BELIMO®

6.6.05 – Update with applications
Dual-duct units, electrical re-heater and radiator heating

A4 Application library CR24 V1.1 EN

Single room applications

CR

BELIMO

Layout

	System	-	Application	- Number		->		System	Application	
	I R C	-	V A V	-				IRC	VAV application	
	I R C	-	V A V	- 0 0 1 1	. 0			IRC system	VAV	variant 0011.0
	I R C	-	V A V	- 0 0 1 1	. 1			- sub-variant 0001.1		

Key

	System	-	Application	- Number	->	System	Application
	I R C	-	A I R	-		IRC	Air (damper)
		-		-			
	I R C	-	V A V	-		IRC	VAV
		-		-			
	I R C	-	W A T	-		IRC	Water
		-		-			
	I R C	-	C L C	-		IRC	Chilled/heated ceiling
		-		-			
	I R C	-	V A R	-		IRC	Various

Overview IRC applications

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The application library consists of various singles room applications based on the proofed Belimo actuators for motorized air and water applications and the new CR24 single room controller range. The applications are subdivided according to its system type.

The library is being update regularly, please check for the lasted issue: on the INTRANET or under www.belimo.ch

The detailed function description and technical data of the CR24 controller can be found in the CR24 Product-Information: www.belimo.ch

Air-Systems, pressure dependent

Application	Description		CR24 Type
IRC-AIR-0011.0	Single-duct – Damper control, Room temperature controlled – cooling mode		CR24-B1
IRC-AIR-0015.0	Single-duct – Damper control, with Change/over function		CR24-B1

VAV-Systems, pressure independent

Application	Description		CR24 Type
IRC-VAV-0011.0	VAV - Single-duct application, Room temperature controlled		CR24-B1
IRC-VAV-0011.1	VAV - Single-duct application, with Boost option: Temperature controlled		CR24-B3
IRC-VAV-0013.0	VAV – Dual duct application, with room temperature controller	new	CR24-B1
IRC-VAV-0015.0	VAV - Single-duct application, Room temperature controlled with 0...10V reheater valve		CR24-B3
IRC-VAV-0015.1	VAV - Single-duct application, Room temperature controlled with 3-Point reheater valve		CR24-B2
IRC-VAV-0016.0	VAV - Single-duct application, Room temperature controlled with 1-stage electrical reheater	new	CR24-B2E
IRC-VAV-0016.1	VAV - Single-duct application, Room temperature controlled with 2-stage electrical reheater	new	CR24-B2E
IRC-VAV-0018.0	VAV - Single-duct application, Room temperature controlled with ON/OFF radiator valve	new	CR24-B2E
IRC-VAV-0111.0	VAV - Single-duct application, with chilled ceiling		CR24-B3

Water applications

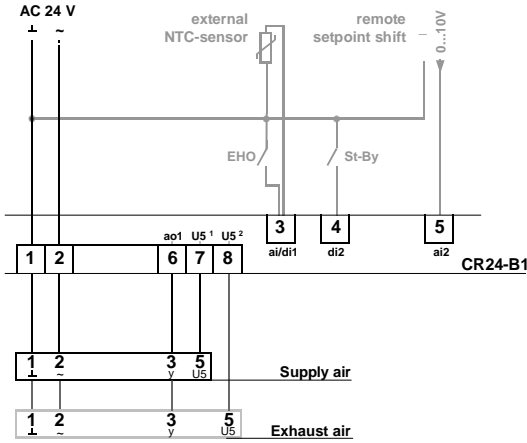| Application	Description	CR24 Type
IRC-WAT-0011.0	2-pipe system with 3-point reheater valve, Room temperature controlled	CR24-B2
IRC-WAT-0015.0	2-pipe system Heat exchanger, with Change/Over function	CR24-B1

Heat-/Chilled Ceiling-Systems

Application	Description	CR24 Type
IRC-CLC-0011.0	Chilled ceiling - 2-pipe-system, Room temperature controlled	CR24-B3
IRC-CLC-0015.0	Heat-/Chilled ceiling - 2-pipe-system, with Change-over function	CR24-B3

Air-Systems, pressure dependent

Application	Description	CR24 Type
IRC-AIR-0011.0	Single-duct – Damper control, Room temperature controlled – cooling mode	CR24-B1
IRC-AIR-0015.0	Single-duct – Damper control, with Change/over function	CR24-B1

Air-System, pressure depending

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IRC-AIR-0011.0	Single-duct Damper control, Room temperature controlled – cooling mode

Wiring diagram CR24-B1

AC 24 V

external NTC-sensor

remote setpoint shift

0...10V

EHO   St-By

		ao1	U5 ¹	U5 ²	3		4		5	
1	2	6	7	8	ai/di1		di2		ai2	**CR24-B1**

1	2		3	5	**Supply air**
⊥	~		y	U5	

1	2		3	5	**Exhaust air**
⊥	~		y	U5	

Mode setting actuator: 2...10V

In- & Output assignment

Inputs
- ai/di1   EHO / ext. Sensor *
- di2   Stand by *
- ai2   Remote setpoint shift *

Outputs
- **ao1   System output (0)2…10V**

* Optional

Note
The pin numbering corresponds to the Belimo actuator connections.

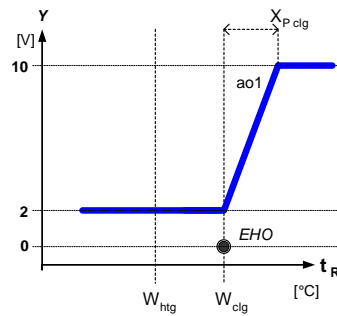Refer to the CR24 Product-Information for technical data and detailed information.

Description, functional diagram

Pressure depending damper application. The room temperature aims as the demand related control value of the connected damper actuators.

Functional diagram

Hints
Mode setting damper: 2...10 V

Configuration, settings CR24-B1

DIP-Switch setting:

1 P-Band: _**normal**_ -   breit
2 di2:   _**Stand by**_ -   Change over

| 1 | 2 |

Setpoint W_H range:

15...36 °C

Options

♦ di1 – *EHO* Energy hold off, e.g. window switch, ext. time switch

♦ di2 – Stand by, e.g. motion detector

♦ ai1 – external temperature sensing – exhaust duct

♦ ai2 – external setpoint shift, e.g. So/Wi-compensation

Operations - MMI

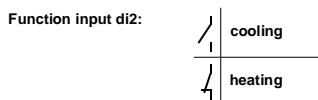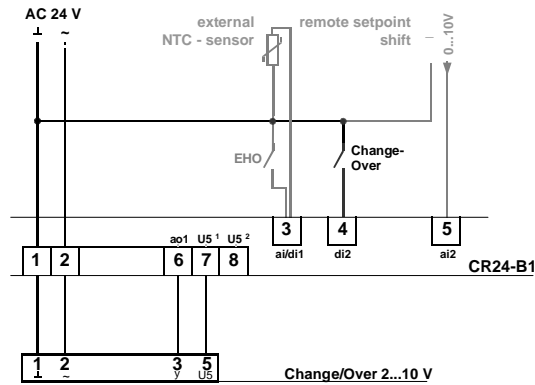| CR24-A1	without user interface	Mode: *AUTO*
CR24-B1	with user interface	Mode: *AUTO-ECO-MAX*

Subject of changes

Air-System, pressure depending

IRC-AIR-0015.0 — Single duct – Damper control, with Change/Over function

Wiring diagram CR24-B1

AC 24 V

external NTC - sensor

remote setpoint shift

0...10V

EHO

Change-Over

1	2		6	7	8	3	4		5

ao1   U5 ¹   U5 ²   ai/di1   di2   ai2   **CR24-B1**

1	2		3	5

y   U5   **Change/Over 2...10 V**

Function input di2:

cooling

heating

In- & Output assignment

Inputs
- *ai/di1   EHO / ext. Sensor **
- *di2   Change/Over*
- *ai2   Remote setpoint shift **

Outputs
- *ao1   Change/over actuator 2…10V*

 * Optional

Note
The pin numbering corresponds to the Belimo actuator connections.

Refer to the CR24 Product-Information for technical data and detailed information.
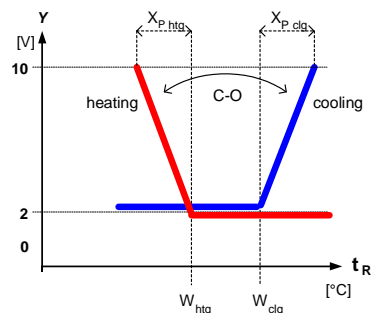
Description, functional diagram

Change-Over

Pressure depending single-duct damper application with Change/Over-function heating - cooling. Change/over Heating <–> cooling switching action via dry contact depending e.g. via the temperature of the supply system.

Functional diagram

Y [V]

$X_{P\,htg}$ $X_{P\,clg}$

heating   C-O   cooling

t_R [°C]

W_{htg} W_{clg}

Hint
Mode setting actuator: 2...10 V

Configuration, setting CR24-B1

DIP-Switch setting:

1 P-Band: **normal** - wide
2 di2:   Stand by - **Change over**

Setpoint W_H range:

15...36 °C

Options

♦ di1 – *EHO* Energy hold off, e.g. window switch, ext. timeswitch

♦ ai1 – external temperature sensing – exhaust duct

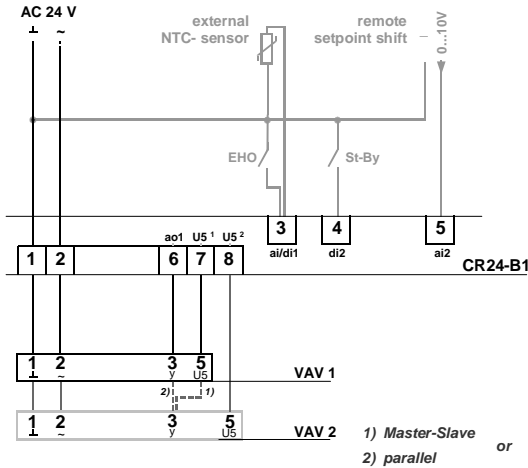♦ ai2 – external setpoint shift, e.g. So/Wi-compensation

Bedienung

CR24-A1   without user interface   Mode: *AUTO*
CR24-B1   with user interface   Mode: *AUTO-ECO-MAX*

Subject to changes

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VAV-Systems, pressure independent

Application	Description		CR24 Type
IRC-VAV-0011.0	VAV - Single-duct application, Room temperature controlled		CR24-B1
IRC-VAV-0011.1	VAV - Single-duct application, with Boost option: Temperature controlled		CR24-B3
IRC-VAV-0013.0	VAV – Dual duct application, with room temperature controller	new	CR24-B1
IRC-VAV-0015.0	VAV - Single-duct application, Room temperature controlled with 0...10V reheater valve		CR24-B3
IRC-VAV-0015.1	VAV - Single-duct application, Room temperature controlled with 3-Point reheater valve		CR24-B2
IRC-VAV-0016.0	VAV - Single-duct application, Room temperature controlled with 1-stage electrical reheater	new	CR24-B2E
IRC-VAV-0016.1	VAV - Single-duct application, Room temperature controlled with 2-stage electrical reheater	new	CR24-B2E
IRC-VAV-0018.0	VAV - Single-duct application, Room temperature controlled with ON/OFF radiator valve	new	CR24-B2E
IRC-VAV-0111.0	VAV - Single-duct application, with chilled ceiling		CR24-B3

VAV-System, pressure independent

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Wiring diagram CR24-B1

AC 24 V

external NTC- sensor   remote setpoint shift   0...10V

EHO   St-By

ao1	U5 [1]	U5 [2]	**3**	**4**		**5**	
1	**2**	**6**	**7**	**8**	ai/di1	di2	ai2	**CR24-B1**

| **1** | **2** | | **3** | **5** | **VAV 1** |
| ⊥ | ~ | | y | U5 | |

2) 〰 1)

| **1** | **2** | | **3** | **5** | **VAV 2** |
| ⊥ | ~ | | y | U5 | |

1) *Master-Slave*
2) *parallel*   **or**

Mode setting VAV-controller: 2...10V

In- & Output assignment

Inputs
- *ai/di1*   *EHO / ext. Sensor **
- *di2*   *Stand by **
- *ai2*   *Remote setpoint shift **

Outputs
- *ao1*   *VAV system output (0)2…10V*

* Optional

Note
The pin numbering corresponds to the Belimo actuator connections.

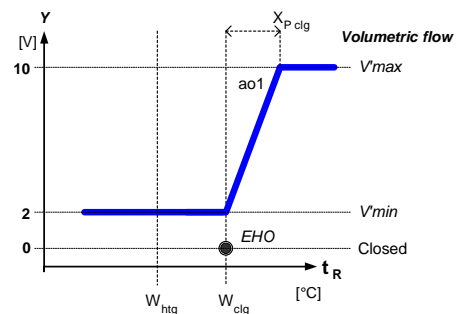Refer to the CR24 Product-Information for technical data and detailed information.

Description, functional diagram

The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric flow range V'min...V'max equals to:

- V'min - to the hygienic air change
- V'max - to the maximum cooling demand.

Functional diagram

Hints
Application requires VAV - controller mode setting: 2...10 V

Configuration, settings CR24-B1

DIP-Switch setting:

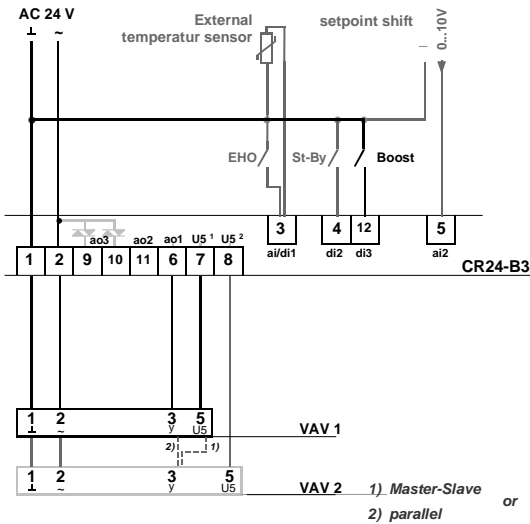|			
1	P-Band:	**_normal_** -	wide
2	di2:	**_Stand by_** -	Change over

Setpoint W_H range:

15...36 °C

Options

♦ di1 – *EHO* Energy hold off, e.g. window switch, ext. timeswitch

♦ di2 – *Stand by*, e.g. motion detector

♦ ai1 – external temperature sensing – exhaust duct

♦ ai2 – external setpoint shift, e.g. So/Wi-compensation

Operations - MMI

| CR24-A1 | without user interface | Mode: *AUTO* |
| CR24-B1 | with user interface | Mode: *AUTO-ECO-MAX* |

VAV-System, pressure independent

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| IRC-VAV-0011.1 | VAV – Single duct application |
| | with Boost 'Temperature controlled' |

Wiring diagram CR24-B3

AC 24 V

External temperatur sensor

setpoint shift

0...10V

EHO / St-By / **Boost**

ao3 ao2 ao1 U5¹ U5²

1	2	9	10	11	6	7	8		3		4	12		5	
									ai/di1		di2	di3		ai2	CR24-B3

| 1 | 2 | | 3 | 5 | VAV 1 |
| | ~ | | y | U5 | |

2) 1)

| 1 | 2 | | 3 | 5 | VAV 2 |
| | ~ | | y | U5 | |

1) Master-Slave   or
2) parallel

Mode setting VAV-controller: 2...10V

In- & Output assignment

Inputs
- *ai/di1   EHO / ext. Sensor **
- *di2   Stand by **
- *di3   Boost*
- *ai2   Remote setpoint shift **

Outputs
- *ao1   VAV system output (0)2…10V*

* Optional

Note
The pin numbering corresponds to the Belimo actuator connections.

Refer to the CR24 Product-Information for technical data and detailed information.

Configuration, settings CR24-B3
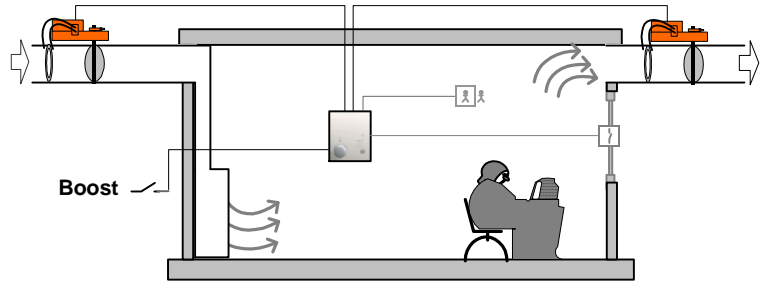
DIP-Switch setting:

1	P-Band:	**normal** - wide
2	V'max Hz:	**Off** - 80%
3	ao2:	**heating** - cooling/C-O
4	di3:	**Boost** - Dewpoint/C-O
5	Boost:	**Temp.** - V'max
6	controller:	**PI** - P

Setpoint W_H range:

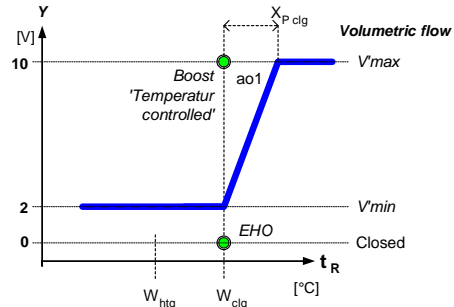15...36 °C

Description, functional diagram

Boost

The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric flow range V'min...V'max equals to: hygienic air change … maximum cooling demand.

Room preconditioning can be triggered via Boost input di3, e.g. via external timer, building management system.

Function '*Boost Temperature controlled*'
- ON: *di3* active   -> *VAV output ao1 10 V (V'max)*
- OFF: *di3* inactive   or   -> Auto operation
         comfort setpoint reached   -> Auto operation

Functional diagram

Y
[V]

$X_{P clg}$

Volumetric flow

10   *Boost 'Temperatur controlled'*   ao1   V'max

2   V'min

0   EHO   Closed

t_R
[°C]

W_{htg} W_{clg}

Hints
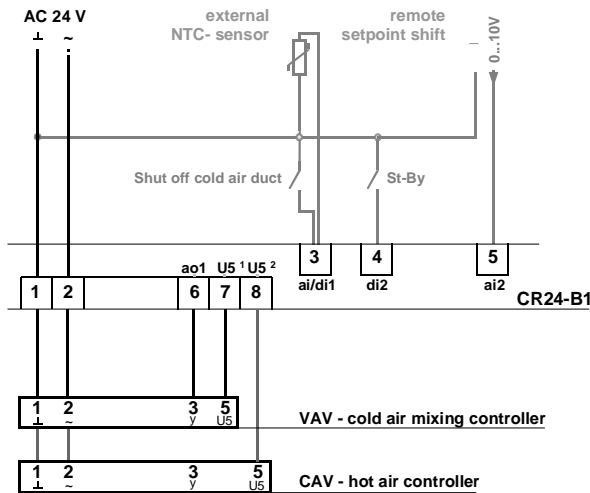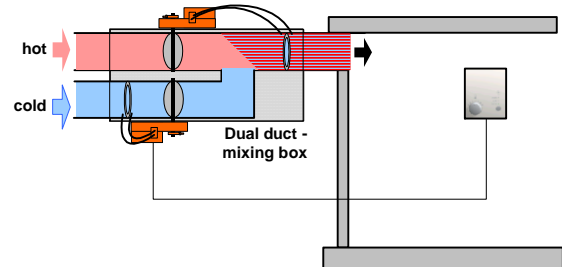Application requires VAV - controller mode setting: 2...10 V

Options

♦ di1 – *EHO* Energy hold off, e.g. window switch, ext. timeswitch

♦ di2 – *Stand by*, e.g. motion detector

♦ ai1 – external temperature sensing – exhaust duct

♦ ai2 – external setpoint shift, e.g. So/Wi-compensation

Operations - MMI

| CR24-A3 | without user interface | Mode: *AUTO* |
| CR24-B3 | with user interface | Mode: *AUTO-ECO-MAX* |

Subject to changes

VAV-System, pressure independent

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VAV – Dual duct application with room temperature controller

Wiring diagram CR24-B1

AC 24 V

external NTC- sensor

remote setpoint shift

0...10V

Shut off cold air duct

St-By

ao1	U5 [1]	U5 [2]	3	4	5
1	2		6	7	8	ai/di1	di2	ai2	CR24-B1

1	2		3	5
⊥	~		y	U5

VAV - cold air mixing controller

1	2		3	5
⊥	~		y	U5

CAV - hot air controller

Mode setting VAV-controller: 2...10V

In- & Output assignment

Inputs
- ai/di1   ext. Sensor * / Shut-off cold air duct *
- di2   St-By Stand by *
- ai2   Remote setpoint shift *

Outputs
- **ao1   VAV system output (0)2…10V**

 * Optional

Note
The pin numbering corresponds to the Belimo actuator connections

Refer to the CR24 Product-Information for technical data and detailed information.

Description, functional diagram

Dual duct - mixing box

The cold and the hot air supplied by the dual duct system get mixed by the two volume controller according to the required room demand.

The hot air constant volume (CAV) controller is supporting the required hot air for the heating condition. At cooling demand the cold air (VAV) controller adds the cold air part as required by the CR24 room temperature controller. In case the cold air parts exceeds the hot air part, the hot air damper gets closed and the cold air suppy is in work only.

Option:
The cold air duct can be shut-off by the use of a switch contact connected to input di1.

Functional diagram

Hints
Application requires VAV - controller mode setting: 2...10 V

Configuration, settings CR24-B1

DIP-Switch setting:

1 P-Band: **normal** - wide
2 di2: **Stand by** - Change over
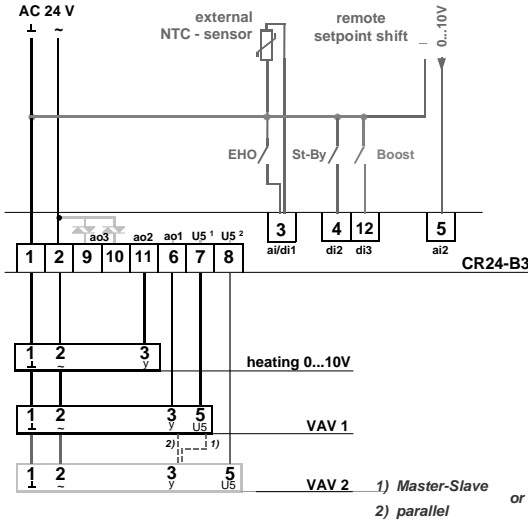
Setpoint W_H range:

15...36 °C

Options

♦ di1 – Shot off cold air duct, e.g. ext. time switch

♦ di2 – *Stand by*, e.g. motion detector

♦ ai1 – external temperature sensing – exhaust duct

♦ ai2 – external setpoint shift, e.g. So/Wi-compensation

Operations - MMI

CR24-A1   without user interface   Mode: *AUTO*
CR24-B1   with user interface   Mode: *AUTO-ECO-MAX*

VAV-System, pressure independent

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IRC-VAV-0015.0

VAV – single duct application with 0...10V reheater valve

Wiring diagram CR24-B3

Hint: Mode setting VAV controller: 2...10V

In- & Output assignment

Inputs
- ai/di1   EHO / ext. Sensor *
- di2   Stand by *
- di3   Boost *
- ai2   Remote setpoint shift *

Outputs
- ao1   **VAV system output (0)2…10V**
- ao3   **Heating output 3-point**

 * Optional

Note
The pin numbering corresponds to the Belimo actuator connections.

Refer to the CR24 Product-Information for technical data and detailed information.

Description, functional diagram

The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range V'min...V'max equals to: - V'min - to the hygienic air change
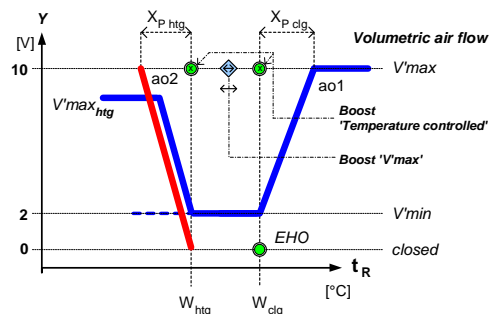- V'max - to the maximum cooling demand.

The reheater gets controlled via the connected 0…10 V valve at heating request. To ensure the required airflow over the reheater the volumetric air flow gets controlled V'min.... 80% V'max during that condition.

Option:
Digital input *di3* driven by a Boost signal allows the preconditioning of the room. Two Boost modes can be used:
- *Boost – 'Temperature controlled'*: quick-heating and/or, -cooling
- *Boost – V'max:* room flush, support smoke extraction

Functional diagram

Hints
- Application requires VAV - controller mode setting: 2...10 V
- Heating output ao2: 0...10 V

Configuration, settings CR24-B3

DIP-Switch setting:

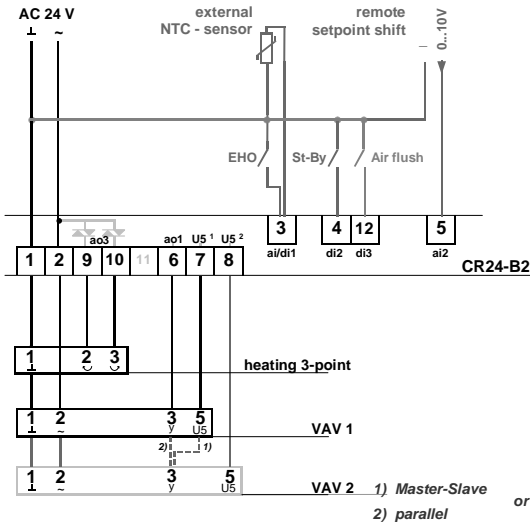|			
1	P-Band:	**normal**	- wide
2	V'max Hz:	Off -	**80%**
3	ao2:	**heating**	- cooling/C-O
4	di3:	**Boost**	- Dewpoint/C-O
5	Boost:	**Temp.**	- V'max
6	controller:	**PI**	- P

Setpoint W_H range:

15...36 °C

Options

♦ di1 – *EHO* Energy hold off, e.g. window switch, ext. time switch

♦ di2 – *Stand by*, e.g. motion detector

♦ di3 – *Boost*, e.g. BMS, ext. time switch

♦ ai1 – external temperature sensing – exhaust duct

♦ ai2 – external setpoint shift, e.g. So/Wi-compensation

Operations - MMI

CR24-A3   without user interface   Mode: *AUTO*
CR24-B3   with user interface   Mode: *AUTO-ECO-MAX*

Subject to changes

IRC-VAV-0015.1

VAV - single duct application
with 3-point reheater valve

Wiring diagram CR24-B2

AC 24 V ⊥ ~   external NTC - sensor   remote setpoint shift   0...10V

EHO   St-By   Air flush

ao3   ao1   U5¹   U5²

| 1 | 2 | 9 | 10 | 11 | 6 | 7 | 8 | 3 ai/di1 | 4 di2 | 12 di3 | 5 ai2 | CR24-B2 |

heating 3-point

VAV 1   2) parallel   1) Master-Slave

VAV 2   1) Master-Slave   2) parallel   or

Hint: Mode setting VAV-controller: 2...10V

In- & Output assignment

Inputs
- *ai/di1 EHO / ext. Sensor **
- *di2 Stand by **
- *di3 Air flush **
- *ai2 Remote setpoint shift **

Outputs
- *ao1 VAV system output (0)2…10V*
- *ao3 Heating output 3-point*

 * Optional

Note
The pin numbering corresponds to the Belimo actuator connections.

Refer to the CR24 Product-Information for technical data and detailed information.

Description, functional diagram

Air flush

The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range V'min...V'max equals to: - V'min - to the hygienic air change
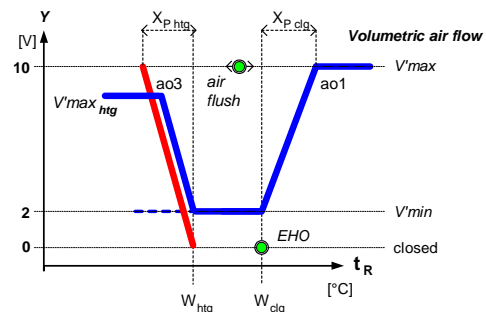   - V'max - to the maximum cooling demand.
A reheater gets activated via the connected 3-point valve at heating request. To ensure the required airflow over the reheater the volumetric air flow gets controlled V'min.... 80% V'max during that condition.

Option:
The VAV-application can be forced to the 'V'max' step by the use of the digital input *di3*. Typical use air flush via an independent air quality control loop, support of smoke extraction, etc. The heating output does not get influenced during that condtion.

Functional diagram

Hints
- Application requires VAV - controller mode setting: 2...10 V
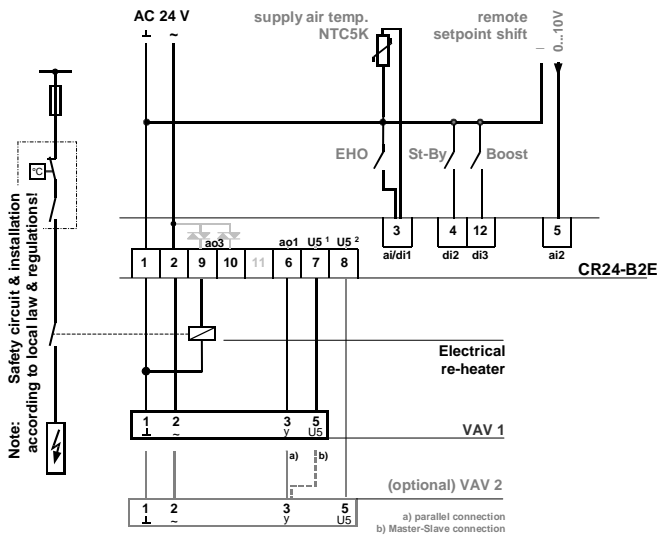- Heating output ao3: 3-point actuator, optimized for 150 s running time

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Configuration, settings CR24-B2

DIP-Switch setting:

1 P-Band: **_normal_** - wide
2 V'max htg   Off - **_80%_**

Setpoint W_H range:

15...36 °C

Options

♦ di1 – *EHO* Energy hold off, e.g. window switch, ext. time switch

♦ di2 – *Stand by*, e.g. motion detector

♦ di3 – *Air flush*, e.g. air quality control, ext. time switch

♦ ai1 – external temperature sensing – exhaust duct

♦ ai2 – external setpoint shift, e.g. So/Wi-compensation

Operations - MMI

| CR24-A2 | without user interface | Mode: | *AUTO* |
| CR24-B2 | with user interface | Mode: | *AUTO-ECO-MAX* |

VAV-System, pressure independent

BELIMO

IRC-VAV-0016.0

VAV – single duct application with 1-stage electrical reheater

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Wiring diagram CR24-B2E

In- & Output assignment

Inputs
- ai/di1   supply air limitation * / EHO *
- di2   Stand by *
- di3   Boost *
- ai2   Remote setpoint shift *

Outputs
- ao1   VAV system output (0)2…10V
- do3/1 Heating output 24 VAC ON/OFF

* Optional

Note
The pin numbering corresponds to the Belimo actuator connections.

Refer to the CR24 Product Information and the data sheet CR24-B2E for technical data and detailed information..

Configuration, settings CR24-B2E

DIP-Switch setting:

1 Steps: **1 or 2** - binary
2 V'max Htg: Off - **80%**

Setpoint W_H range:

15...36 °C

Description, functional diagram

The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range V'min...V'max:
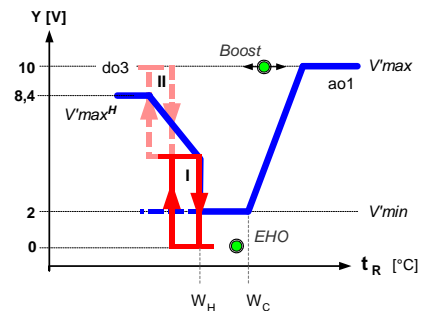- V'min - to the hygienic air change
- V'max - to the maximum cooling demand.

At heating conditions the reheater gets controlled via the ON/OFF Triac-output. The volumetric flow gets increased 35 ... 80% V'max to ensure the thermal transfer.

Options:
By the use of an external sensor mounted in the supply duct the air injection temperature can be limited to a maximum of about 50°C.

Functional diagram

Hints
- Application requires VAV - controller mode setting: 2...10 V

Options

♦ di1 – *EHO* Energy hold off, e.g. window switch, ext. time switch

♦ di2 – *Stand by*, e.g. motion detector

♦ di3 – *Boost*, e.g. BMS, ext. time switch

♦ ai1 – Supply air limitation, NTC5k sensor
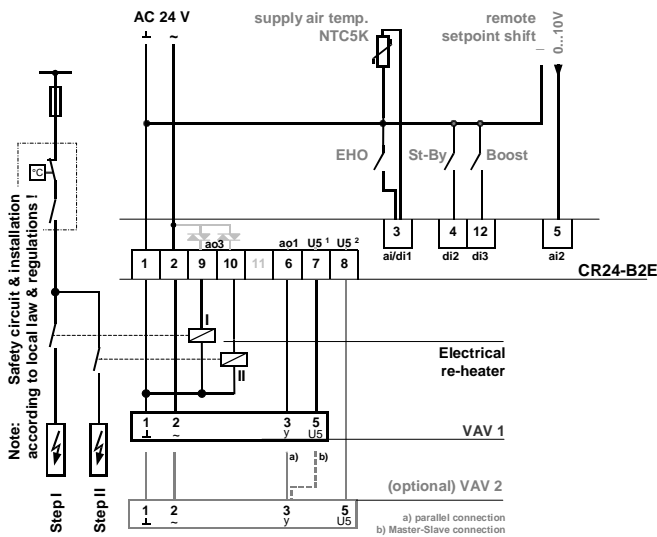
♦ ai2 – external setpoint shift, e.g. So/Wi-compensation

Operations - MMI

CR24-A2E without user interface   Mode: *AUTO*
CR24-B2E with user interface   Mode: *AUTO-ECO-MAX*

V1.1   6.05 Trk   *A4-VAV-0016-0C3-0de*

IRC-VAV-0016.1	VAV – single duct application with 2-stage electrical reheater

Wiring diagram CR24-B2E

AC 24 V — supply air temp. NTC5K — remote setpoint shift 0...10V

EHO — St-By — Boost

Note: Safety circuit & installation according to local law & regulations !

Step I — Step II

CR24-B2E

Electrical re-heater

VAV 1

(optional) VAV 2

a) parallel connection
b) Master-Slave connection

In- & Output assignment

Inputs
- ai/di1 supply air limitation * / EHO *
- di2 Stand by *
- di3 Boost *
- ai2 Remote setpoint shift *

Outputs
- ao1 VAV system output (0)2…10V
- do3/1 Heating output I 24 VAC ON/OFF
- do3/2 Heating output II 24 VAC ON/OFF

* Optional

Note
The pin numbering corresponds to the Belimo actuator connections.

Refer to the CR24 Product-Information and the data sheet CR24-B2E for technical data and detailed information..

Description, functional diagram

The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range V'min...V'max:
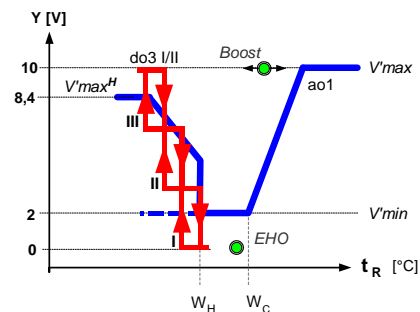- V'min - to the hygienic air change
- V'max - to the maximum cooling demand.

At heating conditions the 2-step re-heater gets controlled via the two ON/OFF Triac-outputs in a binary mode which gives an almost modulating control mode. The volumetric flow gets increased 35 ... 80% V'max to ensure the thermal transfer.

Options:
By the use of an external sensor mounted in the supply duct the air injection temperature can be limited to a maximum of about 50°C.

Functional diagram

Hints
- Application requires VAV - controller mode setting: 2...10 V

Configuration, settings CR24-B2E

DIP-Switch setting:

1 Steps: 1 or 2 - **binary**
2 V'max Htg: Off - **80%**

Setpoint W_H range:

15...36 °C

Options

♦ di1 – *EHO* Energy hold off, e.g. window switch, ext. time switch

♦ di2 – *Stand by*, e.g. motion detector

♦ di3 – *Boost*, e.g. BMS, ext. time switch

♦ ai1 – Supply air limitation, NTC5k sensor
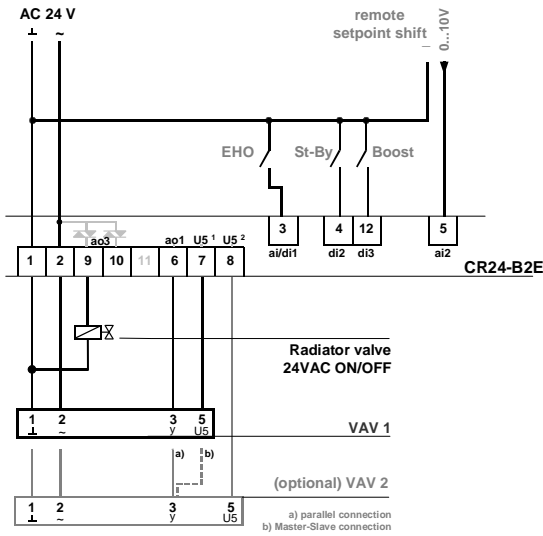
♦ ai2 – external setpoint shift, e.g. So/Wi-compensation

Operations - MMI

CR24-A2E without user interface   Mode: *AUTO*
CR24-B2E with user interface   Mode: *AUTO-ECO-MAX*

VAV-System, pressure independent

BELIMO®

IRC-VAV-0018.0	*VAV- single duct application with radiator heating ON/OFF*

Wiring diagram CR24-B2E

AC 24 V

remote setpoint shift 0...10V

EHO   St-By   Boost

ao3   ao1 U5¹ U5²

| 1 | 2 | 9 | 10 | 11 | 6 | 7 | 8 | 3 | 4 | 12 | 5 |

ai/di1   di2 di3   ai2

CR24-B2E

Radiator valve 24VAC ON/OFF

1	2		3	5
⊥	~		y	U5

VAV 1

(optional) VAV 2

1	2		3	5
⊥	~		y	U5

a) parallel connection
b) Master-Slave connection

In- & Output assignment

Inputs
- di1   EHO *
- di2   Stand by *
- di3   Boost *
- ai2   Remote setpoint shift *

Outputs
- ao1   VAV system output (0)2…10V
- do3/1 Heating output   24 VAC ON/OFF

* Optional

Note
The pin numbering corresponds to the Belimo actuator connections.

Refer to the CR24 Product-Information and the data sheet CR24-B2E for technical data and detailed information.

Description, functional diagram

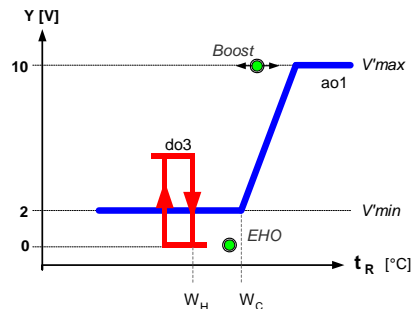The room temperature aims as the demand related control value of the connected VAV units. The variable volumetric air flow range V'min...V'max:
 - V'min - to the hygienic air change
 - V'max - to the maximum cooling demand.

At heating conditions the ON/OFF radiator valve gets controlled via the CR24 Triac-output.

Functional diagram

Y [V]

Boost

10   V'max ao1

do3

2   V'min

0   EHO

t R [°C]

W_H   W_C

Hints
- Application requires VAV - controller mode setting: 2...10 V

Configuration, settings CR24-B2E

DIP-Switch setting:

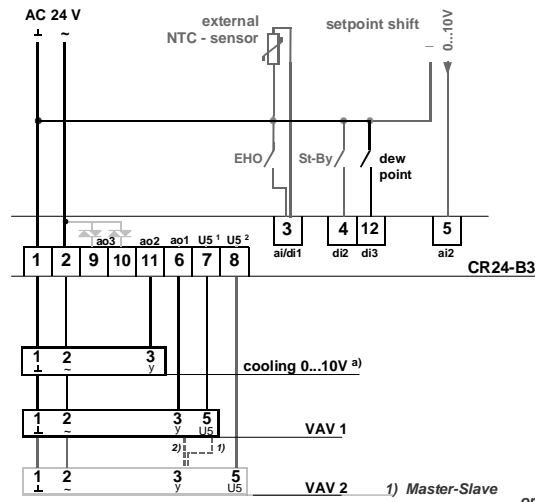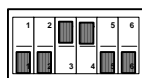|				
1	Steps:	**1 or 2**	-	binary
2	V'max Htg:	**Off**	-	80%

Setpoint W_H range:

15...36 °C

Options

♦ di1 – *EHO* Energy hold off, e.g. window switch, ext. time switch

♦ di2 – *Stand by*, e.g. motion detector

♦ di3 – *Boost*, e.g. BMS, ext. time switch

♦ ai2 – external setpoint shift, e.g. So/Wi-compensation

Operations - MMI

CR24-A2E without user interface   Mode: *AUTO*
CR24-B2E with user interface   Mode: *AUTO-ECO-MAX*

Subject to changes

VAV-System, pressure independent

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IRC-VAV-0111.1 | VAV - single duct application with Chilled ceiling

---

Wiring diagram CR24-B3

AC 24 V

external NTC - sensor   setpoint shift   0...10V

EHO   St-By   dew point

| 1 | 2 | 9 | 10 | 11 | 6 | 7 | 8 | | 3 | | 4 | 12 | | 5 |
| | | ao3 | | ao2 | ao1 | U5¹ | U5² | | ai/di1 | | di2 | di3 | | ai2 |

CR24-B3

cooling 0...10V a)

VAV 1

VAV 2

1) **Master-Slave** or
2) **parallel**

Mode setting VAV controller: 2...10V a)

a) control signal input needs to be adjusted in case of unit sequencing

Function Dew point control: / **cooling** / **Dew point undershot**

In- & Output assignment

Inputs
- ai/di1   EHO / ext. Sensor *
- di2   Stand by *
- di3   **Dew point control**
- ai2   Remote setpoint shift *

Outputs
- ao1   VAV system output (0)2…10V
- ao3   Cooling output 0….10V

* Optional

Note
The pin numbering corresponds to the Belimo actuator connections.

Refer to the CR24 Product-Information for technical data and detailed information.
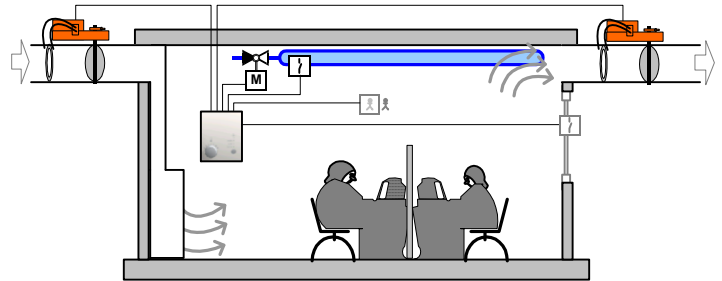

Configuration, settings CR24-B3

DIP-Switch setting:

1	P-Band:	**normal** - wide
2	V'max Hz:	**Off** - 80%
3	ao2: heating -	**cooling/C-O**
4	di3: Boost -	**Dewpoint/C-O**
5	Boost:	**Temp.** - V'max
6	controller:	**PI** - P

Setpoint W H range:

15...36 °C

Description, functional diagram

The room temperature aims as the demand related control value of the connected VAV units and chilled ceiling. The variable volumetric air flow range V'min...V'max equals to: hygienic air change … maximum cooling demand.
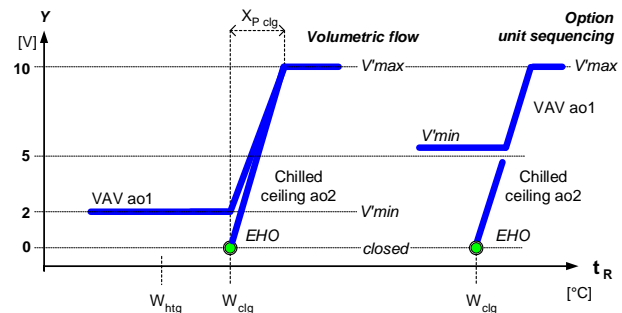
Option – unit sequencing:
The two cooling units can also be used in control sequencing:
  Unit 1 - Chilled ceiling: 0 … 5 V (MFT-actuator)
  Unit 2 - VAV: 5 …10 V (MFT-controller. E.g. NMV-D2M)

Functional diagram

Hints
- Application requires VAV - controller mode setting: 2...10 V
- Cooling output 0 … 10 V

By the use of the control sequencing option the control input of the MFT-actuators need to be adjusted (PC-Tool or MFT-Handy)

Options

♦ di1 – *EHO* Energy hold off, e.g. window switch, ext. time switch

♦ di2 – *Stand by*, e.g. motion detector

♦ ai1 – external temperature sensing – exhaust duct

♦ ai2 – external setpoint shift, e.g. So/Wi-compensation

Operations - MMI

CR24-A3   without user interface   Mode: *AUTO*
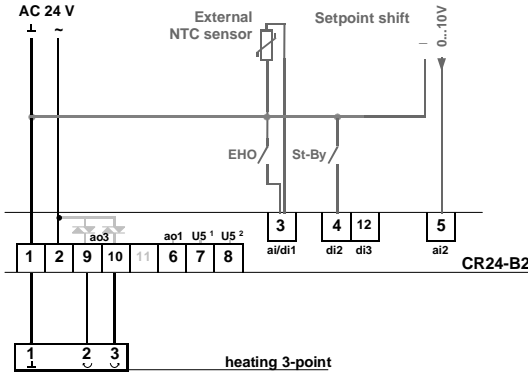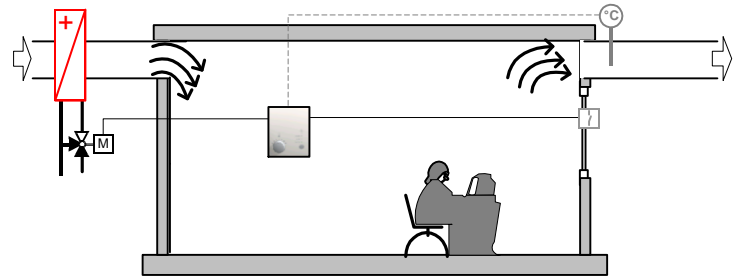CR24-B3   with user interface   Mode: *AUTO-ECO-MAX*

Subject to changes

Water applications

Application	Description	CR24 Type
IRC-WAT-0011.0	2-pipe system with 3-point reheater valve, Room temperature controlled	CR24-B2
IRC-WAT-0015.0	2-pipe system Heat exchanger, with Change/Over function	CR24-B1

Subject of changes

5.04 Trk

Water application

BELIMO

Wiring diagram CR24-B2

In- & Output assignment

Inputs
- ai/di1   EHO / ext. Sensor *
- di2   St-By Standby *
- ai2   Remote setpoint shift *

Outputs
- ao1   Heating valve 3-point

 * Optional

Note
The pin numbering corresponds to the Belimo actuator connections.

Refer to the CR24 Product-Information for technical data and detailed information.

Description, functional diagram

Energy demand controlled reheater application, based on the room temperature.

Functional diagram

Hint
Heating output ao3: 3-point actuator, optimized for 150s running time

Configuration, settings CR24-B2

DIP-Switch setting:

1 P-Band: __normal__ - wide
2 V'max htg   __Off__ - 80%

Setpoint W_H range:

15...36 °C

Options

♦ di1 – *EHO* Energy hold off, e.g. window switch, ext. timeswitch

♦ ai1 – external temperature sensing – exhaust duct

♦ ai2 – external setpoint shift, e.g. So/Wi-compensation
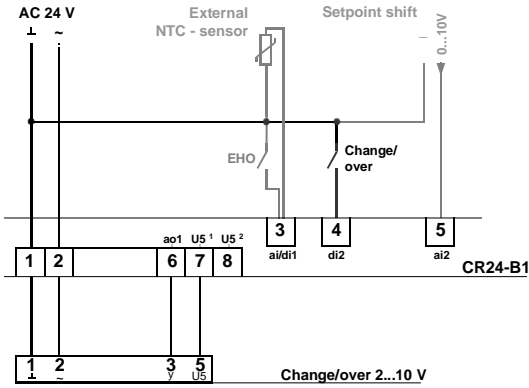
Operations - MMI

CR24-A2   without user interface   Mode: *AUTO*
CR24-B2   with user interface   Mode: *AUTO-ECO-MAX*

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IRC-WAT-0015.0   *2-pipe Heat exchanger with Change/Over function*

Wiring diagram CR24-B1

AC 24 V   External NTC - sensor   Setpoint shift   0...10V

EHO   Change/over

| 1 | 2 | | 6 | 7 | 8 | 3 ai/di1 | 4 di2 | 5 ai2 | CR24-B1 |

ao1   U5¹   U5²

| 1 | 2 | | 3 | 5 | Change/over 2...10 V |
| ⊥ | ~ | | Y | U5 | |

In- & Output assignment

Inputs
- *ai/di1*   *EHO / ext. Sensor ***
- *di2*   *Change/over signal*
- *ai2*   *Remote setpoint shift ***

Outputs
- *ao1*   *Change/over actuator 2…10V*

* Optional

Note
The pin numbering corresponds to the Belimo actuator connections.

Refer to the CR24 Product-Information for technical data and detailed information.

Description, functional diagram

Change-Over

2-pipe demand controlled application supporting Change/over operation. Heating <–> cooling switching action via a dry contact depending e.g. on the flow temperature of the supply system.

Functional diagram

$X_{P\,htg}$ $X_{P\,clg}$

heating   C-O   cooling

W_{htg} W_{clg} t_R [°C]

Hint
Actuator setting: 2...10 V

Configuration, settings CR24-B1

DIP-Switch setting:

   1   P-Band: <u>*normal*</u> - wide
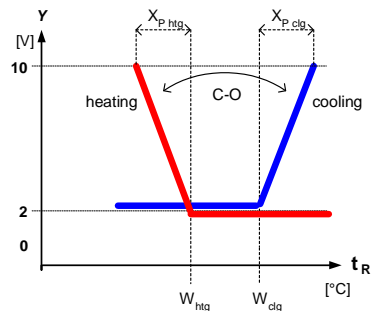   **2**   di2:   Stand by - <u>**Change over**</u>

Setpoint W_H range:

      15...36 °C

Options

♦ di1 – *EHO* Energy hold off, e.g. window switch, ext. timeswitch

♦ ai1 – external temperature sensing – exhaust duct

♦ ai2 – external setpoint shift, e.g. So/Wi-compensation
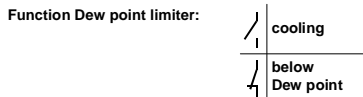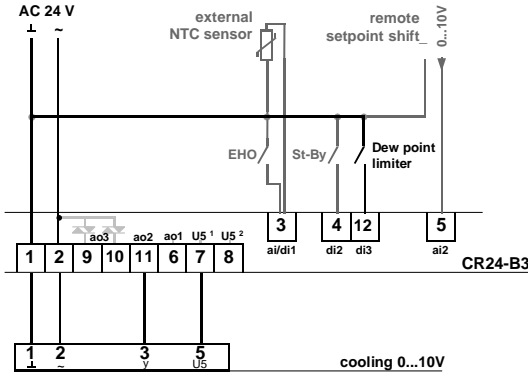
Operations - MMI

CR24-A1   without user interface   Mode: *AUTO*
CR24-B1   with user interface   Mode: *AUTO-ECO-MAX*

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Heat-/Chilled Ceiling-Systems

Application	Description	CR24 Type
IRC-CLC-0011.0	Chilled ceiling - 2-pipe-system, Room temperature controlled	CR24-B3
IRC-CLC-0015.0	Heat-/Chilled ceiling - 2-pipe-system, with Change-over function	CR24-B3

Heat-/Chilled ceiling system

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IRC-CLC-0011.0	Chilled ceiling - 2-pipe-system
	Room temperature controlled

Wiring diagram CR24-B3

AC 24 V

external NTC sensor

remote setpoint shift

0...10V

EHO St-By

Dew point limiter

ao3 ao2 ao1 U5¹ U5²

1	2	9	10	11	6	7	8	3	4	12	5

ai/di1 di2 di3 ai2

CR24-B3

1	2	3	5

U5

cooling 0...10V

Function Dew point limiter:

cooling

below Dew point

In- & Output assignment

Inputs
- ai/di1   EHO / ext. Sensor *
- di2   Stand by *
- di3   Dew point limiter
- ai2   Remote setpoint shift *

Outputs
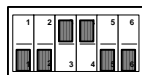- ao2   Cooling output 0...10V

 * Optional

Note
The pin numbering corresponds to the Belimo actuator connections.

Refer to the CR24 Product-Information for technical data and detailed information.

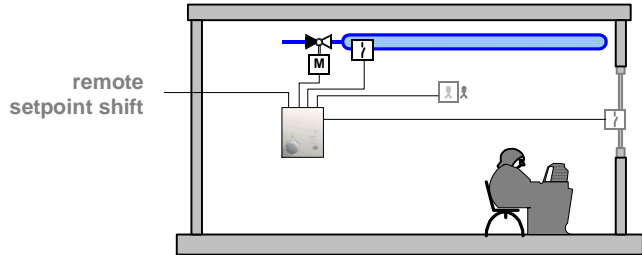## Configuration, settings CR24-B3

DIP-Switch setting:

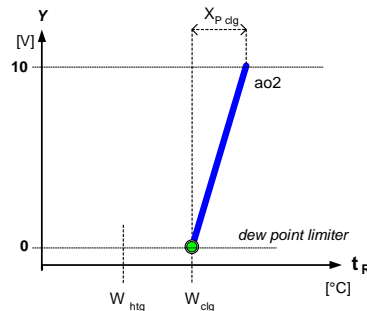| 1	P-Band:	**normal**	- wide
2	V'max Hz:	**Off**	- 80%
3	ao2:	**heating**	- cooling/C-O
4	di3:	**Boost**	- Dewpoint/C-O
5	Boost:	**Temp.**	- V'max
6	controller:	**PI**	- P

Setpoint W_H range:

15...36 °C

Description, functional diagram

remote setpoint shift

The Chilled ceiling application existing of a room temperature controller and a 0...10 V cooling valve. The dew point limiter cares for perspiration water free operation as it switches of the cooling by a 2-point signal.

Functional diagram

Y
[V]

10

$X_{P\,clg}$

ao2

0

dew point limiter

t_R
[°C]

W_{htg} W_{clg}
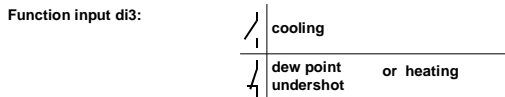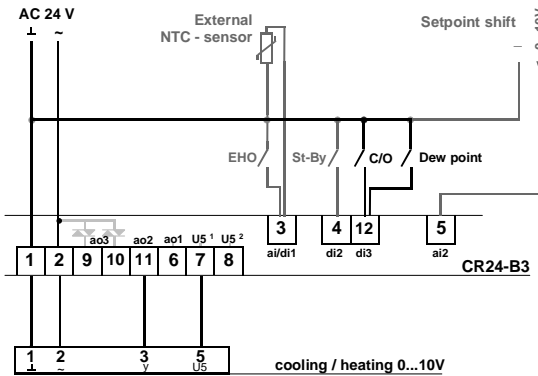
Hint
- Cooling output ao2: 0...10 V

Options

♦ di1 – *EHO* Energy hold off, e.g. window switch, ext. time switch

♦ di2 – *Stand by*, e.g. motion detector

♦ ai1 – external temperature sensing – exhaust duct

♦ ai2 – external setpoint shift, e.g. So/Wi-compensation

Operations - MMI

CR24-A3	without user interface	Mode: *AUTO*
CR24-B3	with user interface	Mode: *AUTO-ECO-MAX*

Subject to changes

Heat-/Chilled ceiling system

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Wiring diagram CR24-B3

AC 24 V · External NTC - sensor · Setpoint shift · 0...10V

EHO · St-By · C/O · Dew point

ao3 · ao2 · ao1 · U5 ¹ · U5 ²

| 1 | 2 | 9 | 10 | 11 | 6 | 7 | 8 | 3 | 4 | 12 | 5 |
ai/di1 · di2 · di3 · ai2 · CR24-B3

| 1 | 2 | | 3 | 5 |
cooling / heating 0...10V

Function input di3:

cooling

dew point undershot　or heating

In- & Output assignment

Inputs
- *ai/di1*　*EHO / ext. Sensor **
- *di2*　　*Stand by **
- *di3*　　*Dew point limiter / Change/over*
- *ai2*　　*Remote setpoint shift **

Outputs
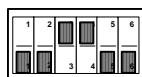- *ao2*　　*Cooling/Heating 0...10V*

* Optional

Note
The pin numbering corresponds to the Belimo actuator connections.

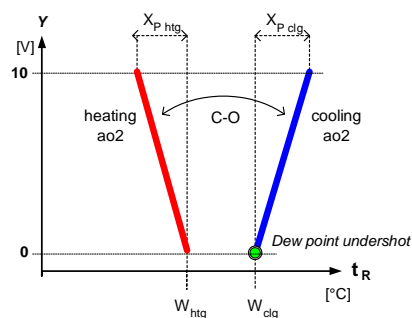Refer to the CR24 Product-Information for technical data and detailed information.

Description, functional diagram

Change-over

This water ceiling system can be used to cover heating and cooling demand due to the build-in Change/over function of the room temperature controller controlling the common 0...10 V valve. Change/over gets activated by an external command wired to digital input *di3*. The dew point limiter cares for perspiration water free operation as it switches off the cooling via a 2-point signal.
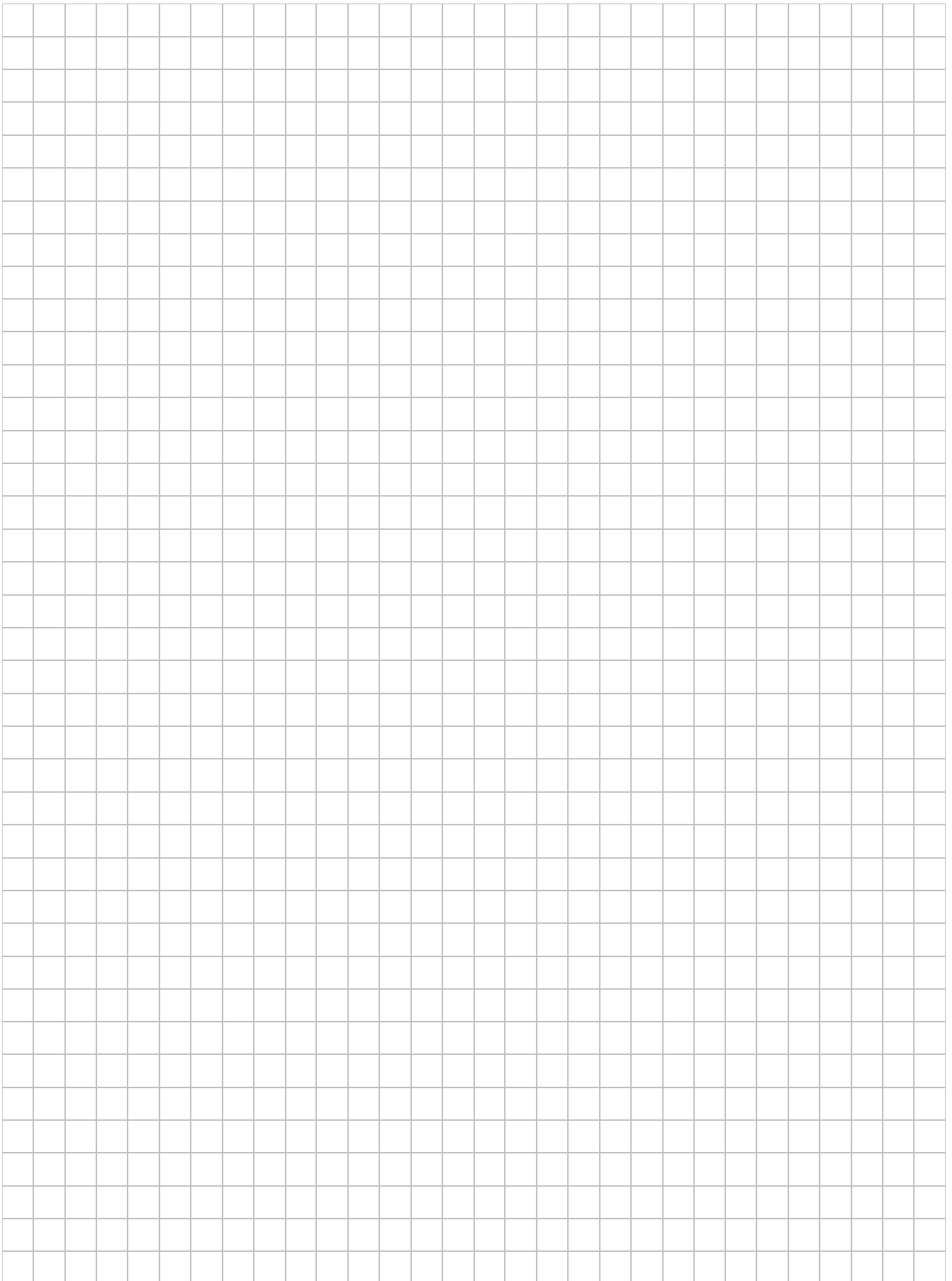
Functional diagram

Y [V], X_P htg, X_P clg, heating ao2, C-O, cooling ao2, Dew point undershot, t_R [°C], W_htg, W_clg

Hint
- Cooling output ao2: 0...10 V

Configuration, settings CR24-B3

DIP-Switch setting:

		normal	wide
1	P-Band:	**_normal_**	- wide
2	V'max Hz:	**_Off_**	- 80%
3	ao2:	**_heating_**	- cooling/C-O
4	di3:	**_Boost_**	- Dewpoint/C-O
5	Boost:	**_Temp._**	- V'max
6	controller:	**_PI_**	- P

Setpoint W_H range:

15...36 °C

Options

♦ di1 – *EHO* Energy hold off, e.g. window switch, ext. timeswitch

♦ di2 – *Stand by*, e.g. motion detector

♦ ai1 – external temperature sensing – exhaust duct

♦ ai2 – external setpoint shift, e.g. So/Wi-compensation

Operations - MMI

| CR24-A3 | without user interface | Mode: *AUTO* |
| CR24-B3 | with user interface | Mode: *AUTO-ECO-MAX* |

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