CRK24-B1 – Heated/chilled ceiling system

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**Description, function**

**Heated/chilled ceiling system**

Suspended ceilings are usually installed as room panelling in commercial premises such as offices, event and meeting rooms, sales and presentation buildings, functional areas in hospitals, etc. This is a typical area of application for heated/chilled ceilings. Chilled ceilings function in accordance with the principle of quiet cooling, i.e. temperatures are not permitted to fall below the dew point.

Depending on the selected water temperature, this technology can be used for either heating or cooling. Furthermore, ceiling systems also have under certain circumstances additional aesthetic, spatial acoustics and lighting functions.

Water is used to lower the surface temperature of the chilled ceiling to a few degrees below the room temperature, although it remains constantly above the dew point.

Because of the fact that the majority of most heat sources release heat via radiation and function without forced convection, the physical action principle of the chilled ceiling is the most comfortable solution for spaces devoted entirely to office functions.

For the ventilation of larger-sized interior heat loads and high levels of air humidity, chilled ceilings are nevertheless more limited in their effectiveness than fancoil units because of maximum cooling output considerations.

**Thermal construction element activation** (also: concrete core activation) refers to systems which utilise building masses for temperature regulation. These systems are used for sole or supplementary room heating and/or cooling. One such system is the thermoactive ceiling [Thermoaktive Decke (TAD)]. (Switzerland TABS = thermoactive component [Bauteil] system).

Pipelines are laid during the construction of solid ceilings, usually plastic piping. Water flows through these pipes as a medium for heating and/or cooling. The entire solid ceiling through which the water flows is thus thermally activated as a transfer and storage mass.

The solid structural component either radiates or absorbs the heat across its entire surface, depending on the heating or cooling situation. System temperature differences remain low because of the comparatively large transference surface. This means that the medium needs not be heated up to the same extent as, for example, the water in a central heating system that uses heaters with a significantly smaller transference surface. Heat pumps, for example, can be efficiently utilised for heating because of these lower supply temperatures. Environmentally friendly energies such as free heat exchange, sole plate cooling or ground water cooling are appropriate sources of cooling.

**Hygienic air change**

The atmosphere in which one feels comfortable and in which one then can work productively is not dependent solely on the temperature. Air quality is also a decisive factor, as is also air hygiene. Combined systems comprising heated/chilled ceilings and VAV systems are therefore ideal. The air is primarily responsible for hygienic air changes and also has an additional supportive effect on temperature behaviour.

The majority of VAV controllers are connected to a central regulating unit. It is for that reason that we are not offering a detailed discussion of this combination application in the present document.
Night switch-off: Regulating the 6-way valve with Energy Hold Off (EHO)

Description, function
Heater/chiller ceiling application with 4-pipe system in connection with the 6-way ball valve and the room temperature controller CRK24-B1. The entire regulating system is blocked by an external switching contact in order to avoid unnecessary energy consumption during prolonged absences or when windows are open. The protection of the building continues to be guaranteed by the fact that the limits during this Energy Hold Off (EHO) are fixed at 15°C for heating and 40°C for cooling. If temperatures fall below the limit values or exceed them, respectively, the system switches on until the setpoint values are achieved once again. For added safety, the frost function is naturally also activated with a switch-on point of 10°C.

Principle diagram

Functional diagram

Connection, allocation CRK24-B1
Regulating the 6-way valve with Energy Hold Off (EHO)

Input and output allocation

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>- di2</td>
<td>- ao1</td>
</tr>
<tr>
<td>- U5^1</td>
<td>System output 6-way ball valve</td>
</tr>
</tbody>
</table>

Diagnostics connection (useful only when using the LR24A-MP actuator)

Override functions

If more than one override function is switched on at the same time, then the one with the highest priority will be activated.

Priority 1: Room protection (Frost)

This function is activated when the room temperature falls below 10°C (protective function).

Priority 2: Energy Hold Off (di2)

The heated/chilled ceiling is switched off in order to avoid unnecessary energy consumption during prolonged absences or when windows are open. The regulating control is however enabled once more when temperatures fall below the limit values or exceed them (<15°C/>40°C).

List of materials

<table>
<thead>
<tr>
<th>Room temperature controller, AC 24 V</th>
<th>CRK24-B1</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-way valve</td>
<td>EXT-K3B2-...-...</td>
</tr>
<tr>
<td>Actuator, AC 24 V / 2 ... 10 V</td>
<td>LR24A-MP, LR24A-SR</td>
</tr>
</tbody>
</table>

Configuration, adjustment setting CRK24-B1

<table>
<thead>
<tr>
<th>DIP</th>
<th>Function</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Switching P-band</td>
<td>Normal – Wide</td>
</tr>
<tr>
<td>2</td>
<td>6-way output</td>
<td>Modulating – On/Off</td>
</tr>
</tbody>
</table>

Function diagram

6-way valve with modulating control (DIP position)
Regulating the 6-way valve with Energy Hold Off (EHO)

Function diagram
6-way valve with On/Off control (DIP position)

Operating

<table>
<thead>
<tr>
<th>Operating mode</th>
<th>Setpoint AUTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTO – ECO – MAX</td>
<td>Rotary button on the front</td>
</tr>
</tbody>
</table>

[Diagram showing the regulation of 6-way valve with Energy Hold Off (EHO)]
All options: 6-way valve regulation with pre-comfort, Energy Hold Off (EHO) and dew point limiter

Description, function

Heater/chiller ceiling application with 4-pipe system in connection with the 6-way ball valve and the room temperature controller CRK24-B1. The entire regulating system is blocked by external switching contacts. The dew point limiter blocks the cooling and moves the ball valve into neutral position. The energy stop is used to fix the setting limits at 15°C for heating and 40°C for cooling. In the meantime, the valve remains in the energy-neutral zone. The room is regulated for readiness during pre-comfort operation. The nominal heating value is lowered by 3K and the nominal cooling value is raised by 3K. For added safety, the frost function is also naturally activated with a switch-on point of 10°C.
6-way valve regulation with pre-comfort, Energy Hold Off (EHO) and dew point limiter

Input and output allocation

<table>
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<tr>
<th>Inputs</th>
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<tbody>
<tr>
<td>- ai/d1 Pre-comfort/Temp. Sensor</td>
<td>- ao1 System output 6-way ball valve</td>
</tr>
<tr>
<td>- di2 Energy Hold Off (EHO)/dew point limiter</td>
<td></td>
</tr>
<tr>
<td>- ai2 ext. setpoint shift</td>
<td></td>
</tr>
<tr>
<td>- U51 Diagnostics connection (useful only when using the LR24A-MP actuator)</td>
<td></td>
</tr>
</tbody>
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Override functions

If more than one override function is switched on at the same time, then the one with the highest priority will be activated.

Priority 1: Room protection (Frost)
This function is activated when the room temperature falls below 10°C (protective function).

Priority 2: Energy Hold Off (EHO)/dew point limiter (di2)
The heated/chilled ceiling is switched off in order to avoid unnecessary energy consumption during prolonged absences or when windows are open. The regulating control is however enabled once more when temperatures fall below the limit values or exceed them (<15°C/>40°C).

Priority 3: Pre-comfort (di1)If a local sensor (e.g. motion detector) has an effect on the input d1, then the room is set to Pre-comfort. The nominal heating value is lowered by 3K and the nominal cooling value is raised by 3K.

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Function diagram

6-way valve with modulating control (DIP position)
6-way valve regulation with pre-comfort, Energy Hold Off (EHO) and dew point limiter

Function diagram
6-way valve with On/Off control (DIP position)

Operating
Operating mode Setpoint AUTO
AUTO – ECO – MAX Rotary button on the front
All-inclusive.

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