FRP6)
Price bracket A | Article no.: 115 992 13 634.10 €

An SD card is included with the controller. See page 90 for Grundfos Direct Sensors™!

Menu languages:

Visit www.resol.de/videos for a product video about this controller

* The cLCus certification confirms that the controller is certified to UL 60730-2-9 and CSA - E60730-2-9-01.
** On request
ELECTRICAL CONNECTION

Examples:

- Solar system with combined store, external heat exchanger, weather-compensated heating circuit, return preheating and backup heating
- Solar system with external heat exchanger, store loading in layers and backup heating by solid fuel boiler
- Solar system with 2 stores, circulation pump control, heat exchange control and weather-compensated heating circuit
- Solar system with combined store and swimming pool, backup heating, heating circuit loading and return preheating
- Solar system with 2 stores, backup heating and 2 weather-compensated heating circuits
- Solar system with store, swimming pool and backup heating over gas- and solid fuel boiler
- Solar system with external heat exchanger, store loading in layers and backup heating by solid fuel boiler
- Solar system with 2 stores, circulation pump control, heat exchange control and weather-compensated heating circuit

Inputs:
- 12 Pt1000, Pt500 or KTY temperature sensor inputs (7 of them can optionally be used for RTA12 remote controls), 3 impulse inputs for V40 flowmeters; 4 Grundfos Direct Sensors™ (2 x analogue, 2 x digital), 1 input for a FlowRotor, 1 CS10 solar cell

Outputs:
- 13 semiconductor relays for pump speed control, 1 potential-free relay and 4 PWM outputs (convertible to 0-10 V signal outputs)

- PWM frequency: 512 Hz
- PWM voltage: 10.5 V
- Switching capacity:
  - 1 (1) A 240 V~ (semiconductor relay)
  - 4 (2) A 24 V / 240 V~ (potential-free relay)
- Total switching capacity: 6.3 A 240 V~
- Power supply: 100 ... 240 V~ (50 ... 60 Hz)

TECHNICAL DATA

- Temperature controls class: III
- Energy efficiency contribution: 1.5 %
- Mode of operation: type 1.B.C.Y action
- Rated impulse voltage: 2.5 kV
- Data interface: RESOL VBus®, SD card slot
- VBus® current supply: 35 mA
- Functions: 7 integrated calorimeters and control of weather-compensated heating circuits. Adjustable system parameters and add-on options (menu-driven), balance and diagnostics functions, function control
- Housing: plastic, PC-ABS and PMMA
- Mounting: wall mounting, mounting into patch panels is possible
- Indication/Display: full graphic display
- Operation: 7 push buttons
- Ingress protection: IP 20/EN 60529
- Protection class: I
- Ambient temperature: 0...-40 °C
- Pollution degree: 2
- Dimensions: 253 x 200 x 47 mm

ACCESSORIES

RESOL DL3 Datalogger
For visualisation via VBus.net, incl. SD card, mains adapter, network and VBus® cable (see page 53)
Price bracket A | Article no.: 180 009 90 | 672.00 €

RESOL EM
Sensor and relay Extension Module with 5 outputs and 6 inputs (see page 37)
Price bracket A | Article no.: 145 440 80 | 212.40 €

VFS/RPS Grundfos Direct Sensor™
Analogue sensors in different versions (see page 90)
from 38.00 €

RESOL TS10
Dew point switch (see page 90)
Price bracket B | Article no.: 155 009 00 | 118.00 €

VFD/RPD Grundfos Direct Sensor™
Digital sensors in different versions (see page 90)
from 38.00 €

RESOL V40
V40 flowmeter in different versions (see page 84)
from 110.40 €

For a survey of accessories see page 50!
A table with the current consumption values of all VBus® accessories can be found on page 63!
Extendable by a range of pre-programmed optional functions, such as:

- Exemplary bypass variant layouts
- Drainback system with booster pump
- Heat dump
- Heat exchange
- Solid fuel boiler
EM Extension module

The EM Extension module provides 5 additional relays and 6 additional sensor inputs for the DeltaSol® MX controller. Up to 5 extension modules can be connected to the MX via the VBus®, so that a total of up to 39 outputs and 45 inputs can be made available for the control logic.

The Extension modules themselves do not require any adjustments, they are simply connected and assigned to the controller. The inputs and outputs of the registered modules will then be available for all functions of the controller. With 5 extension modules and its 2 internal heating circuits, for example, the DeltaSol® MX can manage no less than 7 heating circuits complete with individual room thermostats.

**TECHNICAL DATA**

- **Inputs**: 6 Pt1000, Pt500 or KTY temperature sensors
- **Outputs**: 4 semiconductor relays and 1 potential-free relay
- **Switching capacity**: 1 (1) A 240 V~ (semiconductor relay)
  4 (1) A 24 V~/240 V~ (potential-free relay)
- **Total switching capacity**: 4 A 240 V~
- **Power supply**: 100 ... 240 V~ (50 ... 60 Hz)
- **Supply connection**: type Y attachment
- **Standby**: 0.30 W
- **Mode of operation**: type 1.B.C.Y action
- **Rated impulse voltage**: 2.5 kV
- **Data interface**: RESOL VBus®
- **Housing**: plastic, PC-ABS and PMMA
- **Mounting**: wall mounting
- **Indication / Display**: LC display, 7-segment display
- **Operation**: 3 push buttons and 1 slide switch at the front of the housing

**RESOL EM Extension module**

Sensor and relay Extension module with 5 outputs and 6 inputs

Price bracket A | Article no.: 145 440 80

212.40 €

**RESOL RTA12**

Remote control for connection to the HKM3 and DeltaSol® E, MX, BX Plus, DeltaTherm® HC, HC mini or EM Extension module

Price bracket A | Article no.: 136 000 40

51.20 €
Controller for solar swimming pool heating!

The DeltaSol® Minipool is a controller for heating a swimming pool by means of solar collectors and optimised operation of the filter system. Furthermore, the controller has many additional pool functions such as: maximum limitation of flow temperature, pool cooling function and a flushing function.

- 4 sensor inputs and 2 relay outputs
- Filter runtime monitoring, maximum flow temperature limitation
- Cooling function, collector emergency shutdown
- Heat quantity measurement, operating hours counter

Customised and OEM versions are available on request.
Please contact our sales team.

DeltaSol® Minipool

Inputs: 4 Pt1000 temperature sensors
Outputs: 2 semiconductor relays
Switching capacity: 0.5 (0.5) A 240 V~ (semiconductor relay)
Total switching capacity: 0.8 A 240 V~
Power supply: 220 ... 240 V~ (50 ... 60 Hz)
Supply connection: type Y attachment
Standby: 2.98 W
Mode of operation: type 1.C.Y action
Rated impulse voltage: 2.5 kV
Data interface: RESOL VBus®
VBus® current supply: 30 mA
Functions: function control, filter runtime monitoring, maximum flow temperature limitation, cooling function, collector emergency shutdown, heat quantity measurement, operating hours counter
Housing: plastic, PC-ABS and PMMA
Mounting: wall mounting, mounting into patch panels is possible
Indication/Display: graphic display, 160 x 64 pixels
Operation: 3 push buttons
Ingress protection: IP 20/EN 60529
Protection class: I
Ambient temperature: 0 ... 40 °C
Pollution degree: 2
Dimensions: 172 x 110 x 49 mm

RESOL DeltaSol® Minipool
Price bracket A | Article no.: 115 662 93 306.00 €

RESOL DeltaSol® Minipool – Full kit
Incl. 3 Pt1000 sensors (1 x FKP6, 2 x FRP6)
Price bracket A | Article no.: 115 663 03 337.00 €

EXAMPLE

Menu languages:
The complete solution for your swimming pool heating!

The DeltaSol® Pool is a controller for heating a swimming pool by means of solar collectors and optimised operation of the filter system. Backup heating of the swimming pool is varied according to solar power and pool demand, thus saving expensive energy.

- Solar operating hours counter and heat quantity measurement
- Integrated backup heating demand
- 10 sensor inputs and 7 relay outputs
- Filter runtime and pump monitoring, flushing function
- Maximum flow temperature limitation, cooling function, collector emergency shutdown

Customised and OEM versions are available on request. Please contact our sales team.

DeltaSol® Pool

Inputs: 10 sensor inputs for Pt1000, 1 x CS10, 1 x impulse and 1 digital input
Outputs: 6 semiconductor relays, 1 potential-free relay
Switching capacity:
  1 (1) A 240 V – (semiconductor relay)
  2 (1) A 24 V –/240 V – (potential-free relay)
Total switching capacity: 4 A 240 V –
Power supply: 100 ... 240 V – (50 ... 60 Hz)
Supply connection: type Y attachment
Standby: 1.83 W
Mode of operation: type 1.B.C.Y action
Rated impulse voltage: 2.5 kV
Data interface: RESOL VBus®
VBus® current supply: 30 mA
Functions: solar operating hours counter and heat quantity measurement, function control, filter runtime monitoring, maximum flow temperature limitation, cooling function, collector emergency shutdown, pump monitoring. Add-on backup heating of the swimming pool depending on the need and on the power of the solar collectors
Housing: plastic, PC-ABS and PMMA
Mounting: wall mounting, mounting into patch panels is possible
Indication/Display: 4-line LC text display
Operation: 3 push buttons
Ingress protection: IP 20 / EN 60529
Protection class: II
Ambient temperature: 0 ... 40 °C
Pollution degree: 2
Dimensions: 227 x 156 x 60 mm

RESOL DeltaSol® Pool
Price bracket A | Article no.: 115 661 73 433.70 €

RESOL DeltaSol® Pool – Full kit
Incl. 3 Pt1000 sensors (1 x FKP6, 2 x FRP6)
Price bracket A | Article no.: 115 661 83 464.70 €

Menu languages:

Customised and OEM versions are available on request. Please contact our sales team.
RESOL offers a range of solutions for the control of DHW exchange modules.

The RESOL DHW exchange controllers are available in a number of versions for different system sizes, additional features available are the control of high-efficiency pumps, integrated data logging and the remote access over a network or the Internet with the RESOL VBus®.
**DeltaSol® Fresh**

**OEM DHW exchange controller**

When developing DHW controllers, RESOL always aims to achieve the best possible control quality. The boundaries of each individual development are determined by many equally individual factors. Among these factors are e.g.:

- the hydraulics in use
- the choice, number and positioning of the sensors
- the control algorithm

Pre-configured functions and basic systems facilitate the quick and easy adaptation to your OEM station.

Contact us!

---

**DeltaSol® Fresh 20**

**Inputs:**
4 inputs for Pt1000, Pt500 or KTY temperature sensors

**Outputs:**
2 semiconductor relays, 2 electromechanical relays, 1 PWM output

**Power supply:**
100 ... 240 V~ (50 ... 60 Hz)

**Supply connection:**
type Y attachment

**Data interface:**
RESOL VBus®

**Housing:**
plastic, PC-ABS and PMMA

**Mounting:**
wall mounting, mounting into patch panels is possible

**Indication / Display:**
System-Monitoring-Display

**Operation:**
3 push buttons at the front

**Ingress protection:**
IP 20 / EN 60529

**Protection class:**
I

**Ambient temperature:**
0 ... 40 °C

**Pollution degree:**
2

**Dimensions:**
172 x 110 x 46 mm

---

**DeltaSol® Fresh 100**

**Inputs:**
10 inputs for Pt1000, Pt500 or KTY temperature sensors, 2 V40 impulse inputs, inputs for 2 Grundfos Direct Sensors™ (VFD 2-40 Fast), 1 input for a CS10 irradiation sensor

**Outputs:**
4 semiconductor relays, 1 potential-free relay, 4 PWM outputs (convertible to 0-10 V signal outputs)

**Power supply:**
100 ... 240 V~ (50 ... 60 Hz)

**Supply connection:**
type Y attachment

**Data interface:**
RESOL VBus®, SD card slot

**Housing:**
plastic, PC-ABS and PMMA

**Mounting:**
wall mounting, mounting into patch panels is possible

**Indication / Display:**
full graphic display

**Operation:**
7 push buttons

**Ingress protection:**
IP 20 / EN 60529

**Protection class:**
I

**Ambient temperature:**
0 ... 40 °C

**Pollution degree:**
2

**Dimensions:**
198 x 170 x 43 mm

---

**Highly stable DHW draw-off temperature**

**Customised control for systems with or without circulation**

**Flexible circulation function for different user profiles, also available with thermal disinfection**

**Reliable DHW heating even in the case of a fault condition**

**Control of standard or high-efficiency pumps**

**Cascades of up to 4 DHW exchange controllers or stations**

**Remote access over a local network or over the Internet possible via RESOL VBus®**
RESOL heating controllers offer solutions for different kinds of space and water heating systems, from small water heating stoves up to large multivalent systems.

Conventional heating takes many different forms today – next to the well-known oil and gas furnaces, more and more solid fuel boilers of different kinds can be found, often combined with other heat sources.
# Survey of heating controllers

<table>
<thead>
<tr>
<th>Feature</th>
<th>DeltaTherm® FK</th>
<th>DeltaTherm® HC mini</th>
<th>DeltaTherm® HC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature sensor inputs</strong></td>
<td>4</td>
<td>5</td>
<td>8 (9)</td>
</tr>
<tr>
<td>Sensor type</td>
<td>Pt100</td>
<td>Pt100</td>
<td>Pt100, Pt500, KTY</td>
</tr>
<tr>
<td>Semiconductor relays</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Potential-free relay</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>PWM/0-10V outputs</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

## Software

<table>
<thead>
<tr>
<th>Feature</th>
<th>FK</th>
<th>HC mini</th>
<th>HC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-configured systems</td>
<td>8</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>Mixed heating circuits</td>
<td>-</td>
<td>1</td>
<td>6¹</td>
</tr>
<tr>
<td>Mixer control weather-compensated</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Mixer control with target temperature</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Operating modes</td>
<td>-</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>0-10V boiler control</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Room control</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Remote access with VBus™ Touch HC</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Remote display via VBus™ Touch FK</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Remote access with RCP12</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Heating circuit antifreeze function</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Heating circuit chimney sweeper function</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Screed drying function</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Room thermostats</td>
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<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Thermal disinfection</td>
<td>-</td>
<td>-</td>
<td>✓²</td>
</tr>
<tr>
<td>DHW heating</td>
<td>✓</td>
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</tr>
<tr>
<td>Circulation</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>Solid fuel boiler</td>
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<td>✓</td>
</tr>
<tr>
<td>Heating circuit return preheating</td>
<td>✓</td>
<td>-</td>
<td>✓²</td>
</tr>
<tr>
<td>Return mixing function</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Weather-compensated backup heating</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Night correction</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Boiler protection</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Start-up/Overrun</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Backup heating suppression</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Heat exchange</td>
<td>✓</td>
<td>-</td>
<td>✓²</td>
</tr>
<tr>
<td>Mixer</td>
<td>✓</td>
<td>-</td>
<td>✓²</td>
</tr>
<tr>
<td>Parallel relay</td>
<td>-</td>
<td>-</td>
<td>✓²</td>
</tr>
<tr>
<td>Error relay</td>
<td>-</td>
<td>-</td>
<td>✓²</td>
</tr>
<tr>
<td>Function block</td>
<td>-</td>
<td>-</td>
<td>✓²</td>
</tr>
<tr>
<td>HQM</td>
<td>-</td>
<td>-</td>
<td>✓²</td>
</tr>
</tbody>
</table>

¹ via EM Extension module(s)  
² via convertible impulse inputs
DeltaTherm® HC mini

The DeltaTherm® HC mini offers a compact and user-friendly solution for simple heating systems. It can control a weathercompensated heating circuit and its backup heating demand. Additionally, there’s a choice of 5 different operating modes, a boiler protection option and a night correction.

Due to the commissioning menu and the 4 pre-configured basic systems, configuration is quick and easy.

The chimney sweeper function and the holiday mode can be activated by pressing a single button.

Heating control, simple and efficient

- 4 pre-configured basic systems
- Screed drying function
- 4 relay outputs (incl. 1 potential-free extra-low voltage relay)
- 5 inputs for Pt1000 temperature sensors
- 5 operating modes, boiler protection, room thermostat and night correction
- Holiday mode, chimney sweeper function and screed drying function via microbuttons
- Data logging, transfer of adjustments and firmware updates via MicroSD card
- Unit °C and °F selectable

Customised and OEM versions are available on request. Please contact our sales team.
ELECTRICAL CONNECTION

EXAMPLES

1 mixed heating circuit
1 mixed heating circuit with backup heating (demand)
1 static heating circuit
1 static heating circuit with backup heating (demand)

ACCESSORIES

ESBE kvs 6,3 ¾”
3-port mixing valve (see page 99)
Price bracket B | Article no.: 270 009 40
51.80 €

Euromix ¾”
3-port mixer (see page 99)
Price bracket B | Article no.: 270 009 70
110.00 €

RESOL RTA12 Remote control
The heating curve can be comfortably adjusted from the living area (see page 91)
Price bracket A | Article no.: 136 000 40
51.20 €

RESOL DL2 Datalogger
For visualisation via VBus.net, incl. SD card and network cable, mains adapter and VBus® cable pre-connected (see page 54)
Price bracket A | Article no.: 180 007 10
309.00 €

RESOL AM1
Alarm module for signalling system failures (see page 62)
Price bracket B | Article no.: 180 008 70
67.00 €

RESOL FRP12 Indoor temperature sensor
Used for measuring the indoor temperature with a Pt1000 measuring element (see page 91)
Price bracket A | Article no.: 155 008 90
29.60 €

For a survey of accessories see page 50!

TECHNICAL DATA

Inputs: 5 inputs for Pt1000 temperature sensors (1 of them can be converted to switch and one of them to RTA)
Outputs: 3 semiconductor relays, 1 potential-free extra-low voltage relay, 1 PWM output, 10-10 V output
PWM frequency: 512 Hz
PWM voltage: 10.8 V
Switching capacity: 1 (1) A 240 V~ (semiconductor relay) 1 (1) A 30 V~ (potential-free relay)
Total switching capacity: 3 A 240 V~
Power supply: 100...240 V~ (50...60 Hz)
Supply connection: type Y attachment
Standby: 0.66 W
Temperature controls class: III
Energy efficiency contribution: 1.5 %
Mode of operation: type 1.B.C.Y action
Rated impulse voltage: 2.5 kV
Data interface: RESOL VBus®, MicroSD card slot
VBus® current supply: 60 mA
Functions: weather-compensated heating circuit control, backup heating, room thermostat, chimney sweeper function, screw drying function
Housing: plastic, PC-ABS and PMMA
Mounting: wall mounting, mounting into patch panels is possible
Indication/Display: full graphic display, control lamp (Lightwheel®)
Operation: 4 push buttons at the front and 1 adjustment dial (Lightwheel®)
Ingress protection: IP 20/EN 60529
Protection class: I
Ambient temperature: 0...40 °C
Pollution degree: 2
Dimensions: 110 x 166 x 47 mm

A table with the current consumption values of all VBus® accessories can be found on page 63!
DeltaTherm® HC

The DeltaTherm® HC can control a weather-compensated heating circuit, the DHW loading and the backup heating demand for both.

With up to five extension modules, further heating circuits, additional DHW functions such as circulation or thermal disinfection, and the efficient implementation of further heat sources can be controlled.

Due to the flexible application and extension possibilities, the heating controller is also ideal for larger objects such as apartment houses, residential homes and industrial buildings.

Customised and OEM versions are available on request. Please contact our sales team.

Heat upon request!

- 9 pre-configured basic systems and numerous pre-programmed optional functions
- 30 pre-programmed schemes for the temperature controls classes II, III, IV, VI, VII and VIII
- Up to 5 EM extension modules can be connected via the RESOL VBus® (39 sensors and 30 relays in total), up to 6 mixed heating circuits
- 2 inputs for digital Grundfos Direct Sensors™
- Screed drying function
- Data logging, storing and firmware updates via SD memory card
- Modulating heating control with 0-10 V boiler control
- Weather-compensated control with room influence or demand-based room control with up to 5 room temperature sensors
- Remote access with a room control unit or the VBus® Touch HC App

RESOL DeltaTherm® HC
Price bracket A | Article no.: 115 002 53 397.30 €
RESOL DeltaTherm® HC – Full kit
Incl. 5 Pt1000 sensors (1 x FAP13, 1 x FRP21, 3 x FRP6)
Price bracket A | Article no.: 115 002 63 454.30 €
RESOL DeltaTherm® HC – ErP 6 kit
Incl. 1 x FAP13, 1 x RCP12, 1 x FRP21, 1 x FRP6
Price bracket A | Article no.: 115 005 73 485.40 €
RESOL DeltaTherm® HC – ErP 8 kit
Incl. 1 x FRP21, 1 x FRP6, 1 x RCP12, 2 x FRP12
Price bracket A | Article no.: 115 005 83 523.90 €

A 0-10V adapter cable and an SD card are included with the controller. See page 90 for Grundfos Direct Sensors™!

Menu languages:
**EXAMPLES**

1. Mixed heating circuit with external heat source (e.g., district heating)
2. Mixed heating circuit with backup heating (demand)
3. Mixed heating circuit with external heat source (e.g., district heating)
4. Mixed heating circuit with DHW heating and backup heating (demand)
5. Mixed heating circuit with DHW heating and backup heating (demand for heating circuit and DHW)
6. Mixed heating circuit with solid fuel boiler and backup heating (demand)
7. Mixed heating circuit with solid fuel boiler
8. Mixed heating circuit with external heat source (e.g., heat pump)
9. Mixed and one un-mixed heating circuit with backup heating (demand)

**ACCESSORIES**

- **RESOL KM1 Communication module**
  - For visualization via VBus.net, incl. network cable, mains adapter and VBus® cable pre-connected (see page 56)
  - Price bracket A | Article no.: 180 011 30 | 255.00 €

- **RESOL FRP12 Indoor temperature sensor**
  - Used for measuring the indoor temperature with a Pt1000 measuring element (see page 91)
  - Price bracket A | Article no.: 155 008 90 | 29.60 €

- **RESOL SV6 Sensor distribution box**
  - 8 (9) inputs for Pt500, Pt1000 or KTY temperature sensors, 1 V40 impulse input, inputs for 2 digital Grundfos Direct Sensors™*, 1 input for a CS10 irradiation sensor
  - Price bracket A | Article no.: 145 441 30 | 375.75 €

For a survey of accessories see page 50!

**RESOL EM Sensor and relay Extension module with 5 outputs and 6 inputs (see page 37)**

Price bracket A | Article no.: 145 440 80 | 212.40 €

**RESOL RCP12 Room control unit**

- Price bracket A | Article no.: 136 000 50 | 67.00 €
- Price bracket B | Article no.: 166 000 50 | 129.00 €

**RESOL SV6 Sensor distribution box**

- Price bracket A | Article no.: 145 441 30 | 375.75 €
- Price bracket B | Article no.: 166 441 30 | 472.50 €

For a survey of accessories see page 50!

**TECHNICAL DATA**

- **Inputs:** 8 (9) inputs for Pt500, Pt1000 or KTY temperature sensors, 1 V40 impulse input, inputs for 2 digital Grundfos Direct Sensors™*, 1 input for a CS10 irradiation sensor
- **Outputs:** 4 semiconductor relays, 1 potential-free relay, 2 PWM outputs
- **PWM frequency:** 1000 Hz
- **PWM voltage:** 10.5 V
- **Switching capacity:**
  1. (1) A 240 V~ (semiconductor relay)
  2. (1) A 24 V~/240 V~ (potential-free relay)
- **Total switching capacity:** 4 A 240 V~
- **Power supply:** 100...240 V~ (50...60 Hz)
- **Supply connection:** type Y attachment
- **Standby:** 0.81 W
- **Temperature controls class:** VIII
- **Energy efficiency contribution:** 5 %
- **Mode of operation:** type 1.B.C.Y action
- **Rated impulse voltage:** 2.5 kV
- **Data interface:** RESOL VBus®, SD card slot
- **VBus® current supply:** 60 mA
- **Functions:** screen drying, weather-compensated heating circuit control, backup heating, DHW heating with priority logic, circulation, thermal disinfection, heat quantity measurement, optional functions such as solid fuel boiler, return preheating, etc.
- **Housing:** plastic, PC-ABS and PMMA
- **Mounting:** wall mounting, mounting into patch panels is possible
- **Indication/Display:** full graphic display, operating control lamp LED (directional pad) and background illumination
- **Operation:** 7 push buttons
- **Ingress protection:** IP 20/EN 60529
- **Protection class:** I
- **Ambient temperature:** 0...50 °C
- **Pollution degree:** 2
- **Dimensions:** 198 x 170 x 43 mm

For the digital inputs, the following sensor combinations are possible:
- 1 x RPD, 1 x VFD
- 2 x VFD, but with different measuring ranges only

A cable with the current consumption values of all VBus® accessories can be found on page 63!
DeltaTherm® FK

The DeltaTherm® FK Solid fuel boiler controller has been especially developed for systems with solid fuel boilers, water heating stoves or pellet stove heating systems. With the integrated PWM outputs, the FK can manage the speed control of 2 high-efficiency pumps.

With its easily configurable optional functions, the versatile software allows e. g. for the control of an electronic mixer for the return mixing function, a thermostatic backup heating, a target temperature control function and many more.

Customised and OEM versions are available on request. Please contact our sales team.

The biomass specialist!

- 2 relay outputs, 4 temperature sensor inputs
- 2 PWM outputs for the speed control of high-efficiency pumps
- Control of an electronic mixer for the return mixing function
- Heating backup
- Heat exchange function
- Thermostatic backup heating

RESOL DeltaTherm® FK
Price bracket A | Article no. 115 002 83 307.00 €

RESOL DeltaTherm® FK – Full kit
Incl. 3 Pt1000 sensors (1 x FKP6, 2 x FRP6)
Price bracket A | Article no. 115 002 93 338.00 €

A PWM adapter cable is included with the controller. High-temperature sensors can be found on page 87.

Manuals available:
ELECTRICAL CONNECTION

**Inputs:**
- 4 Pt1000 temperature sensors

**Outputs:**
- 2 semiconductor relays
- 2 PWM outputs

**PWM Frequency:** 1000 Hz

**PWM Voltage:** 10.5 V

**Switching Capacity:**
- 1 (1) A 240 V~ (semiconductor relay)
- Total switching capacity: 2 A 240 V~

**Power Supply:**
- 100 ... 240 V~ (50 ... 60 Hz)

**Supply Connection:** type Y attachment

**Standby:** 0.46 W

**Mode of Operation:**
- type 1.C.Y action

**Rated Impulse Voltage:** 2.5 kV

**Data Interface:**
- RESOL VBus®

**VBus® Current Supply:** 35 mA

**Functions:**
- minimum and maximum temperature limitation
- mixer control for the return mixing function
- target temperature control
- speed control
- heating circuit backup
- thermostatic backup heating
- heat exchange
- PWM pump control
- operating hours counter

**Housing:** plastic, PC-ABS and PMMA

**Mounting:**
- wall mounting
- mounting into patch panels is possible

**Indication / Display:**
- full graphic display

**Operation:**
- 3 push buttons

**Ingress Protection:**
- IP 20 / EN 60529

**Protection Class:** I

**Ambient Temperature:** 0 ... 40 °C

**Pollution Degree:** 2

**Dimensions:** 172 x 110 x 46 mm

**ACCESSORIES**

**RESOL DL2 Datalogger**
- For visualisation via VBus.net, incl. SD card and network cable, mains adapter and VBus® cable pre-connected (see page 54)
- Price bracket A | Article no.: 180 007 10 309.00 €

**RESOL SDFK Smart Display**
- Display module with 3 displays for biomass boiler temperature and store temperature as well as for the pump status (see page 61)
- Price bracket A | Article no.: 180 010 80 182.00 €

**RESOL VBus® sensor adapter cable**
- JST adapter cable for systems in which the 4th sensor is required
- Price bracket C | Article no.: 112 041 33 2.60 €

**RESOL AM1**
- Alarm module for signalling system failures (see page 62)
- Price bracket B | Article no.: 180 008 70 67.00 €

**RESOL VBus®/LAN interface adapter**
- Network connection set for RESOL controllers with VBus® incl. Service CD (see page 57)
- Price bracket B | Article no.: 180 008 80 106.50 €

**RESOL VBus®/USB interface adapter**
- PC connection kit for RESOL controllers with VBus® incl. Service CD (see page 57)
- Price bracket B | Article no.: 180 008 50 58.90 €

**RESOL VBus®/Touch FK**

With VBus®Touch FK (see page 59), you can turn your mobile devices into a remote data display for your RESOL controller with a solid fuel boiler function.

Visit [www.resol.de/videos](http://www.resol.de/videos) for a product video

A table with the current consumption values of all VBus® accessories can be found on page 63!

**TECHNICAL DATA**

![Diagram showing dimensions](image)

**Inputs:**
- 4 Pt1000 temperature sensors

**Outputs:**
- 2 semiconductor relays, 2 PWM outputs

**PWM Frequency:** 1000 Hz

**PWM Voltage:** 10.5 V

**Switching Capacity:**
- 1 (1) A 240 V~ (semiconductor relay)
- Total switching capacity: 2 A 240 V~

**Power Supply:**
- 100 ... 240 V~ (50 ... 60 Hz)

**Supply Connection:** type Y attachment

**Standby:** 0.46 W

**Mode of Operation:**
- type 1.C.Y action

**Rated Impulse Voltage:** 2.5 kV

**Data Interface:**
- RESOL VBus®

**VBus® Current Supply:** 35 mA

**Functions:**
- minimum and maximum temperature limitation
- mixer control for the return mixing function
- target temperature control
- speed control
- heating circuit backup
- thermostatic backup heating
- heat exchange
- PWM pump control
- operating hours counter

**Housing:** plastic, PC-ABS and PMMA

**Mounting:**
- wall mounting
- mounting into patch panels is possible

**Indication / Display:**
- full graphic display

**Operation:**
- 3 push buttons

**Ingress Protection:**
- IP 20 / EN 60529

**Protection Class:** I

**Ambient Temperature:** 0 ... 40 °C

**Pollution Degree:** 2

**Dimensions:** 172 x 110 x 46 mm

For a survey of accessories see page 50!
Find the right accessories for your controller!

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<th>Accessory</th>
<th>A1M1 (page 62)</th>
<th>C310 (page 92)</th>
<th>DL2 (page 54)</th>
<th>DL3 (page 55)</th>
<th>KM1 (page 56)</th>
<th>VBus / PWM (page 57)</th>
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* RCP12 for controller version 2.0 (DeltaSol® MX) / 1.09 (DeltaTherm® HC) or higher
<table>
<thead>
<tr>
<th>VBus® / USB</th>
<th>VBus® / LAN</th>
<th>GA3 (page 81)</th>
<th>RTA12 / RCP2 (page 91)</th>
<th>SD/SDFK (page 64)</th>
<th>SP40 (page 92)</th>
<th>HKM3 (page 64)</th>
<th>SD3 / SDFK (page 61)</th>
<th>STA-W (page 64)</th>
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</table>
## Customisation of RESOL controllers

### Controllers with inlay (e.g. DeltaSol® BS, MX)

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<tr>
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<th>Company headquarters</th>
<th>Company address</th>
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### Controllers with printed housing (e.g. DeltaSol® CS, AL)

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### Controllers with display cover pane (e.g. DeltaSol® SL, SLT)

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Alternatively, the Slider of the DeltaSol® SL series can be printed by pad printing.

## Spare fuses

### Spare glass fuses

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<td>Bag with fuses, 10 x 0.8 A</td>
<td>Price bracket C</td>
</tr>
<tr>
<td>1.0 A</td>
<td>Bag with fuses, 10 x 1.0 A</td>
<td>Price bracket C</td>
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<td>2.0 A</td>
<td>Bag with fuses, 10 x 2.0 A</td>
<td>Price bracket C</td>
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### Spare can fuses

<table>
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<th>Value</th>
<th>Description</th>
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<tr>
<td>2.0 A</td>
<td>Bag with fuses, 10 x 2.0 A</td>
<td>Price bracket C</td>
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</table>

## Auxiliary relays

Auxiliary relays for separation of different electric circuits.

In the case of wall mounting, please use the one of the housings HRG2 (appropriate for up to 2 HR230 auxiliary relays) or HRG3 (appropriate for 1 HR230/3 auxiliary relay).

### TECHNICAL DATA

- **Contacts:** 1 NO, 1 NC, single-phase (HR230), 4 NO, three-phase (HR230/3)
- **Rated current:** 20 A (HR230), 40 A (HR230/3)
- **Rated voltage:** 250/400V (HR230), 250/440V (HR230/3)

### HR230 Auxiliary relay

- Single-phase, suitable for all RESOL controllers
- Price bracket A | Article no.: 280 002 60 | 34.40 €

### HRG2 Housing

- For up to 2 HR230 Auxiliary relays
- Price bracket A | Article no.: 280 003 10 | 10.20 €

### HR230/3 Auxiliary relay

- Three-phase, suitable for all RESOL controllers
- Price bracket A | Article no.: 280 033 50 | 84.00 €

### HRG3 Housing

- For 1 HR230/3 Auxiliary relay
- Price bracket A | Article no.: 280 033 60 | 22.50 €
Datalogger & VBus® accessories

Data communication between different components takes place via the RESOL VBus®. The controllers are therefore able to communicate with additional modules, allowing the system to be analysed and adapted to the individual consumer and system.
DL2 Datalogger

This additional module enables the acquisition and storage of large amounts of data (such as measuring and balance values of the solar system) over a long period of time. System access is possible with just a few clicks via the VBus.net Internet portal. For transmission of the data stored in the internal memory of the DL2 to a PC, an SD card can be used.

The DL2 is appropriate for all controllers with RESOL VBus®. The datalogger can be connected directly to a PC or router for remote enquiry and thus enables comfortable system monitoring for yield monitoring or for diagnostics of faults.

- Visualisation of system states
- Yield monitoring
- Easy error diagnostics
- Internet access via VBus.net
- Export function for further data processing in spreadsheet programs
- Direct connection of PC or router for remote enquiry

### TECHNICAL DATA

**Housing:** plastic PC-ABS and PMMA
**Ingress protection:** IP 20 | EN 60529
**Protection class:** III

**Ambient temperature:** 0 ... 40 °C
**Dimensions:** Ø 130 mm, depth 45 mm
**Mounting:** wall mounting

**Display:** bar LED for monitoring the memory capacity, 1 illuminated push button for indication of the SD card status

**Interfaces:** RESOL VBus® for the connection to the controller, LAN

**Power supply:**
- Input voltage of mains adapter: 100 ... 240 V~, 50-60 Hz
- Rated current: 350 mA
- Input voltage of Datalogger: 5 V ± 5 %

**Memory:** 180 MB internal memory, with a logging interval of 5 min sufficient for:
- 21 months for a system with one DeltaSol® MX, 3 EM, 3 heating circuits and 1 HQM
- 26 months for a system with one DeltaSol® MX, 1 EM and 1 heating circuit
- 33 months for a system with one DeltaSol® MX

The Datalogger can be branded with your own logo. Please contact our sales team.

![Resol DL2 Datalogger](image)

**RESOL DL2 Datalogger**
For visualisation via VBus.net, incl. SD card and network cable, mains adapter and VBus® cable pre-connected

<table>
<thead>
<tr>
<th>Price bracket</th>
<th>Article no.</th>
<th>Price [€]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>180 007 10</td>
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</table>

**MicroSD card, 4 GB memory capacity, incl. adapter**

<table>
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<th>Price bracket</th>
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<tbody>
<tr>
<td>C</td>
<td>180 007 41</td>
<td>6.70</td>
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</table>

**VBus.net**
The www.VBus.net Internet portal – your system data displayed as live data, diagrams and tables
DL3 Datalogger

Be it solar thermal, heating or DHW heat exchange controllers – with the RESOL DL3 you can easily and conveniently log system data of up to 6 controllers. Get a comprehensive overview of all controllers connected with the large full graphic display. Transfer data with an SD memory card or a USB memory stick, or use the LAN interface to view and process data on your PC. System access is possible with just a few clicks via VBus.net.

- Data logging and parameterisation of up to 6 VBus® master devices
- Temperature measurements and logging via integrated sensor and impulse inputs possible
- BACnet functionality for BACnet-conform transmission and of data
- All important settings directly adjustable on the DL3
- Live data configuration with filters and customised views
- Data storing via SD card
- Firmware update possible over SD card or Internet
- Internet access to the system data via VBus.net

RESOL DL3 Datalogger
For visualisation via VBus.net, incl. SD card, mains adapter, network and VBus® cable

Price bracket A | Article no.: 180 009 90

672.00 €

The Datalogger can be branded with your own logo. Please contact our sales team.
The KM1 Communication module is the network connection for solar and heating systems, especially suited for technicians managing large systems, heating installers and home owners who like to keep a close eye on their system.

The system can be parameterised over the Internet. VBus.net e. g. enables system yield monitoring in a comprehensive system graphic.

- With VBus.net support
- Comfortable system parameterisation via the RESOL ServiceCenter software or the RESOL RPT parameterisation tool
- Quick error diagnostics
- Suitable for all RESOL controllers with VBus®
- Integrated LAN interface for network connection

Housing: plastic PC-ABS and PMMA
Ingress protection: IP 20 / EN 60529
Protection class: III
Ambient temperature: 0 ... 40 °C
Dimensions: Ø 139 mm, depth 45 mm
Mounting: wall mounting
Display: operating control LED
Interfaces: RESOL VBus® for the connection to the controller, 10/100 Base TX Ethernet, Auto MDIX
Power consumption: < 1.95 W
Power supply:
  input voltage of mains adapter: 100 ... 240 V~
  rated current: 350 mA
  input voltage of communication module: 5 V Volt ± 5 %

The device can be branded with your own logo. Please contact our sales team.
**VBus®/USB interface adapter**

- USB 2.0 full speed compatible
- With mini USB-B port
- Remote parametrisation of the controller via VBus®
- RESOL Service CD included
- Including standard USB-mini USB adapter cable

With the RESOL VBus®/USB interface adapter, the controller can be connected to the USB port of a PC via the VBus®.

**VBus®/LAN interface adapter**

- The network connection for your solar system
- Access to the system via the complete network
- Remote parametrisation of the controller via VBus®
- RESOL Service CD included

The VBus®/LAN interface adapter is designed for the direct connection of the controller to a PC or router. It enables easy access to the controller via the local network of the owner.

**VBus®/PWM interface adapter**

- Speed control of high-efficiency pumps for controllers without integrated PWM outputs
- Convertible from PWM to 0-10 V signal

The VBus®/PWM interface adapter is installed between the VBus® output of the controller and the PWM-input of the high-efficiency pump, where it transforms the VBus® data packets into a 0-10V or a PWM signal.

**VBus®-Repeater**

- Connect multiple modules to one controller
- Maximum current supply of 200 mA
- VBus® cable extension of up to 150 m in total possible

The VBus®-Repeater amplifies the VBus® signal of a controller and supplies a current of 200 mA in total to modules connected.

---

**RESOL VBus®**

The VBus® is a two-wire bus, which allows RESOL controllers and additional modules to interchange data. In addition to that, it is possible to power VBus® modules without external power supply — the number of VBus® accessories that can be connected to one controller depends on the sum of their current consumption (see page 63) and on the current supply of the controller VBus®. All RESOL controllers are equipped with a VBus® interface (except the DeltaSol® A/AX/AIX HE).

**TECHNICAL DATA**

- **Housing:** plastic
- **Protection class:** IP 20 / EN 60529
- **Dimensions:** 95 x 70 x 25 mm

**VBus®/USB Interfaces:**
- RESOL VBus® for the connection to the controller, mini USB-B
- Power supply: via RESOL VBus®

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<th>€</th>
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</table>

**VBus®/LAN Interfaces:**
- RESOL VBus® for the connection to the controller, LAN connection RJ45 with 2 status LEDs
- Power supply: mains adapter input voltage: 100 ... 240 V~ (50 ... 60 Hz)
- adapter input voltage: 12 V

<table>
<thead>
<tr>
<th>Price bracket B</th>
<th>Article no.</th>
<th>Price</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>180 008 80</td>
<td>106.50</td>
<td></td>
</tr>
</tbody>
</table>

**VBus®/PWM**

- **Display:** 7-segment LED display
- **Power supply:** mains adapter input voltage: 100 ... 240 V~ (50 ... 60 Hz)
- adapter input voltage: 12 V
- **PWM frequency:** 512 Hz
- **PWM voltage:** 11.8 V

**RESOL VBus®/PWM interface adapter**

<table>
<thead>
<tr>
<th>Price bracket B</th>
<th>Article no.</th>
<th>Price</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>180 008 60</td>
<td>92.50</td>
<td></td>
</tr>
</tbody>
</table>

**RESOL VBus®-Repeater**

- **Input:** 1 RESOL VBus® master (controller)
- **Outputs:** 3 VBus® devices (modules, e.g. AM1, SD3, 200 mA in total)
- **Power supply:** input voltage of mains adapter: 100 ... 240 V~ (50 ... 60 Hz)
- input voltage of repeater: 12 V~ / 0.5 A / 5.5 × 2.5 mm

<table>
<thead>
<tr>
<th>Price bracket B</th>
<th>Article no.</th>
<th>Price</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>180 010 40</td>
<td>104.60</td>
<td></td>
</tr>
</tbody>
</table>
VBus.net

Freely configurable Dashboard – your live system or diagram incl. weather data at a glance.

Share your data with other VBus.net users – grant system data access to your installer or energy consultant.

Simplified filter creation – define data points via Drag&Drop and configure them for further use.

Advanced live system editor with extended format and layout functions.

Diagram function now with freely positionable legend.

Freely configurable e-mail notifications to recipients of your choice, e.g. in the case of error messages, temperature deviations, etc.

Your solar thermal and heating system on the Internet – without any tedious router configuration.

System access via the Web browser – no software installation required.

For every PC and mobile device worldwide.

VBus.net is all about the data of your RESOL controller. Live data of your system, customized filter settings and much more await you.

VBus.net is available in 2 different versions: Basic and PRO. Easily usable with a DL2*, DL3 Datalogger or KM1 Communication module.

* beginning with firmware version 2.0.0

VBus.net PRO

OEM versions with your design – contact us!

VBus.net is the Internet portal for easy and secure access to your system data.
VBus® Touch
Keep an eye on your solar system

The RESOL app for the Apple iPad makes your solar yield palpable — worldwide.
A touch of your finger is all you need to view detailed temperature charts, generate yield balances and monitor the status of your system.

VBus® Touch HC
Adjust your heating via app

This easy-to-use app enables you to make adjustments on your RESOL heating controller (DeltaTherm® HC and HC mini) from a mobile device.
Thus, e.g. the operating mode can be set via the app. Additionally, the system data are displayed in a clearly arranged graphic.

VBus® Touch FK
Your mobile remote display

With VBus® Touch FK, you can turn your mobile devices into a remote data display for your RESOL controller with a solid fuel boiler function.
The system data are displayed in a clearly arranged, animated graphic.
**VBus® Touch Trainer**

*Your controller as an app*

The new RESOL app VBus® Touch Trainer is ideal for all who wish to train—themselves or others—in operating RESOL controllers. The app simulates a controller in real-life operation—buttons and controls have the same function as in the real controllers.

VBus® Touch Trainer is available free of charge, a demo controller is included in the basic version. Further controllers can be bought from within the app.

**OEM versions with your design – contact us!**

---

**RPT Parameterisation Tool**

*Configure your controllers from your PC*

The RPT Parameterisation Tool is a software that enables the remote parameterisation of RESOL controllers.

The computer in use must be connected to the controller via an interface adapter, Datalogger or KM1 communication module in a common network.

**Download software and manual free of charge ✓**

**OEM versions with your design – contact us!**

---

**RESOL ServiceCenter Software RSC**

*Your offline data processing software*

The modular designed software enables PC-recording of the data measured by the controller, editing of the data files for further processing by standard spreadsheet programs and visualisation of individual systems with all measuring and balancing values. (Windows XP, Windows Vista, Windows 7)

**Download software and manual free of charge ✓**

---

*VBus® is a registered trademark of RESOL GmbH*

Apple, the Apple logo and iPad are trademarks of Apple Inc., registered in the U.S. and other countries. App Store is a service mark of Apple Inc.
GA3 Large Display

The RESOL GA3 is a completely mounted large display module for visualisation of collector and store temperatures as well as the heat quantity of the solar system via one 6-digit and two 4-digit 7-segment displays. An easy connection to all controllers by RESOL VBus® is possible.

Stainless steel frame with high quality multiplex wood elements and mounting plates for interior wall mounting. The front plate is made of antireflective filter glass and is printed with a light-resistant UV-lacquering. The universal VBus® allows the parallel connection of 8 large displays as well as additional VBus® modules.

RESOL GA3 Large Display
Large Display module with 3 displays for collector and store temperatures as well as for heat quantity, incl. power supply

Price bracket C | Article no.: 180 006 53
643.00 €

SD3 / SDFK Smart Display

The RESOL SD3 and SDFK Smart Displays are used for visualising data issued by the controller. The SD3 Smart Display indicates the collector temperature, the store temperature and the energy yield of the solar thermal system.

In the heating area, the SDFK Smart Display indicates the solid fuel boiler temperature and the bottom/top store temperatures as well as the pump status.

- Visualisation of collector and store temperature as well as heat quantity (SD3)
- Visualisation of solid fuel boiler temperature and bottom/top store temperature as well as pump status (SDFK)
- One 6-digit and two 4-digit 7-segment LED displays (SD3)
- Three 4-digit 7-segment LED displays as well as one bicoloured LED red/green (SDFK)
- Simple connection and power supply via RESOL VBus®
- °C and °F versions available
- Customised sensor and relay allocation possible on request

RESOL SD3 Smart Display
Display module with 3 displays for collector and store temperature as well as for heat quantity (suitable for all DeltaSol® controllers equipped with a VBus®)

Price bracket A | Article no.: 180 004 90
182.00 €

RESOL SDFK Smart Display
Display module with 3 displays for biomass boiler temperature and store temperature as well as for the pump status (suitable for DeltaTherm® FK, DeltaSol® E and BX Plus from version 1.06)

Price bracket A | Article no.: 180 010 80
182.00 €

TECHNICAL DATA

Ingress protection: IP 30 (suitable for dry rooms)
Ambient temperature: 0 ... 40 °C
Dimensions: 530 x 630 x 100 mm
Weight: approx. 10 kg
Power supply: 220 ... 240 V~ (50 ... 60 Hz) (by mains adapter, included)
Power consumption: max. 12 VA
Data input: RESOL VBus®

Further versions and customised layout of the front plate on request.
**AM1 Alarm module**

The AM1 Alarm module is designed to signal system failures. It is to be connected to the VBus® of the controller and issues an optical signal via the red LED if a failure has occurred.

The AM1 also has a potential-free relay output, which can e. g. be connected to a building management system (BMS), so that a collective error message can be issued in the case of a system failure. Thus, the reliability and the stable yield of the system are ensured.

**Technical Data**

- Reliable failure signal by LED
- Connection to a building management system (BMS) possible
- Supply and control via RESOL VBus®

**Housing:** plastic (PC 2207 UV); base part: Karilen E 42 D - H201

**Ingress protection:** IP 54

**Ambient temperature:** -25 ... +70 °C

**Dimension:** 111 x 68 x 40 mm

**Mounting:** wall mounting

**Display:** 1 LED

**Power supply:** RESOL VBus®

**Output:** 1 potential-free relay

**Interface:** RESOL VBus®

**Switching capacity:** max. 30 V, 1A; 125 V~, 0.5 A

**DeltaSol® MX**

Data communication between the devices takes place via the RESOL VBus®.

---

**EM-HP Extension module**

The EM-HP Extension module enables the control of up to 4 loads with a high current consumption. The power supply of these loads is established over electromechanical relays with a switching capacity of 4 A each.

For the speed control of high-efficiency pumps, the Extension module is equipped with 4 PWM outputs that can be converted to 0-10V outputs.

**Technical Data**

- Connection and speed control of loads with a high current consumption
- Simple connection to the controller via VBus®
- Easy configuration with selection and DIP switches
- 4 electromechanical relays

**Outputs:**

- 4 electromechanical relays, 4 PWM/0-10 V outputs
- PWM frequency: 512 Hz
- PWM voltage: 10.5 ... 11 V

**Switching capacity:**

- 4 (2) A 240 V~ (electromechanical relay)
- Total switching capacity: 8 A 240 V~
- Power supply: 100 ... 240 V~ (50 ... 60 Hz)
- Supply connection: type Y attachment
- Standby: 0.52 W
- Mode of operation: type 1.B action
- Rated impulse voltage: 2.5 kV
- Data interface: RESOL VBus®
- Housing: plastic, PC-ABS and PMMA
- Mounting: wall mounting
- Indication/Display: operating control LED
- Operation: 4 DIP switches, 1 slide switch
- Ingress protection: IP 20/EN 60529
- Protection class: II
- Ambient temperature: 0 ... 40 °C
- Pollution degree: 2
- Dimensions: 144 × 208 × 43 mm

**Price Bracket A | Article no.: 145 441 20 | 225.00 €**
Application examples of the VBus®

Latest generation RESOL devices are equipped with VBus® connectors and are connected to each other using two twisted wires each (bell wire). Several VBus® modules can be connected in parallel.

Example illustrations, further configurations are possible.

Data communication between the devices takes place via the RESOL VBus®.

Current consumption of the VBus® devices

The number of VBus® accessories that can be connected to one controller depends on the sum of their current consumption and on the current supply of the controller VBus®.

<table>
<thead>
<tr>
<th>Device</th>
<th>Maximum current consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBus® / PWM interface adapter</td>
<td>6.5 mA</td>
</tr>
<tr>
<td>VBus® / USB interface adapter</td>
<td>6.5 mA</td>
</tr>
<tr>
<td>VBus® / LAN interface adapter</td>
<td>6.5 mA</td>
</tr>
<tr>
<td>DL2 Datalogger</td>
<td>1.5 mA</td>
</tr>
<tr>
<td>DL3 Datalogger</td>
<td>VBus® 1-5: 10 mA, VBus® 6-0.5 mA</td>
</tr>
<tr>
<td>KMI Communication module</td>
<td>1.5 mA</td>
</tr>
<tr>
<td>SD3 Smart Display</td>
<td>17.5 mA</td>
</tr>
<tr>
<td>SDFK Smart Display</td>
<td>25 mA</td>
</tr>
<tr>
<td>GA3 Large Display</td>
<td>1 mA</td>
</tr>
<tr>
<td>AM1 Alarm module</td>
<td>16.5 mA</td>
</tr>
<tr>
<td>HKM3 Heating circuit extension module</td>
<td>1 mA</td>
</tr>
<tr>
<td>EM / EM-HP Extension module</td>
<td>1 mA</td>
</tr>
<tr>
<td>STA-W module</td>
<td>12 mA</td>
</tr>
<tr>
<td>WMZ</td>
<td>35 mA</td>
</tr>
<tr>
<td>WMZ-G1</td>
<td>35 mA</td>
</tr>
</tbody>
</table>

The VBus® Repeater amplifies the VBus® signal such that modules with a combined current consumption of up to 200 mA can be connected (see page 57).
STA-W module

The STA-W module is an interface designed for the exchange of heat quantity measurement values between RESOL devices and external appliances. It can be connected to a RESOL controller or a calorimeter via the VBus®. Whenever the heat quantity increases by 1 kWh, the module operates a potential-free contact which is connected to the central building management system. The total number of operated contacts can be visualised as heat quantity by the software of the central building management system.

RESOL STA-W module
VBus® converter (heat quantity to impulses)
Price bracket B | Article no.: 180 008 20

HKM3 Heating circuit extension module

The HKM3 heating circuit extension module enables the control of an additional heating circuit. A simple VBus® connection is enough to add a complete weather-compensated heating circuit to the controller. The HKM3 is equipped with 6 sensor inputs, one of which can be used for the optional RTA12 remote control. Four semiconductor relays are available for controlling the mixing valve and the heating circuit pump. Additionally, a potential-free relay can be used for backup heating demand.

In combination with the controller connected, the HKM3 not only controls the basic functions of the heating circuit and the DHW priority, it also has an antifreeze function and a blocking protection for the heating circuit pump.

RESOL HKM3
Heating circuit module for a weather-compensated heating circuit
Price bracket A | Article no.: 145 440 60

RESOL HKM3 – Full kit
Heating circuit module incl. 2 sensors (1 x FAP13, 1 x FRP21)
Price bracket A | Article no.: 145 440 70

TECHNICAL DATA

STA-W module

- **Housing**: plastic, PC-ABS
- **Ingress protection**: IP 20, with insulation IP 22 (EN 60529)
- **Ambient temperature**: 0 ... 40 °C
- **Dimensions**: Ø 139 mm, depth 45 mm
- **Mounting**: wall mounting
- **Display**: 1 LED
- **Power supply**: RESOL VBus®
- **Interface**: RESOL VBus®
- **Output**: 1 potential-free relay (max. 24 V, 1 A, 15 W)
- **Max. frequency**: 5 Hz

The RESOL STA-W is designed for the connection to all controllers listed in this catalogue (except the DeltaSol® A/AX/AX HE and DeltaTherm® HC mini/FK).

HKM3 Heating circuit extension module

- **Inputs**: 5 Pt1000 temperature sensors and 1 RTA12 remote control
- **Outputs**: 4 semiconductor relays, 1 potential-free relay
- **Switching capacity**: 1 (1) A 240V– (semiconductor relay) 4 (1) A 24 V–/240 V– (potential-free relay)
- **Total switching capacity**: 4 A 240 V–
- **Power supply**: 100 ... 240 V– (50 ... 60 Hz)
- **Supply connection**: type Y attachment
- **Standby**: 0.41 W
- **Mode of operation**: type 1.B.C.Y action
- **Rated impulse voltage**: 2.5 kV

**Data interface**: RESOL VBus®

**Housing**: plastic, PC-ABS and PMMA

**Mounting**: wall mounting

**Indication / Display**: LC display, 7-segment display, operating control lamp

**Operation**: 3 push buttons and 1 slide switch at the front of the housing

**Ingress protection**: IP 20 / EN 60529

**Protection class**: II

**Ambient temperature**: 0 ... 40 °C

**Pollution degree**: 2

**Dimensions**: 144 × 208 × 43 mm

Suitable for the DeltaSol® E controller only!
Pump stations offer solutions for the efficient use of a system through harmonised components. They contain all units necessary for the operation of a solar system.

Installation and initial operation of the stations are easy, because the components are already pre-assembled and ready to plug in.

DHW heat exchange modules available on request!
Survey of pump stations

<table>
<thead>
<tr>
<th>Logo Type designation</th>
<th>Company headquarters</th>
<th>Company address</th>
<th>Company headquarters</th>
<th>Company address</th>
<th>Company headquarters</th>
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<th>Company headquarters</th>
<th>Company address</th>
<th>Company headquarters</th>
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<td>Wilo Stratos PARA 15/1-9</td>
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<td>Air separator</td>
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<td>5 ... 35 l/min</td>
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<td>Grundfos Direct Sensor™</td>
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<td>DeltaSol® CS/2, CS/4, CS Plus</td>
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<td>Metric thread/230V~ pump</td>
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</tr>
</tbody>
</table>

Further combinations of pumps and threads are available on request!

Customisation of our pump stations

The customised version of our pump stations includes the following:

<table>
<thead>
<tr>
<th>Logo</th>
<th>Type designation</th>
<th>Company headquarters</th>
<th>Company address</th>
</tr>
</thead>
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<tr>
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<tr>
<td>Manual</td>
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</tr>
<tr>
<td>Embossed label</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Embosed label with your company logo:**

On request the pump stations can be manufactured with a customised embossed label on the front half of the insulation.

For this purpose we will need the following:
- Your company logo as vector eps file
- Alternatively, our standard embossed label with the inscription FlowSol® can be used.

Ask our sales team for the price of your personal customisation! For further information on customising our controllers see page 52.
FlowSol® S / S HE pump station

The FlowSol® S pump station is a single-line pump station and is used in the solar return. The station is available with a choice of controllers from the popular DeltaSol® BS series or DeltaSol® CS series.

The pump station is pre-assembled and contains all the vital hydraulic components for operating a solar thermal system and is particularly easy to install.

- Safety assembly with connection for the diaphragm-type expansion vessel, safety valve and pressure gauge
- Insulated design casing
- Fill and drain valves
- Integrated standard or high-efficiency pump
- Wall mounting bracket with fastening material
- Non-return valves: opening pressure 40 mbar, openable
- Connection to diaphragm-type expansion vessel: ¼” IT, flat sealing
- Outlet safety valve: ¼” IT
- Connections to the solar pipes: ⅜” IT
- Maximum temperature: 95 °C
- Maximum pressure: 6 bar
- Medium: water with max. 50% glycol
- Dimensions: approx. 430 × 223 × 193 mm (with insulation) distance centres: 100 mm distance centre/wall: 67 mm
- Material:
  - fittings: brass
  - seals: EPDM/AFM 34
  - insulation: EPP foam

Controller ErP data (standby):
- DeltaSol® BS/2: 0.45 W
- DeltaSol® BS/4: 0.74 W
- DeltaSol® BS Plus: 0.38 W
- DeltaSol® CS/2: 0.58 W
- DeltaSol® CS/4: 0.60 W
- DeltaSol® CS Plus: 0.59 W

Optionally available with a Grundfos pump!

### TECHNICAL DATA

#### Circulating pump:
FlowSol® S: Wilo ST 15/6 ECO or ST 15/7 ECO (surcharge)
FlowSol® S HE: Wilo Yonos PARA ST15/7.0-PWM2 (power consumption of the pump: 23 W)

#### Safety valve:
6 bar

#### Pressure gauge:
0 ... 10 bar

#### Flowmeter:
1 ... 13 l/min

#### Non-return valves:
open pressure 40 mbar, openable

#### Connection to diaphragm-type expansion vessel:
¼” IT, flat sealing

#### Outlet safety valve:
¼” IT

#### Connections to the solar pipes:
⅜” IT

### Station Controller Pt1000 sensors Article no. €

<table>
<thead>
<tr>
<th>Station</th>
<th>Controller</th>
<th>Pt1000 sensors</th>
<th>Article no.</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td>FlowSol® S</td>
<td>DeltaSol® BS/2</td>
<td>(1 x FKP6, 2 x FRP6)</td>
<td>290 018 73</td>
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<td>FlowSol® S</td>
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<td>FlowSol® S</td>
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<td>492.30</td>
</tr>
</tbody>
</table>

**EEI < 0.23**

**Station Controller Pt1000 sensors Article no. €**

<table>
<thead>
<tr>
<th>Station</th>
<th>Controller</th>
<th>Pt1000 sensors</th>
<th>Article no.</th>
<th>€</th>
</tr>
</thead>
<tbody>
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<td>DeltaSol® CS/2</td>
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<td>DeltaSol® CS Plus</td>
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<td>290 028 63</td>
<td>628.00</td>
</tr>
</tbody>
</table>

**EEI < 0.23**

All prices are subject to price bracket A. On request, all stations are available without controller!
FlowSol® B / B HE pump station

The FlowSol® B is a pre-assembled twin-line pump station and contains all the vital hydraulic components for operating a solar thermal system and is particularly easy to install.

The pump station is available in many combinations with four different controller series and four different pump variants.

- Integrated controller
- Integrated standard or high-efficiency pump
- Fill and drain valves
- Safety assembly with connection for the diaphragm-type expansion vessel, safety valve and pressure gauge

- Wall mounting bracket with mounting material
- Air separator with manual air vent for the solar thermal system

**TECHNICAL DATA**

Circulating pump: FlowSol® B / Wilo ST 15/6 ECO or ST 15/7 ECO (surcharge)
FlowSol® B HE: Wilo Y onos PARA ST 15/7.0-PWM2 (power consumption of the pump: 23 W)
Safety valve: 6 bar
Pressure gauge: 0 ... 10 bar
Flowmeter: 1 ... 13 l/min
Non-return valves: opening pressure 20 mbar, openable
Connection to diaphragm-type expansion vessel: ¾” ET, flat sealing
Outlet safety valve: ¾” IT
Connections to the solar pipes: ¾” IT
Maximum temperature flow/return: 120 °C / 95 °C
Maximum pressure: 6 bar
Medium: water with max. 50 % glycol
Dimensions: approx. 481 × 320 × 190 mm (with insulation)
distance centres: 100 mm
distance centre/wall: 67 mm
Material: fittings: brass
seals: AFM 34
insulation: EPP foam

**Controller ErP data (standby):**

<table>
<thead>
<tr>
<th>Station</th>
<th>Controller</th>
<th>Pt1000 sensors</th>
<th>Article no.</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td>FlowSol® B</td>
<td>DeltaSol® BS series (1 x FKP6, 2 x FRP6)</td>
<td>290 019 43 (BS/2)</td>
<td>681.00</td>
<td></td>
</tr>
<tr>
<td>FlowSol® B</td>
<td>DeltaSol® BS Plus (2 x FKP6, 2 x FRP6)</td>
<td>290 019 53 (BS/4)</td>
<td>704.80</td>
<td></td>
</tr>
<tr>
<td>FlowSol® B</td>
<td>DeltaSol® BX (2 x FKP6, 3 x FRP6)</td>
<td>290 020 33</td>
<td>681.00</td>
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<tr>
<td>FlowSol® B</td>
<td>DeltaSol® BX (2 x FKP6, 3 x FRP6)</td>
<td>290 020 43</td>
<td>704.80</td>
<td></td>
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<tr>
<td>FlowSol® B</td>
<td>DeltaSol® BX Plus (2 x FKP6, 3 x FRP6)</td>
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<td>681.00</td>
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<tr>
<td>FlowSol® B</td>
<td>DeltaSol® SL (2 x FKP6, 2 x FRP6)</td>
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<td>681.00</td>
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<tr>
<td>FlowSol® B</td>
<td>DeltaSol® SLL (2 x FKP6, 2 x FRP6)</td>
<td>290 029 63</td>
<td>681.00</td>
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<tr>
<td>FlowSol® B</td>
<td>DeltaSol® SLT (2 x FKP6, 2 x FRP6)</td>
<td>290 029 43 (LAN)</td>
<td>704.80</td>
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</tbody>
</table>

**Variants with high-efficiency pump**

<table>
<thead>
<tr>
<th>Station</th>
<th>Controller</th>
<th>Pt1000 sensors</th>
<th>Article no.</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td>FlowSol® B HE</td>
<td>DeltaSol® CS series (1 x FKP6, 2 x FRP6)</td>
<td>290 028 13 (CS/2)</td>
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<tr>
<td>FlowSol® B HE</td>
<td>DeltaSol® CS Plus (2 x FKP6, 2 x FRP6)</td>
<td>290 028 23 (CS/4)</td>
<td>704.80</td>
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<tr>
<td>FlowSol® B HE</td>
<td>DeltaSol® BX (2 x FKP6, 3 x FRP6)</td>
<td>290 022 33</td>
<td>681.00</td>
<td></td>
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<tr>
<td>FlowSol® B HE</td>
<td>DeltaSol® BX (2 x FKP6, 3 x FRP6)</td>
<td>290 022 43</td>
<td>704.80</td>
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<tr>
<td>FlowSol® B HE</td>
<td>DeltaSol® BX Plus (2 x FKP6, 3 x FRP6)</td>
<td>290 022 53</td>
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<td></td>
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<tr>
<td>FlowSol® B HE</td>
<td>DeltaSol® SL (2 x FKP6, 2 x FRP6)</td>
<td>290 029 53</td>
<td>681.00</td>
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<tr>
<td>FlowSol® B HE</td>
<td>DeltaSol® SLL (1 x FKP6, 2 x FRP6)</td>
<td>290 029 63</td>
<td>681.00</td>
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<tr>
<td>FlowSol® B HE</td>
<td>DeltaSol® SLT (2 x FKP6, 2 x FRP6)</td>
<td>290 029 43 (LAN)</td>
<td>704.80</td>
<td></td>
</tr>
</tbody>
</table>

All prices are subject to price bracket A. On request, all stations are available without controller!
**FlowSol® B HE WMZ pump station**

The FlowSol® B HE WMZ is a pre-assembled twin-line pump station with integrated heat quantity measurement via a VFS Grundfos Direct Sensor™. An external flowmeter is not required.

- With integrated heat quantity measurement via VFS Grundfos Direct Sensor™
- Pre-assembled twin-line pump station
- Integrated DeltaSol® BX W controller
- Design insulation casing
- Innovative hinged controller panel for quick and easy access to the hydraulic components
- Safety assembly with connection for the diaphragm-type expansion vessel, safety valve and pressure gauge
- Fill and drain valves
- Wall mounting bracket with mounting material
- Air separator with manual air vent for the solar thermal system

**TECHNICAL DATA**

**Circulating pump:**
Osi Yonos PARA ST 15/7.0-PWM2 (power consumption of the pump: 23 W)

**Safety valve:** 6 bar

**Pressure gauge:** 0 ... 10 bar

**Grundfos Direct Sensor™:** VFS 1-12, VFS 2-40

**Non-return valves:**
opening pressure 20 mbar, openable

**Connection to diaphragm-type expansion vessel:** ¼” ET, flat sealing

**Outlet safety valve:** ¾” IT

**Connections to the solar pipes:** ¾” IT, at the VFS: ¾” ET

**Maximum temperature fl ow/return:**
120 °C/95 °C

**Maximum pressure:** 6 bar

**Medium:**
water with max. 50 % glycol

**Dimensions:**
approx. 481 × 320 × 190 mm (with insulation) distance centres: 100 mm distance centre / wall: 67 mm

**Material:**
- fittings: brass
- seals: AFM 34
- insulation: EPP foam

**Controller ErP data (standby):**
DeltaSol® BX W: 0.58 W

**RESOL FlowSol® B HE WMZ – DeltaSol® BX W**
Twin-line pump station, incl. DeltaSol® BX W, high-efficiency pump,
5 sensors Pt1000 (2 x FKP6, 3 x FRP6) and Grundfos Direct Sensor™ VFS 1-12
Price bracket A | Article no.: 290 026 33 877.00 €

**RESOL FlowSol® B HE WMZ – DeltaSol® BX W**
Twin-line pump station, incl. DeltaSol® BX W, high-efficiency pump,
5 sensors Pt1000 (2 x FKP6, 3 x FRP6) and Grundfos Direct Sensor™ VFS 2-40
Price bracket A | Article no.: 290 026 43 884.00 €

On request, all stations are available without controller!
FlowSol® XL pump station

The FlowSol® XL is a pre-assembled twin-line pump station especially developed for systems with high flow rates. Equipment and nominal width are designed to meet the demands of large collector fields.

- Integrated DeltaSol® BX or DeltaSol® BX Plus controller
- Integrated energy-saving high-efficiency pump
- Safety assembly with connection for the diaphragm-type expansion vessel, safety valve and pressure gauge
- Ball valves with non-return valves in flow and return
- Flowmeter
- Air separator with manual air vent for the solar thermal system
- Fill and drain valves

**RESOL FlowSol® XL – DeltaSol® BX**
Twin-line pump station, incl. DeltaSol® BX controller and 5 Pt1000 sensors (2 x FKP6, 3 x FRP6)
Price bracket A | Article no. 290 023 83 1160.50 €

**RESOL FlowSol® XL – DeltaSol® BX Plus**
Twin-line pump station, incl. DeltaSol® BX Plus controller and 5 Pt1000 sensors (2 x FKP6, 3 x FRP6)
Price bracket A | Article no. 290 023 93 1296.00 €

**RESOL FlowSol® XL – without controller**
Twin-line pump station
Price bracket A | Article no. 290 026 83 981.20 €

**TECHNICAL DATA**

- **Circulating pump:** Wilo Stratos PARA 15/1-9 (power consumption of the pump: 45 W)
- **Safety valve:** 6 bar
- **Pressure gauge:** 0 ... 10 bar
- **Flowmeter:** 5 ... 35 l/min
- **Ball valves in flow and return with non-return valves and thermometer handles:** non-return valves: opening pressure 20 mbar, openable thermometer: 0 ... 160 °C
- **Connection to diaphragm-type expansion vessel:** 1” ET, flat sealing
- **Outlet safety valve:** 1” IT
- **Connections to the solar pipes:** 1” IT
- **Maximum temperature flow/return:** 120 °C / 95 °C
- **Maximum pressure:** 6 bar
- **Medium:** water with max. 50% glycol
- **Dimensions:** approx. 470 x 380 x 220 mm (with insulation)
distance centres: 125 mm
distance centre/wall: 73 mm
- **Material:**
  - fittings: brass
  - seals: AFM 34
  - o-ring: FKM
  - insulation: EPP foam
- **Controller ErP data (standby):**
  - DeltaSol® BX: 0.50 W
  - DeltaSol® BX Plus: 0.73 W

For collector fields of up to 100 m²
Accessories for pump stations of the FlowSol® series (except for FlowSol® XL)

Wall mounting for diaphragm-type expansion vessel with screws and wall plugs, high grade steel corrugated tube and connection thread ¾". Including quick release valve coupling enabling removal of expansion without draining down of the system.

Wall mounting for diaphragm-type expansion vessel
Price bracket B | Article no.: 280 004 60 34.10 €

Filling and injection pump with non-return valve for pressure increase and refilling of heat transfer fluids. ½" ET self-sealing with O-ring, 15 mm tube connection, pump output 2 l/min, 4.5 bar max.

RESOL Filling and injection pump
Price bracket B | Article no.: 280 005 40 67.00 €

Self-sealing double nipples ¾" ET
Price bracket B | Article no.: 280 008 90 2.60 €

Max. operating temperature: 120 °C

Filling and flushing unit
Price bracket B | Article no.: 290 013 40 31.10 €

A dirt trap with fine sieve, 1" IT and ET, flat-sealing, temperature-resistant up to 150 °C, mounting length 80 mm.

Dirt trap DN20
Price bracket B | Article no.: 280 007 80 26.40 €

Solder transition nipples

<table>
<thead>
<tr>
<th>Size</th>
<th>Article no.</th>
<th>Price</th>
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<tbody>
<tr>
<td>¾&quot; to 10 mm</td>
<td>280 008 40</td>
<td>3.40 €</td>
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<td>¾&quot; to 12 mm</td>
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<td>¾&quot; to 15 mm</td>
<td>280 008 60</td>
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<td>¾&quot; to 18 mm</td>
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<tr>
<td>¾&quot; to 22 mm</td>
<td>280 008 80</td>
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All prices are subject to price bracket B

Fittings

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<td>3.50 €</td>
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<tr>
<td>Cutting ring fitting ¾&quot; to 12 mm</td>
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<td>3.10 €</td>
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<td>Cutting ring fitting ¾&quot; to 15 mm</td>
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</tr>
<tr>
<td>Cutting ring fitting ¾&quot; to 22 mm</td>
<td>280 014 60</td>
<td>3.30 €</td>
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</table>

All prices are subject to price bracket B

Support bushings

<table>
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<tr>
<th>Size</th>
<th>Article no.</th>
<th>Price</th>
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<tbody>
<tr>
<td>10 mm for cutting ring fitting ¾&quot; to 10 mm</td>
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<td>12 mm for cutting ring fitting ¾&quot; to 12 mm</td>
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<tr>
<td>22 mm for cutting ring fitting ¾&quot; to 22 mm</td>
<td>280 016 20</td>
<td>1.10 €</td>
</tr>
</tbody>
</table>

All prices are subject to price bracket B
Accessories for pump stations of the FlowSol® series
(except for FlowSol® XL)

ALS15 discharge hose

At the safety valve outlet of a solar thermal or heating system, it can get pretty hot at times. The RESOL ALS15 sees to it that no-one gets hurt and nothing gets soiled when that happens.

The robust, heat resistant EPDM hose fits all common ¾” safety valve outlets, can be individually shortened and is easy and effortless to install.

**TECHNICAL DATA**

- **Material:** EPDM
- **Length:** 150 cm
- **Weight:** ~0.49 kg
- **Opening:** Ø 3 cm
- **Colour:** black
- **Max. temperature:** 120 °C

**ALS15 discharge hose**

Price bracket B | Article no.: 280 004 92 | 15.50 €

VM1020 flowmeter

A correct flow rate is vital for the function of a solar thermal system. The RESOL VM1020 flowmeter indicates flow rates from 1 ... 13 litres per minute, with the integrated flow rate limiter, the value can be throttled.

With the also integrated fill/drain valve, flushing and draining processes can be carried out; an opening for the immersion sensor enables an easy return temperature measurement.

**TECHNICAL DATA**

- **Nominal size:** DN 15
- **Max. pressure:** 6 bar
- **Max. operation temperature:** 140 °C
- **Fittings:** upper connection thread: 1”, flat sealing lower connection thread: ¾”, metal seated
- **Indication range:** 1 ... 13 l/min

**VM1020 flowmeter**

Price bracket B | Article no.: 280 004 90 | 49.60 €

LT20 air separator

A solar thermal system has to be vented regularly in order to function efficiently. The RESOL LT20 air separator, installed in the solar flow line, permanently separates the air from the heat transfer fluid.

With the air vent valve and the hose included, the collected air can be discharged manually.

**TECHNICAL DATA**

- **Nominal size:** DN 15
- **Max. pressure:** 6 bar
- **Max. operation temperature:** 140 °C
- **Fittings:** upper connection thread: 1” union nut, flat sealing lower connection thread: ¾” IT, metal seated

**LT20 air separator**

Price bracket B | Article no.: 280 004 91 | 28.30 €

Spare pumps

**Wilo ST 15/6**

Price bracket B | Article no.: 280 006 10 | 135.00 €

**Wilo ST 15/7**

Price bracket B | Article no.: 280 006 20 | 165.00 €
RESOL tools and HE accessories are indispensable tools for craftsmen, service technicians and lab workers alike – they facilitate the maintenance of solar thermal and heating systems and help increasing efficiency as well as reliability and yield stability.
SBS 2000 filling and flushing station

For solar thermal professionals, filling and flushing solar thermal systems is a day-to-day business.

The SBS 2000 is the ideal companion for that – lots of thoughtful details help to make this quicker, easier and cleaner.

- Easy handling and cleaning
- Pictorial instructions on the station
- For heat transfer fluids and cleaning fluids
- Powerful pump
- Dirt filter at the pump inlet
- Additional handles for easy transport
- Integrated hose reel
- Filling level control
- Also available as a 115 V~ version

TECHNICAL DATA

Dimensions: 1000 × 400 × 530 mm
Weight: 21 kg
Tank: 30 litres, PE, with dirt filter and fill level control
Delivery flow: 5 ... 47 l/min
Delivery height: 42 m
Pressure: 4.2 bar
Drain valve: ½”
Medium: water, glycol mixtures, cleaning fluids
Medium temperature: max. 65 °C

Visit www.resol.de/videos for a product video

ACCESSORIES

Set of 2 ball valves with butterfly handles for pressure and flushing hose
Price bracket C | Article no. 280 050 60 16.70 €

Extension cable, 5 m (black)
Price bracket C | Article no. 280 050 70 14.50 €

With safety connection, suitable for 280 010 90 only

<table>
<thead>
<tr>
<th>Version</th>
<th>DE</th>
<th>UK 230 V~</th>
<th>UK 115 V~</th>
<th>US</th>
<th>AUS</th>
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<td>Article no.</td>
<td>280 010 90</td>
<td>280 010 93</td>
<td>280 011 93</td>
<td>280 010 97</td>
<td>280 012 93</td>
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<td>Pump</td>
<td>230V~/50 Hz</td>
<td>230V~/50 Hz</td>
<td>115V~/60 Hz</td>
<td>115V~/60 Hz</td>
<td>230V~/50 Hz</td>
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<td>Pump power</td>
<td>550 W</td>
<td>550 W</td>
<td>1000 W</td>
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<tr>
<td>Connection</td>
<td>CEE 7/4 socket</td>
<td>UK plug</td>
<td>UK plug</td>
<td>UK plug</td>
<td>AUS plug</td>
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<tr>
<td>Pump pressure</td>
<td>4.2 bar</td>
<td>4.2 bar</td>
<td>4.2 (3’) bar</td>
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<tr>
<td>Price</td>
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<td>546.00 €</td>
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</table>

All prices are subject to price bracket B

* when operating at 50 Hz frequency
For this purpose we will need the following:

- Your company logo as a .tif or an .eps vector file
- The desired type designation of the product
- Your company address
- For the personalised base part colour: the desired RAL number

Ask our sales team for the price of your personal customisation!

The customised version of the SBS 2000 includes the following:

<table>
<thead>
<tr>
<th>Logo</th>
<th>Type designation</th>
<th>Company headquarters</th>
<th>Company address</th>
<th>RAL number</th>
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</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Heat transfer fluids

Propylene-glycol-water mixtures are commonly used as the heat transfer fluid. An antifreeze concentration of about 40 % of glycol in the mixture prevents the system from damage.

Even at temperatures of -21 °C, the system remains in an operable state. Temperatures below this protection point will cause the formation of ice pulp, which however is not able to destroy tubes and piping.

However, today’s high-end flat collectors and direct-flow vacuum tube collectors may cause the premature degradation of conventional heat transfer fluid at high stagnation temperatures. In order to prevent this process, the operating pressure of the system can be limited to 4 bar or a high-temperature-resistant heat transfer fluid can be used.

Tyfocor® L/L-eco, LS, GE are not subject to the Ordinance of Hazardous Substances.

Important notice about the use of heat transfer fluids:
- Only use heat transfer fluid which is suitable for solar thermal systems
- All parts of the system that come into contact with fluids must be glycol-resistant
- Concentrations of more than 50 % of glycol are to be avoided in order to achieve optimum efficiency
- At a pH value of 7.5 or less, the heat transfer fluid should be replaced

Data sheets can be downloaded from our website.

Tyfocor® L/L-eco
- Canister of 11 kg concentrate
- Price bracket B | Article no. 290 000 15 63.00 €

Tyfocor® L
- Canister of 11 kg concentrate
- Price bracket B | Article no. 290 000 10 58.10 €

Tyfocor® GE (for heat pump systems)
- Canister of 11 kg concentrate
- Price bracket B | Article no. 290 026 60 54.70 €

Tyfocor® LS
- Canister of 10 l ready mix
- Price bracket B | Article no. 290 000 20 36.50 €

Physical and chemical characteristics

Density at 20 °C (100 Vol-% concentration): approx. 1.055 g/cm³

Concentrate Tyfocor® L/L-eco
- Form: liquid
- Colour: colourless
- Odour: nearly odourless
- Antifreeze temp. (<40 Vol-%): -23.7 °C
- Boiling point: >150 °C
- Flashing point: >100 °C
- Density at 20 °C: 1.054 ... 1.058 g/cm³

Example mixing ratio Tyfocor® L/L-eco: 1 tank Tyfocor® L/L-eco + 15.6 l of water = 26 l of ready mix with 40 Vol % (-23.7 °C)

Concentrate Tyfocor® GE
- Form: liquid
- Colour: blue-green
- Odour: product-specific
- Antifreeze temp.: -28 °C
- Boiling point: >175 °C
- Flashing point: >100 °C
- Density at 20 °C: 1.100 ... 1.130 g/cm³

Example mixing ratio Tyfocor® GE: 1 tank Tyfocor® GE + 15.6 l of water = 26 l of ready mix with 40 Vol % (-23.7 °C)

Readymix Tyfocor® LS
- Form: liquid
- Colour: red fluorescent
- Odour: product-specific
- Antifreeze temp.: -28 °C
- Boiling point: >100 °C
- Flashing point: none
- Density at 20 °C: 1.032 ... 1.035 g/cm³

Note: Do not dilute ready mix fluids!
HE-Check
Testing device for PWM and 0-10 V signals

With the HE-Check, the function of the pump and the signals of the controller can be checked quickly and easily.

Simulating PWM/0-10 V signals
- Suitable for all devices with PWM/0-10 V inputs
- Generating speed control signals from 0-100 %
- Adjustable frequency and voltage
- Checking pump function

Testing PWM/0-10 V signals
- Suitable for all devices with PWM/0-10 V outputs
- Precise measuring of:
  - PWM voltage
  - PWM frequency
  - Easy fault diagnostics

Bidirectional pumps
- Simultaneous generating and measuring of PWM signals
- Flow rate indication
- Pump status display:
  - No PWM signal
  - Standby
  - Normal operation
  - Error

Inputs: PWM/0-10 V
Outputs: PWM/0-10 V
PWM frequency: 40 ... 2000 Hz
Measuring range: 0 ... 15 V
Power supply: 3 type AAA batteries (included),
typical battery life: 2 years
Functions: measuring and generating a PWM or
0-10 V signal
Housing: plastic, ABS and TPE
Indication/Display: full graphic display
Operation: 6 push buttons at the front
Ingress protection: IP 54/DIN EN 60529
Safety: 18 V class I/EN 61010
Ambient temperature: 0 ... 40 °C
Pollution degree: 2
Dimensions: 120 × 65 × 27 mm

He-Check
Testing device for PWM and 0-10 V signals

Price bracket B | Article no.: 280 016 50 266.00 €
The PSW Pump signal converter series

PSW Basic
The PSW Basic is small, easy to install and simple to connect. It covers a large part of the most common signal combinations – it converts the signal of a speed-controlling semiconductor relay into either a PWM or a 0-10 V signal, both of those inverted if necessary.

- For solar and heating pumps
- PWM or 0-10 V output signal
- Inversion of the output signal possible
- Robust and dripping water protected housing

<table>
<thead>
<tr>
<th>RESOL PSW Basic</th>
<th>Price bracket B</th>
<th>Article no.: 180 010 50</th>
<th>Setup incl. Wilo Yonos PARA ST 15/7 pump (130 mm)</th>
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<tbody>
<tr>
<td></td>
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<td>67.00 €</td>
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<tr>
<td></td>
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<td>265.00 €</td>
<td>305.00 €</td>
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</table>

PSW Premium
The functionality of the PSW Premium is very similar to that of the PSW Basic, but it is additionally equipped with a relay output for the power supply of the pump. Moreover, it has an overrun function to reduce the number of switching processes for the high-efficiency pump.

- For solar and heating pumps
- PWM or 0-10 V output signal
- Inversion of the output signal possible
- Pump status display

<table>
<thead>
<tr>
<th>RESOL PSW Premium</th>
<th>Price bracket B</th>
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<tbody>
<tr>
<td></td>
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<td>76.50 €</td>
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</table>

PSW Universal
The PSW Universal offers a total of 80 different signal combinations between bursts, leading-edge and trailing-edge phase cutting, PWM, 0-10 V, 0-20 mA, 4-20 mA and their inverted variations. It is additionally equipped with an L’ output that renders an external power supply to the pump unnecessary.

- For solar and heating pumps
- Flexible in- and outputs: PWM, 0-10 V, 0-20 mA, 4-20 mA
- Inversion of the output signal possible

<table>
<thead>
<tr>
<th>RESOL PSW Universal</th>
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</table>

PSW Premium Set
With the PSW Premium Set, converting your system to high-efficiency pump technology is simple and cost-effective. It contains an energy-saving Wilo Yonos PARA: high-efficiency pump and a PSW Premium pump signal converter that enables the connection of a high-efficiency pump to a controller without a corresponding output. The pump and the signal converter are pre-connected in order to make installation as quick and as easy as possible. The PSW Premium Set is available with a choice of different pumps.

- Ready to plug in
- Harmonised system
- Available in DN15 and DN25
- Choice of different pumps
- OEM versions available

<table>
<thead>
<tr>
<th>RESOL PSW Premium Set</th>
<th>Price bracket B</th>
<th>Article no.: 180 011 10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>280.00 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td>314.00 €</td>
</tr>
</tbody>
</table>

The PSW Pump signal converters are used for connecting speed-controlled high-efficiency pumps to a controller without a corresponding output.

Thus, when replacing the pump, speed control can be enabled without replacing the controller.

TECHNICAL DATA
Inputs: bursts, phase cutting
Outputs: PWM, 0-10 V
PWM frequency: 625 Hz +-1.5 %
PWM voltage: 11 V
Power supply: 220 ... 240V- (50 ... 60 Hz)
Supply connection: type Y attachment
Power consumption: max. 1.5 VA
Housing: plastic
Ingress protection: IP 65/EN 60529
Ambient temperature: 0 ... 50 °C
Dimensions: 80 x 80 x 53 mm

Inputs: bursts, phase cutting
Outputs: 1 semiconductor relay, 1 PWM, 1 0-10 V
PWM frequency: 625 Hz +-2.5 %
PWM voltage: 11 V
Power supply: 220 ... 240V- (50 ... 60 Hz)
Power consumption: max. 1.7 VA
Housing: plastic
Ingress protection: IP 20/EN 60529
Ambient temperature: 0 ... 40 °C
Dimensions: Ø 139 mm, depth 45 mm

Inputs: PWM, 0-10 V, 0-20 mA, 4-20 mA, bursts, leading-edge phase control, trailing-edge phase control
Outputs: 1 semiconductor relay, 1 PWM, 0-10 V, 0-20 mA, 4-20 mA
PWM frequency: 625 Hz +-1 %
PWM voltage: 11 V
Switching capacity: 1 (1) A 240V- (semiconductor relay)
Total switching capacity: 1 A 240V-
Power supply: 100 ... 240V- (50 ... 60 Hz)
Power consumption: < 1 W
Housing: plastic
Ingress protection: IP 20/EN 60529
Ambient temperature: 0 ... 40 °C
Dimensions: 144 x 208 x 43 mm
Test box

Solar systems reach an increasingly high degree of efficiency but in many cases they can still further increase their efficiency through regular and professional maintenance.

The test box is a professional service box for checking solar thermal systems quickly and easily. Problems affecting system operation can be detected reliably with the help of these measuring and testing devices.

Refractometer

Test set with precise refractometer for exact determination of the cloud point of the heat transfer fluid.

Contents of the test box
- Test and indication badges
- Compass
- pH test strips
- Screwdriver with voltage control
- Mini screwdriver
- Manometer
- Hand-held refractometer
- Digital multimeter

Test and indication badges (25 pieces)
Price bracket C | Article no. 290 000 60 14.70 €

pH test strips (84 pieces)
Price bracket C | Article no. 290 001 10 13.70 €

Test box
Price bracket B | Article no. 290 009 20 198.00 €

Contents of the refractometer set
- Padded plastic box
- Pipet for sampling
- Mini screwdriver

Dimensions: 27 x 40 x 155 mm
Weight: 180 g

Refractometer set
Price bracket B | Article no. 280 009 60 49.00 €

Refractometer set for exact determination of the cloud point
Price bracket B | Article no. 280 006 00 58.90 €
Thermostats, measuring instruments and calorimeters are important devices for the installer as well as for the end user. A thermostat is an electronic controller which compares the temperature detected by the sensor to the preset value and controls it using actuators, such as pumps and valves, to achieve that value.

Furthermore, the RESOL product range includes components such as measuring instruments and calorimeters which can be used separately.
TT1 Thermostat controller

The TT1 Thermostat controller compares the temperature measured by a sensor with the preadjusted switch-on temperature. If this temperature falls below the adjusted switch-on value (heating operation) the relay switches on. If the temperature is exceeded, the relay switches off. Depending on the adjustment of the switch-on and switch-off temperature, the controller operates in heating or cooling operation.

Depending on the application area, all Pt1000 temperature sensors from our product range can be used. Electronic temperature controller (thermostat) with combined LC display for indication of the actual temperature and adjustment parameters (menu-driven).

One temperature sensor from our product range is required.

EXAMPLES

Request for backup heating

Cooling function

RTM1 Mini digital thermometer

Battery-operated mini digital thermometer with connected sensor for universal application.

TIP:
Put several digital thermometers in the store insulation so that you can always read out different temperatures of the store.

RESOL RTM1
Mini digital thermometer
Price bracket B | Article no. 236 000 20
9.80 €

Input: 1 Pt1000 temperature sensor
Output: 1 electromechanical relay (changeover), potential-free
Power supply: 220 ... 240 V~
Switching capacity:
4 (2) A 240 V~ (electromechanical relay)
4 (2) A 24 V~ (electromechanical relay)
Adjustment range: -20 ... +150 °C
Measuring range: -40 ... +250 °C
Housing: plastic, PC-ABS and PMMA
Mounting: wall mounting, mounting into patch panel is also possible
Display: LC display, multi-functional combined display with pictograms, two 2-digit text fields and two 4-digit 7-segment displays as well as one bi-coloured LED
Operation: by 3 push buttons at the front of the housing
Ingress protection: IP 20 / EN 60529
Ambient temperature: 0 ... 40 °C
Dimensions: 172 x 110 x 49 mm

The device can be branded with your own logo.
Please contact our sales team.

RESOL TT1
Thermostat controller
Price bracket A | Article no. 125 110 13 169.20 €

RESOL TT1
Thermostat controller incl. 1 Pt1000 sensor (FRP6)
Price bracket A | Article no. 125 110 33 179.20 €

Colour: black
Dimensions: 48 x 28.6 x 14 mm
Display: 3-digit LC display, continuous indication
Measuring range: -50 ... +95 °C
Resolution: 0.1 °C
Precision: +/- 1 °C
Measuring rate: 10 seconds
Sensor:
with 2.0 m connection cable (non-extendable)
Incl. battery: G10X1PC
The TT2 Thermostat controller is equipped with two high-current relays to which an electric immersion heater of up to 3.6 kW (230 V~)/1.8 kW (115 V~) can be connected.

Thus, the TT2 manages the time and temperature control of the electric backup heating for a DHW store. The rapid heat-up function makes for extra comfort. A wireline remote control with an integrated LED enables a comfortable operation of the rapid heat-up function.

- Direct connection of an electric immersion heater up to 3.6 kW (230 V~)/1.8 kW (115 V~)
- Time and temperature control of the electric backup heating
- Rapid heat-up function with optional remote control activation
- Intuitive operating concept
- Energy-efficient switch-mode power supply
- For thermosiphon systems

**TECHNICAL DATA**

**Inputs:** 1 Pt1000 temperature sensor; 1 input for RCTT Remote control

**Output:** 2 high-current relays for electric immersion heater

**Switching capacity:** 16 (3) A 240 V~ (high-current relay)

**Power supply:** 100 … 240 V~ (50 … 60 Hz)

**Supply connection:** type Y attachment

**Standby:** 0.44 W

**Mode of operation:** type 1.C action

**Rated impulse voltage:** 2.5 kV

**Functions:** time-controlled thermostat function, DHW heating with rapid heat-up function

**Housing:** plastic, PC-ABS and PMMA

**Mounting:** wall mounting, also suitable for mounting into patch panels

**Display:** LC display, multi-functional combined display with pictograms, two 2-digit text fields and two 4-digit 7-segment displays

**Operation:** 3 buttons at the front of the housing

**Ingress protection:** IP 20 / DIN EN 60529

**Protection class:** II

**Ambient temperature:** 0 … 40 °C

**Degree of pollution:** 2

**Dimensions:** 172 x 110 x 46 mm

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**RCTT Remote control**

With status LED

The RCTT Remote control is designed for activating the rapid heat-up function without accessing the controller menu.

**RESOL RCTT**

Remote control for connection to the TT2 or the DeltaSol® AL E HE

Price bracket A | Article no.: 136 000 60 43.40 €

**RESOL TT2**

Thermostat controller

Price bracket A | Article no.: 125 111 03 149.50 €

**RESOL TT2 – Full kit**

Thermostat controller incl. 1 Pt1000 sensor (FKP6)

Price bracket A | Article no.: 125 111 13 160.00 €

Housing: wall mounting, material ASA, colour: pure white, similar to RAL 9010

Ingress protection: IP 10

Ambient temperature: 0 … 40 °C

Dimensions: 84.5 x 84.5 x 25 mm
EC1 Variable controller for circulation systems

The purpose of a circulation system is to provide the consumer with hot water as quick as possible when opening the tap. The pipe line system for the supply of domestic water is simultaneously used as a circulation system so that by means of the circulating pump, water is passed through the water pipes even without having to open the tap.

Via a flow switch in the cold water pipe, the controller monitors the water draw-off. After opening the tap for a short moment, the circulating pump is switched on and will be switched off again after the adjusted runtime. The tap operates like a “remote control”. This circulating pump control function is an eco-friendly and energy-saving solution in line with demand.

RESOL EC1 - Full kit
Variable controller for circulation systems with FS08 flow switch
Price bracket A | Article no. 136 112 63 229.00 €

FS07 / FS08 Flow switch

The FS07 / FS08 Flow switch is used for flow detection and incorporates a reed-contact, which will be closed as soon as the flow rate is larger than 1 litre/min.

NOTE
Suitable for vertical installation only. Please pay attention to the flow direction indicated on the housing!

RESOL FS07
Flow switch (230V– version; not suitable for EC1)
Price bracket A | Article no. 256 011 10 135.00 €

RESOL FS08
Flow switch (suitable for EC1)
Price bracket A | Article no. 256 011 00 92.00 €

TECHNICAL DATA

Input: 1 sensor input for flow switch
Output: 1 electromechanical relay
Power supply: 220 … 240 V~ (50 … 60 Hz)
Power consumption: approx. 2 VA
Controller adjustment: menu-driven
Housing: plastic, PC-ABS and PMMA
Mounting: wall mounting, mounting into patch panels is possible
Operation: by 3 push buttons at the front of the housing
Display: LC display, multi-functional combined display
Ingress protection: IP 20 / EN 60529
Ambient temperature: 0 … 40 °C
Dimensions: 172 x 110 x 49 mm

RESOL FS07
Flow switch (230V~ version; not suitable for EC1)
Price bracket A | Article no. 256 011 10 135.00 €

RESOL FS08
Flow switch (suitable for EC1)
Price bracket A | Article no. 256 011 00 92.00 €

Housing: brass
Temperature range: -30°C ... +100°C
Maximum pressure: 10 bar
Switching capacity: 250 V~ / 3 A (FS07)
300 V~/ / 1 A (FS08)
Switching point: 1 litre / min
Fittings:
Upper connection thread: ET 22 mm, flat sealing
Lower connection thread: IT ¾”
Dimensions: 102 mm x 36 mm
WMZ Calorimeter

Universal calorimeter module for solar and heating systems. Graphic display for indication of flow and return temperature, heat quantity, flow rate and sensor faults (balance values are also stored in the case of a power failure). Suited for solar systems with water or water-glycol mixtures (water, propylene glycol, ethylene glycol and Tyfocor® LS adjustable).

- Energy, temperature and flow rate displays with imperial units
- Commissioning menu for easy configuration
- Available for different voltages

RESOL WMZ - Full kit
Calorimeter module incl. 2 Pt1000 temp. sensors (2 x FRP30) and 1 V40-06 flowmeter
Article no.: 135 304 13 248.40 €
as above, but with V40-15 flowmeter
Article no.: 135 304 23 248.40 €
as above, but with V40-25 flowmeter
Article no.: 135 304 33 248.40 €
as above, but with V40-35 flowmeter
Article no.: 135 305 03 398.50 €
as above, but with V40-60 flowmeter
Article no.: 135 305 13 398.50 €
as above, but with V40-100 flowmeter
Article no.: 135 305 23 538.20 €
as above, but with V40-150 flowmeter
Article no.: 135 305 33 755.00 €

All prices are subject to price bracket B

RESOL WMZ
Calorimeter module
Price bracket B | Article no.: 135 303 53 125.50 €

TECHNICAL DATA

Power supply: 220 ... 240 V~ (50 ... 60 Hz)
Power consumption: approx. 2 VA

Settings:
- Volumetric content of glycol: 0 ... 70% (1% - steps)
- Impulse rate of flow rate: 0 ... 99 l/Imp (1 l/Imp - steps) for RESOL V40 flowmeter

Sensors: RESOL Pt1000 sensors only
Measuring precision: ± 0.3 K
Measuring range: -30 ... +150 °C
Interface: RESOL VBus®
Display: graphic display as well as bi-coloured LED
Operation: by 3 push buttons at the front of the housing
Ingress protection: IP 20 / EN 60529
Ambient temperature: 0 ... 40 °C
Dimensions: 172 x 110 x 49 mm

T-piece sensor

(Please see page 90 for further information)

RESOL T22
T-piece sensor 22 mm with FKP 5.5 temperature sensor and TH30 immersion sleeve
Price bracket A | Article no.: 155 005 80 33.00 €

RESOL T28
T-piece sensor 28 mm with FKP 5.5 temperature sensor and TH30 immersion sleeve
Price bracket A | Article no.: 155 005 90 36.00 €
### V40 Flowmeter

The RESOL V40 is a measuring instrument with a contactor for measuring the flow of water or water-glycol-mixtures and can be connected directly to the controller or calorimeter for heat quantity measurement. After a specific volume has passed, the V40 reed switch sends an impulse to the calorimeter.

The heat quantity used is calculated by these impulses, the temperature difference and pre-defined parameters (glycol type, concentration, heat capacity etc.). Fitting included.

#### VERSION 1

<table>
<thead>
<tr>
<th>Irradiation impeller DN20</th>
<th>0.6-1.5 m³/h</th>
<th>2.5 m³/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Mounting length without fitting (mm)</td>
<td>110</td>
<td>130</td>
</tr>
<tr>
<td>B Mounting with fitting (mm)</td>
<td>208</td>
<td>228</td>
</tr>
<tr>
<td>C Height with pulser (mm)</td>
<td>108</td>
<td></td>
</tr>
<tr>
<td>D Height at centre of pipe (mm)</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Counter width (mm)</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td>Weight without fitting (kg)</td>
<td>0.7</td>
<td></td>
</tr>
</tbody>
</table>

Vertical and horizontal mounting is possible.

#### VERSION 2

<table>
<thead>
<tr>
<th>Irradiation impeller DN25/DN40/DN50</th>
<th>3.5 m³/h</th>
<th>6.0 m³/h</th>
<th>10 m³/h</th>
<th>15 m³/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Mounting length without fitting (mm)</td>
<td>260</td>
<td>300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Total height (mm)</td>
<td>143</td>
<td>169</td>
<td>183</td>
<td></td>
</tr>
<tr>
<td>C Height at centre of pipe (mm)</td>
<td>100</td>
<td>123</td>
<td>126</td>
<td></td>
</tr>
<tr>
<td>H Height with flange (mm)</td>
<td>152</td>
<td>192</td>
<td>204</td>
<td></td>
</tr>
<tr>
<td>Weight with fitting (kg)</td>
<td>3.2</td>
<td>6.4</td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td>Weight without fitting (kg)</td>
<td>2.7</td>
<td>5.3</td>
<td>5.8</td>
<td></td>
</tr>
</tbody>
</table>

Horizontal mounting is possible.

#### NOTE:

Version 1 is suitable for horizontal as well as for vertical mounting. Version 2 is for horizontal mounting only.

### Type

<table>
<thead>
<tr>
<th>Type</th>
<th>V40-06</th>
<th>V40-15</th>
<th>V40-25</th>
<th>V40-35</th>
<th>V40-60</th>
<th>V40-100</th>
<th>V40-150</th>
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<tbody>
<tr>
<td>Version</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Impulse rate (l/imp)</td>
<td>1</td>
<td>10</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Nominal width (DN)</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>40</td>
</tr>
<tr>
<td>Connection thread at the counter (G..B)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Connection thread of the fitting (R..)</td>
<td>¾</td>
<td>¾</td>
<td>¾</td>
<td>¼</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Max. oper. pressure (Pmax) (bar)</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
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<tr>
<td>Max. oper. temperature (Tmax) (°C)</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>130</td>
<td>130</td>
<td>130</td>
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<tr>
<td>Nominal flow (Qn) (m³/h)</td>
<td>0.6</td>
<td>1.5</td>
<td>2.5</td>
<td>3.5</td>
<td>6</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Maximum flow (Qmax) (m³/h)</td>
<td>1.2</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>12</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Insulation limit ± 3% (Qt) (l/h)</td>
<td>48</td>
<td>120</td>
<td>200</td>
<td>280</td>
<td>480</td>
<td>800</td>
<td>1200</td>
</tr>
<tr>
<td>Minimum flow horizontal (Qmin) (l/h)</td>
<td>12</td>
<td>30</td>
<td>50</td>
<td>70</td>
<td>120</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>Minimum flow vertical (Qmin) (l/h)</td>
<td>21</td>
<td>60</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>Art. no.</td>
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<td>280 011 10</td>
<td>280 011 20</td>
<td>280 013 60</td>
<td>280 013 70</td>
<td>280 013 80</td>
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<td>Price (€)</td>
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<td>110.40</td>
<td>110.40</td>
<td>283.80</td>
<td>283.80</td>
<td>420.20</td>
<td>608.30</td>
</tr>
</tbody>
</table>

All prices are subject to price bracket B.
The WMZ-G1 is a measurement and display unit for solar thermal systems and conventional heating systems. It is possible to connect up to two Grundfos Direct Sensors\textsuperscript{TM}, which measure the temperature as well as one additional value – depending on the type: flow rate, relative or differential pressure.

Heat quantity measurement is possible when two Grundfos Direct Sensors\textsuperscript{TM} are connected and at least one of them is a VFS type sensor. The WMZ-G1 also monitors the operating status of the system and displays deviations.

- Recording of: flow temperature, return temperature, power, heat quantity, flow rate, pressure, differential pressure, system errors
- Easy connection
- Dot matrix display
- Function control
- Configurable control parameters

### TECHNICAL DATA

**Inputs:**
- 2 VFS, RPS or DPS Grundfos Direct Sensors\textsuperscript{TM}
- Power supply: 220 ... 240 V–
- Power consumption: approx. 2 VA
- Measuring range: -30 ... +150 °C
- Interface: RESOL VBus®
- Display: graphic display as well as bi-coloured LED
- Housing: plastic, PC ABS and PMMA
- Protection class: IP 20 / EN 60529
- Ambient temperature: 0 ... 40 °C
- Dimensions: 172 x 110 x 49 mm

**RESOL WMZ-G1**
Calorimeter module for Grundfos Direct Sensors\textsuperscript{TM}
Price bracket B | Article no.: 135 307 03 142.60 €

**VFS 1-12 l Grundfos Direct Sensor\textsuperscript{TM}**
Sensor incl. fitting, insert and connection cable
Price bracket B | Article no.: 130 000 20 (Solar / DHW) 92.00 €
Price bracket B | Article no.: 130 002 00 (Heating) 92.00 €

**VFS 2-40 l Grundfos Direct Sensor\textsuperscript{TM}**
Sensor incl. fitting, insert and connection cable
Price bracket B | Article no.: 130 000 30 (Solar / DHW) 94.00 €
Price bracket B | Article no.: 130 002 10 (Heating) 94.00 €

**RPS 0-10 bar Grundfos Direct Sensor\textsuperscript{TM}**
Sensor incl. fitting and connection cable
Price bracket B | Article no.: 130 000 40 (Solar / DHW) 38.00 €
Price bracket B | Article no.: 130 002 20 (Heating) 38.00 €

Please note: different versions for different application areas – Heating and Solar/DHW!
Sensors are used to detect certain quantities such as temperature and irradiation. Platinum sensors, which change their electrical resistance proportionally to the temperature, are used for temperature measurements.

The sensor type is indicated by the third letter “P”, for example: FKP or FRP. FK designates the sensor of the heat source (e.g. collector sensor) and FR the reference sensor (e.g. store sensor). These sensor types have the same electrical features. They differ only in the connecting cable.
Temperature sensors
(for installation into immersion sleeves)

The standard temperature sensors for collectors and stores are printed in bold.

Note: The temperature range refers to the insulation of the sensor cable!

All silicone cables are UV- and ozone-resistant.

Semiconductor sensors
(spare part for older product series)

High-temperature sensors
(for temperatures up to 300 °C Pt1000 version)
**Cylindrical clip-on sensors**  
(for surface mounting on tubes) Pt1000 version

<table>
<thead>
<tr>
<th>Sensor</th>
<th>L1 [mm]</th>
<th>L2 [mm]</th>
<th>Material</th>
<th>Application</th>
<th>Temperature range</th>
<th>Article no.</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td>FKP21</td>
<td>39</td>
<td>1500</td>
<td>Silicone cable</td>
<td>Collector</td>
<td>-50 ... +180 °C</td>
<td>155 003 30</td>
<td>26.00</td>
</tr>
<tr>
<td>FRP21</td>
<td>39</td>
<td>2500</td>
<td>PVC cable</td>
<td>Store</td>
<td>-5 ... +80 °C</td>
<td>155 005 40</td>
<td>24.00</td>
</tr>
<tr>
<td>incl. pipe clip</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FRP22</td>
<td>39</td>
<td>2500</td>
<td>PVC cable</td>
<td>Store</td>
<td>-5 ... +80 °C</td>
<td>155 008 80</td>
<td>23.20</td>
</tr>
<tr>
<td>incl.: 1 bracket, 1 cable tie (up to 105 °C), 1 tin of heat conductive paste</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Flatscrew sensors**  
(for installation on plane surfaces) Pt1000 version

<table>
<thead>
<tr>
<th>Sensor</th>
<th>L1 [mm]</th>
<th>L2 [mm]</th>
<th>Material</th>
<th>Application</th>
<th>Temperature range</th>
<th>Article no.</th>
<th>€</th>
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</thead>
<tbody>
<tr>
<td>FKP9</td>
<td>32</td>
<td>1500</td>
<td>Silicone cable</td>
<td>Collector</td>
<td>-50 ... +180 °C</td>
<td>155 003 60</td>
<td>24.40</td>
</tr>
<tr>
<td>FRP9</td>
<td>32</td>
<td>2500</td>
<td>PVC cable</td>
<td>Store</td>
<td>-5 ... +80 °C</td>
<td>155 003 70</td>
<td>22.30</td>
</tr>
</tbody>
</table>

**Complete sensors**  
(Temperature sensors complete with immersion sleeve and strain relief)

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Immersion depth [mm]</th>
<th>Material</th>
<th>Temperature range</th>
<th>Article no.</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td>FKP30</td>
<td>FKPS,5 30</td>
<td>Brass</td>
<td>-50 ... +180 °C</td>
<td>155 001 90</td>
<td>24.60</td>
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<tr>
<td>FRP30</td>
<td>FRP5,5 30</td>
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<td>-5 ... +80 °C</td>
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<td>155 004 30</td>
<td>37.80</td>
</tr>
</tbody>
</table>

**Note:** The temperature range refers to the insulation of the sensor cable.
**Immersion sleeves**

Because of the short component length, it is recommended to use the TH30 immersion sleeve with the FKP5.5 or FRP5.5 temperature sensor.

<table>
<thead>
<tr>
<th>Article no.</th>
<th>Material</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
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PN10 at 90 °C

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<tr>
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<tbody>
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PN10 at 90 °C

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<td>280 001 00</td>
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</tr>
<tr>
<td>290 002 20</td>
<td>Stainless steel</td>
<td>20.60</td>
</tr>
</tbody>
</table>

PN16 at 90 °C

All prices are subject to price bracket A
**Grundfos Direct Sensors™**

**VFS 1-12 l Grundfos Direct Sensor™**
Analogue sensor incl. fitting, insert and connection cable
- Price bracket B | Article no.: 130 000 20 (Solar / DHW) 92.00 €
- Price bracket B | Article no.: 130 002 00 (Heating) 92.00 €

**VFS 2-40 l Grundfos Direct Sensor™**
Analogue sensor incl. fitting, insert and connection cable
- Price bracket B | Article no.: 130 000 30 (Solar / DHW) 94.00 €
- Price bracket B | Article no.: 130 002 10 (Heating) 94.00 €

**RPS 0-10 bar Grundfos Direct Sensor™**
Analogue sensor incl. fitting and connection cable
- Price bracket B | Article no.: 130 000 40 (Solar / DHW) 38.00 €
- Price bracket B | Article no.: 130 002 20 (Heating) 38.00 €

**VFD 1-12 l Grundfos Direct Sensor™**
Digital sensor incl. fitting, insert and connection cable
- Price bracket B | Article no.: 130 000 80 (Solar / DHW) 92.00 €
- Price bracket B | Article no.: 130 002 30 (Heating) 92.00 €

**VFD 2-40 l Grundfos Direct Sensor™**
Digital sensor incl. fitting, insert and connection cable
- Price bracket B | Article no.: 130 001 00 (Solar / DHW) 94.00 €
- Price bracket B | Article no.: 130 002 40 (Heating) 94.00 €

**RPD 0-10 bar Grundfos Direct Sensor™**
Digital sensor incl. fitting and connection cable
- Price bracket B | Article no.: 130 000 90 (Solar / DHW) 38.00 €
- Price bracket B | Article no.: 130 002 50 (Heating) 38.00 €

For the DeltaSol® AL E HE, BX Plus, MX, CS series and DeltaTherm® HC only:

**VFS 1-12 l Grundfos Direct Sensor™**
Analogue sensor incl. fitting, insert and connection cable
- Price bracket B | Article no.: 130 000 20 (Solar / DHW) 92.00 €
- Price bracket B | Article no.: 130 002 00 (Heating) 92.00 €

**VFS 2-40 l Grundfos Direct Sensor™**
Analogue sensor incl. fitting, insert and connection cable
- Price bracket B | Article no.: 130 000 30 (Solar / DHW) 94.00 €
- Price bracket B | Article no.: 130 002 10 (Heating) 94.00 €

**RPS 0-10 bar Grundfos Direct Sensor™**
Analogue sensor incl. fitting and connection cable
- Price bracket B | Article no.: 130 000 40 (Solar / DHW) 38.00 €
- Price bracket B | Article no.: 130 002 20 (Heating) 38.00 €

Please note: if you wish to connect two digital sensors to a controller, only use Grundfos Direct Sensors™ with different measuring ranges.

**TS10 Dew point switch**

The TS10 Dew point switch is designed for condensation detection in a heating circuit used for cooling purposes.

If the relative humidity falls below the adjusted set value, the TS10 will switch a potential-free contact.

**T-piece sensor**

T-piece sensor for mounting into pipes.

The temperature sensor in the immersion sleeve measures the temperature of the circulating medium.

**Heat conductive paste**

For installation of sensors (as flatscrew or pipe sensor) into the immersion sleeves, the heat conductive paste has to be used for a good heat transfer.
**FAP13 Outdoor temperature sensor**

The RESOL FAP13 is used for measuring the outdoor temperature with a Pt1000 measuring element.

**RESOL FAP13**
Indoor temperature sensor
Price bracket A | Article no.: 155 008 10
28.30 €

---

**RTA12 Remote control**

With the RTA12, the heating curve can be comfortably adjusted from the living area. Increasing the heating curve setting causes an increase in flow temperature, decreasing the setting causes a decrease. The integrated Pt1000 sensor measures the ambient temperature.

**RESOL RTA12**
Remote control for connection to the HKM3, DeltaSol® E, MX, BX Plus, DeltaTherm® HC / HC mini or EM Extension Module
Price bracket A | Article no.: 136 000 40
51.20 €

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**RCP12 Room control unit**

With the RCP12, the heating curve can be comfortably adjusted from the living area. The integrated Pt1000 sensor measures the room temperature. The additional operating mode switch enables a quick change of modes, e.g. from Automatic to Night mode.

**RESOL RCP12**
Room control unit for connection to the DeltaSol® MX (from version 2.0) or DeltaTherm® HC (from version 1.09)
Price bracket A | Article no.: 136 000 50
67.00 €

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**FRP12 Indoor temperature sensor**

The RESOL FRP12 is used for measuring the indoor temperature with a Pt1000 measuring element.

**RESOL FRP12**
Indoor temperature sensor
Price bracket A | Article no.: 155 008 90
29.60 €
**SV6 Sensor distribution box**

With the SV6, the signal of a Pt1000 temperature sensor can be distributed to 6 outputs. Thus, the signal of a single sensor can be made available to up to 6 controllers. In the case of a sensor fault, the LED will flash red.

**RESOL SV6**
Sensor distribution box  
Price bracket A | Article no.: 145 441 30  
375.75 €

**SP10 Overvoltage protection**

Overvoltage protection device placed in housing, suitable for mounting outdoors. We generally recommend installing the overvoltage protection in order to avoid overvoltage damage at collector sensors, e.g. caused by local lightning storms.

**RESOL SP10**
Sensor overvoltage protection  
Price bracket A | Article no.: 180 110 70  
17.50 €

**CS10 Solar cell**

The solar cell is used for measuring the irradiation intensity. The short-circuit current rises with increasing irradiation intensity. Depending on the controller, the sensor can also be used for additional plausibility control or direct control. The connecting cable can be extended to 100 m.

**RESOL CS10**
Solar cell  
Price bracket A | Article no.: 151 003 20  
62.30 €

**CS-I Global irradiation sensor**

The CS-I global irradiation sensor is used for precise and reliable measurement of solar irradiation. It converts the irradiation measured proportionally into an interference-resistant 4 ... 20 mA signal.

**RESOL CS-I Global irradiation sensor**  
4-20 mA output signal, incl. mains adapter, connection box (IP 44) and mounting material  
Price bracket C | Article no.: 151 005 10  
160.00 €

**TECHNICAL DATA**

- Distributes the signal of a Pt1000 temperature sensor
- Enables using a single sensor for multiple controllers
- Amplifies the signal for transmitting values over great cable lengths

Evaluation and display of measured values by means of the DL3.
Valves are used to control fluid flow. In hydraulic systems, different valves are used in order to run parts of the system separately or to switch on or off particular parts as required. 2-port valves allow or stop flow rates. Changeover valves are used to distribute and redirect flow rates.
VA20 2-port valve

The 2-port valve RESOL VA20 is used for switching flow rates in solar, heating and air conditioning systems.

The VA20 is a 2-port valve with an electro-thermal actuator. The actuating time of approx. 3 minutes enables a flow rate regulation without water hammers. The VA20 comes with brass connection fittings.

RESOL VA20-NO / DN 15
R½", with actuator normally open
Price bracket B | Article no.: 270 007 40 49.00 €
RESOL VA20-NO / DN 20
R¾", with actuator normally open
Price bracket B | Article no.: 270 007 60 57.20 €
RESOL VA20-NO / DN 25
R1", with actuator normally open
Price bracket B | Article no.: 270 007 80 75.20 €
RESOL VA20-NO / DN 32
R1¼", with actuator normally open
Price bracket B | Article no.: 270 008 00 102.60 €

RESOL VA20-NC / DN 15
R½", with actuator normally closed
Price bracket B | Article no.: 270 007 50 49.00 €
RESOL VA20-NC / DN 20
R¾", with actuator normally closed
Price bracket B | Article no.: 270 007 70 57.20 €
RESOL VA20-NC / DN 25
R1", with actuator normally closed
Price bracket B | Article no.: 270 007 90 75.20 €
RESOL VA20-NC / DN 32
R1¼", with actuator normally closed
Price bracket B | Article no.: 270 008 10 102.60 €

Larger quantity? Ask for an offer!
VA300 Changeover valve

The VA300 is a 3-port-valve with an electrothermal actuator. The actuating time of approx. 3 minutes enables a flow rate regulation without water hammers.

### TECHNICAL DATA

<table>
<thead>
<tr>
<th>DN</th>
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<td>64</td>
</tr>
<tr>
<td>H2</td>
<td>93</td>
<td>98.5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SW</td>
<td>37</td>
<td>47</td>
<td>66</td>
<td>66</td>
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</table>

### VALVE

- **Max. operating temperature:**
  - Long-term: up to 120 °C
  - Short-term: 140 °C
- **Valve housing:** corrosion resistant red brass
- **Internal parts:** brass and stainless steel
- **Sealings:** EPDM
- **Max. pressure:** 10 bar
- **Connection thread:** ¾", 1", 1¼", or 1½"

### ACTUATOR

- **Power supply:** 230 V~, 50 ... 60 Hz
- **Power consumption:** max. 2.5 W
- **Ambient temperature:** max. 50 °C
- **Ingress protection:** IP 44 (when mounted vertically to the top)
- **Spring force:** 90 N
- **Stroke:** 4 mm

### EXAMPLE

**RESOL VA300-NO / DN 20 (normally open)**
- ¾", with actuator and fittings
- Price bracket B | Article no.: 270 008 20 96.30 €

**RESOL VA300-NO / DN 25 (normally open)**
- 1", with actuator and fittings
- Price bracket B | Article no.: 270 008 40 114.00 €

**RESOL VA300-NO / DN 32 (normally open)**
- 1¼", with actuator and fittings
- Price bracket B | Article no.: 270 008 60 222.30 €

**RESOL VA300-NO / DN 40 (normally open)**
- 1½", with actuator and fittings
- Price bracket B | Article no.: 270 008 80 228.90 €

**RESOL VA300-NC / DN 20 (normally closed)**
- ¾", with actuator and fittings
- Price bracket B | Article no.: 270 008 30 96.30 €

**RESOL VA300-NC / DN 25 (normally closed)**
- 1", with actuator and fittings
- Price bracket B | Article no.: 270 008 50 114.00 €

**RESOL VA300-NC / DN 32 (normally closed)**
- 1¼", with actuator and fittings
- Price bracket B | Article no.: 270 008 70 222.30 €

**RESOL VA300-NC / DN 40 (normally closed)**
- 1½", with actuator and fittings
- Price bracket B | Article no.: 270 008 90 228.90 €

Larger quantity? Ask for an offer!

**SVA-NO Actuator for VA20 / VA300 (normally open)**
- Price bracket B | Article no.: 270 007 20 36.70 €

**SVA-NC Actuator for VA20 / VA300 (normally closed)**
- Price bracket B | Article no.: 270 007 30 36.70 €
VA22 2-port motor-driven ball valve

The VA22 is a 2-port-valve with a silent synchronous motor. The actuating time of approx. 30 seconds enables a quick flow rate regulation without water hammers. The position of the ball valve can easily be read from the indicator on the housing. The limit switch signal output can additionally be used for control purposes.

EXAMPLE

**TECHNICAL DATA**

**ACTUATOR**
- Operating voltage: 220 ... 240 V~
- Motor: synchronous motor
- Load for limit switch: 5 (1) A 220 ... 240 V~
- Power consumption: 7.5 VA max.
- Insulation class: II insulated
- Ingress protection: IP 44
- Actuation time: 30 s / 90°
- Operation mode: open - closed
- Ambient temperature: 0 ... 50 °C
- Torque: 6 Nm (max. 8 Nm)
- Electrical connection: 4 x 0.5 mm²

**VALVE**
- Max. operating temperature: 0 ... 120 °C
- Nominal pressure: PN 15 (max. PN 16)
- Valve connection: IT on both sides
- Flow: full flow, according to nominal width NW.
- Valve: pressed brass (CuZn40Pb2)
- Valve connection: brass (CuZn40Pb2)
- Valve spindle: brass (CuZn40Pb2)
- Valve ball: brass, hard-chromium-plated
- Ball sealing: PTFE-ring teflon sealing
- Spindle sealing: 1 x O-ring EPDM, 1 x O-ring Viton and 1 x O-ring PTFE
- Sealing spindle to valve: 1 x O-ring EPDM, the axial stress between valve spindle and slot is compensated by another sealing.
VA32 3-port motor-driven valve

The VA32 is a 3-port-valve with a silent synchronous motor. The actuating time of approx. 18 seconds enables a quick flow rate regulation without water hammers. The initial state of the adjusted flow direction can easily be switched. The limit switch signal output can additionally be used for control purposes.

![Diagram of VA32 valve]

**TECHNICAL DATA**

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<td>1”</td>
<td>1¼”</td>
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<tr>
<td>B</td>
<td>72</td>
<td>90</td>
<td>90</td>
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<td>C</td>
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<td>D</td>
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<tr>
<td>E</td>
<td>54</td>
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</table>

**ACTUATOR**

- **Power consumption:**
  - Relay on, motor running: 9 VA
  - Relay on, motor in standby: 5 VA
  - Relay off: 0 VA
- **Protection class:** II (EN60335-1)
- **Ingress protection:** IP 44 (IEC529)
- **Output signal:** phase L, 1 (1) A
- **Connection line:** 4 x 0.5 mm², L = 1 m
- **Regulating angle:** 90°
- **Actuation time:** 18 s / 90°
- **Torque:** 6 Nm (max. 8 Nm)
- **Ambient temperature:** 0 … 55 °C
- **Operation mode:** open - closed

**VALVE**

- **Torque:** 6 Nm (max. 8 Nm)
- **Max. operating temperature:** +2 … -110 °C
- **Max. operating pressure:** 6 bar
- **Housing:** forged brass
- **Rotor with the axle:** brass
- **Axle sealing:** 4 x O-rings, EPDM
- **Possibility of motor control:** UV-3
- **For reduction of axle friction:** PA-plate

**EXAMPLE**

- **Kᵥs values**
  - Flow rate (m³/h) vs. Pressure (bar)

**RESOL VA32-DN20**
- R¾”, motor-driven changeover valve
- Price bracket B | Article no.: 270 001 90
- 91.30 €

**RESOL VA32-DN25**
- R1”, motor-driven changeover valve
- Price bracket B | Article no.: 270 002 00
- 93.80 €

**RESOL VA32-DN32**
- R1¼”, motor-driven changeover valve
- Price bracket B | Article no.: 270 003 10
- 103.50 €

**Actuator for VA32**
- Price bracket B | Article no.: 270 004 50
- 79.60 €

Larger quantity? Ask for an offer!
MA10/MA25 DHW thermostatic mixing valve

(scald protection for potable water and DHW systems)

Thermostatic mixing valve for installation into hot water circuits as scald protection.

The thermostatic mixing valve MA10/MA25 is used for limiting the hot water temperature, e.g. in thermosiphon systems or in solar potable water systems.

- No auxiliary electric energy required
- Continuously adjustable between 35 ... 65 °C
- Installation in the hot water flow, in systems with stub or circulation pipes
- Screwed or soldered connections possible
- Any installation position possible

**TECHNICAL DATA**

- **Flow rate** V (m³/h).
- **Pressure loss** ∆p (bar)
- **Housing**: dezincification-resistant brass
- **Guide component**: PTFE
- **Internal seal**: EPDM
- **External seal**: asbestos-free, flat-sealing
- **Operating pressure**: max. 10 bar
- **Max. temperature hot water inlet**: max. 90 °C
- **Adjustment range mixed water outlet**: 35 ... 65 °C

**EXAMPLE**

- **Thermosiphon system**

**RESOL MA10**
Thermostatic mixing valve, ET R 1”
Price bracket B | Article no. 280 013 40
45.80 €

**RESOL MA25**
Thermostatic mixing valve, ET R 1 ¼”
Price bracket B | Article no. 280 015 50
58.80 €

Reducing bushes
- **ET ¾”, Set of 3 units for MA10**
  Price bracket B | Article no. 280 013 50
  10.80 €

- **ET 1”, Set of 3 units for MA25**
  Price bracket B | Article no. 280 015 60
  22.00 €

Larger quantity? Ask for an offer!
3-port heating mixers

ESBE 3-port mixing valves and actuator

The ESBE 3-port-mixers are high-class mixing valves for heating applications. The matching actuator ARA661 is optionally available.

- Very low leak rate
- Runtime only 120 s (90°)
- Available with different nominal widths and thread sizes

Euromix 3-port mixer

The Euromix 3-port mixer comes with a pre-mounted actuator and is available up to DN32.

- Pre-mounted combination of mixing valve and actuator
- Easy to install and maintenance-free
- Available with different nominal widths and thread sizes

ESBE kvs 6.3, ⅝” DN20
3-port mixing valve
Price bracket B | Article no.: 270 009 40 51.80 €

Euromix ¾” DN20
3-port mixer
Price bracket B | Article no.: 270 009 70 110.00 €

Euromix 1” DN25
3-port mixer
Price bracket B | Article no.: 270 009 80 112.00 €

ESBE 3-port mixing valve

Connection thread: Rp ¾” / Rp 1” / Rp 1 ¼”
Nominal width: DN20 / DN25 / DN32
Nominal pressure: PN10
Fluid temperature: 0 ... 110 °C (long-term) / 130 °C (short-term)
Max. differential pressure: diverting: 2 bar / mixing: 1 bar
Torque (at nominal pressure): < 3 Nm
Closing pressure: 2 bar
Flow rate coefficient kvs:
- 6.3 m³/h / 6.3 m³/h / 10 m³/h (Δp = 1 bar)

Leak rate:
- diverting: 0.02 % / mixing: 0.05 % (Δp = 1 bar)
- kvs:
  - 6.3 m³/h / 6.3 m³/h / 10 m³/h (Δp = 1 bar)

Mixer housing:
- dezincification-resistant brass DZR

Valve inlet: abrasion-resistant brass
Shaft and bushing: PPS composite
O-rings: EPDM
Fluid: water, glycol < 50 %

Euromix Actuator

Matching the ESBE mixing valves

ESBE Actuator ARA661
matching the ESBE mixing valves
Preisgruppe B | Artikel-No.: 270 009 30 112.95 €

Euromix ¾” DN20
3-port mixer
Price bracket B | Article no.: 270 009 70 110.00 €

Euromix 1” DN25
3-port mixer
Price bracket B | Article no.: 270 009 80 112.00 €

Euromix 1 ¼” DN32
3-port mixer
Price bracket B | Article no.: 270 009 90 117.00 €

PREISLISTE

ESBE kvs 6.3, ⅝” DN25
3-port mixing valve
Price bracket B | Article no.: 270 009 50 52.90 €

ESBE actuator

Power supply: 230 V~ (+/- 10 %), 50 Hz
Power consumption: 5 VA
Protection class: II
Ingress protection: IP 41
Ambient temperature: -5 ... +55 °C
Connection cable: 3 x 0.5 mm², I = 1.5 m
Runtime: 120 s / 90°
Torque: 6 Nm

ESBE 3-port mixing valve

Connection thread: Rp ¾” / Rp 1” / Rp 1 ¼”
Nominal width: DN20 / DN25 / DN32
Nominal pressure: PN10
Fluid temperature: -10 ... +110 °C (long-term) / 130 °C (short-term)
Max. differential pressure: diverting: 2 bar / mixing: 1 bar
Closing pressure: 2 bar
Flow rate coefficient kvs:
- 7 m³/h / 10 m³/h / 10 m³/h (Δp = 1 bar)

Leak rate:
- diverting: 0.2 % kvs (Δp = 1 bar)
- kvs:
  - 7 m³/h / 10 m³/h / 10 m³/h (Δp = 1 bar)

Mixer housing:
- brass (CW617N)

Shaft, rotor, flap: brass (CW617N)
Inlet: PPS
O-rings: EPDM, FKM
Fluid: water, glycol < 50 %
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If you are interested in RESOL products and are based outside Germany, you are welcome to contact RESOL Germany or our local distributors. We will gladly provide you with contact data of further distributors upon request.
In order to strengthen our international sales we are looking for strong partners all over the world who are interested in a long-term cooperation with RESOL.
I. Scope
1. The following General Terms and Conditions apply to all supplies and services provided by RESOL – Elektronische Regelungen GmbH (hereinafter as “RESOL”).
2. Together with these General Terms and Conditions, all transactions are also subject to the supplementary clause “overall reservation of title” of the Central Association of the Electrical and Electronics Industry as amended. Together with these General Terms and Conditions, all foreign transactions are also subject to the interpretation rules of the Incoterms® 2010 on concluding the agreement.
3. Deviating, contradictory or supplementary provisions from these General Terms and Conditions are only binding on RESOL, even when known, if these have been explicitly recognised in writing by RESOL for the respective transaction.
4. The text of the currently valid version of these General Terms and Conditions can be downloaded free of charge on the Internet at www.resol.de.

II. Contract conclusion/offer and acceptance
1. Purchase orders/orders (offers) are binding on the purchaser for four weeks counting from receipt by RESOL. Purchase orders/orders become legally binding on being executed by RESOL otherwise only with the contents of the written order confirmation from RESOL. Verbal agreements or those reached by phone only become part of the contract on being confirmed in writing by RESOL. The same applies to orders through the Internet or E-mail.
2. Cost estimates, drawings, technical documents, suggestions for solving problems and other documents received by the purchaser from RESOL before concluding the contract remain RESOL’s property until the contract is concluded. At RESOL’s request, these are to be returned to RESOL if no contract is concluded. The documents or parts therefore must not be duplicated in any manner or otherwise made accessible to third parties without explicit consent from RESOL.

III. Prices and conditions of payment
1. Prices are to be understood net “EXW Hasingen, Incoterms® 2010” and do not include packaging, statutory value added tax, freight with transport insurance, custo- mes, postage or any other delivery costs. Deliveries within the EU single market (intra-trading) are only exempt from VAT if the consignee’s valid value added tax identification number (VAT ID No.) is stated in the purchase order to RESOL.
2. Payments are due without deduction within 30 days from the date of the invoice. Payments by notes or cheques are ruled out. Punctual payment depends on the date of payment being received by RESOL. In the event of delayed payment, RESOL can claim default interest amounting to nine percentage points above the currently valid base rate. If several due receivables are still outstanding, RESOL is entitled to stipulate which individual invoices will be balanced by the incoming payment. The customer shall receive corresponding notification.
3. If RESOL should receive notification, after written order confirmation, with regard to material financial deterioration on the part of the customer or if there should be other justified doubts as to the customer’s creditworthiness, RESOL is entitled to proceed with deliveries only against collateral security or prepayment. If the customer is in arrears, RESOL can postpone further deliveries and services until payment of the outstanding receivables, unless the customer makes prepayment.
4. RESOL reserves the right to make deliveries against prepayment in individual cases.
5. The purchaser is only entitled to offset with counter claims or withholding payments in cases that are undisputed or have been finally and conclusively established.

IV. Delivery and passage of risk
1. The goods shall be dispatched at the customer’s risk, even if the freight order is issued by RESOL and at RESOL’s costs. Fixed delivery deadlines are only binding if agreed by contract or confirmed by RESOL. A delivery is deemed to be punctual according to the point in time of handing the goods over to the forwarer or another company entrusted with transport/shipping.
2. Packaging is charged at cost price. On request, RESOL ships goods in environment-friendly returnable boxes, whereby return of the boxes must be free of charge for RESOL.

V. Reservation of title
1. RESOL reserves title of ownership to all delivered goods until complete payment of all invoices arising from the business relationship with the customer. This also applies when the purchase price has been paid for certain deliveries of goods determined by the customer, as the reservation of title acts as security for all RESOL’s balance claims.

VI. Material defects and liability
1. The customer is obliged to inspect the goods delivered by RESOL straightaway for any signs of visible transport damage. Any faults detected on goods receipt shall be reported immediately in writing to RESOL. In the case of justified complaints, RESOL is obliged to proceed with reworking or replacement delivery at RESOL’s choice. If reworking or replacement delivery should be in vain, the customer can only demand redelivery action; any reduction is excluded. Complaints whose return delivery has to take place free of charge and that require a detailed fault report will be inspected with the results documented in a test report. The customer retains ownership of the part subject to complaint; in the case of unjustified fault complaints, the test report includes an offer to the customer for return delivery free of charge, or scrapping free of charge.
2. Minor changes to the construction, form and design of the delivered goods are permitted and deemed to be contractual insofar as they are not detrimental to the intended purpose, quality and functionality. RESOL products are subject to constant technical progress and on-going development. RESOL therefore reserves the right to make modifications without special notification.
3. If the customer supplies RESOL with parts for the product being produced and supplied by RESOL in execution of an order issued by the customer, RESOL is indemnified from any liability for material defects insofar as the item supplied by RESOL is faulty on account of a fault in the part supplied. If the goods are found to be in perfect condition, RESOL shall issue the customer with a credit note amounting to at least 25 % of the net invoice amount, after deduction of a handling fee.

VII. Place of fulfilment and jurisdiction
The place of fulfilment and jurisdiction for all disputes arising from the contractual rela- tionship between the customer and RESOL shall be RESOL’s registered place of business, or the customer’s registered place of business at RESOL’s choice. The contractual relationships between RESOL and the customer shall be subject to German law.

VIII. Severability clause
If individual provisions of these General Terms and Conditions should be or become legally invalid, this shall not affect the validity and effectiveness of the remaining provisions of the General Terms and Conditions. It is agreed that the invalid provision shall be replaced by the statutory provision that comes as close as possible in financial terms to the meaning and intention of the invalid provision of the General Terms and Conditions.

Version: 01/2016

Note
All data mentioned in this catalogue correspond to the current standard of knowledge during printing. January 2016. The data are correct to the best of our knowledge. As faults can never be excluded, no liability is assumed for incorrect information. Subject to change of product range. The products shown represent some examples – the illustrations may differ from the original part in shape and color.
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This catalogue is valid from the 01.01.2016 until a new catalogue is issued.