# Supply and extract VAV with integrated damper actuator, heating and cooling coil on triac output

DXR2..10PL..

- Supply & extract air volume control with integrated damper actuator (10 Nm)
- Room temperature control
- Air quality control
- Room temperature and rapid ventilation operation via KNX PL-Link room operator unit with temperature, air quality & relative humidity measurement

Plant diagram
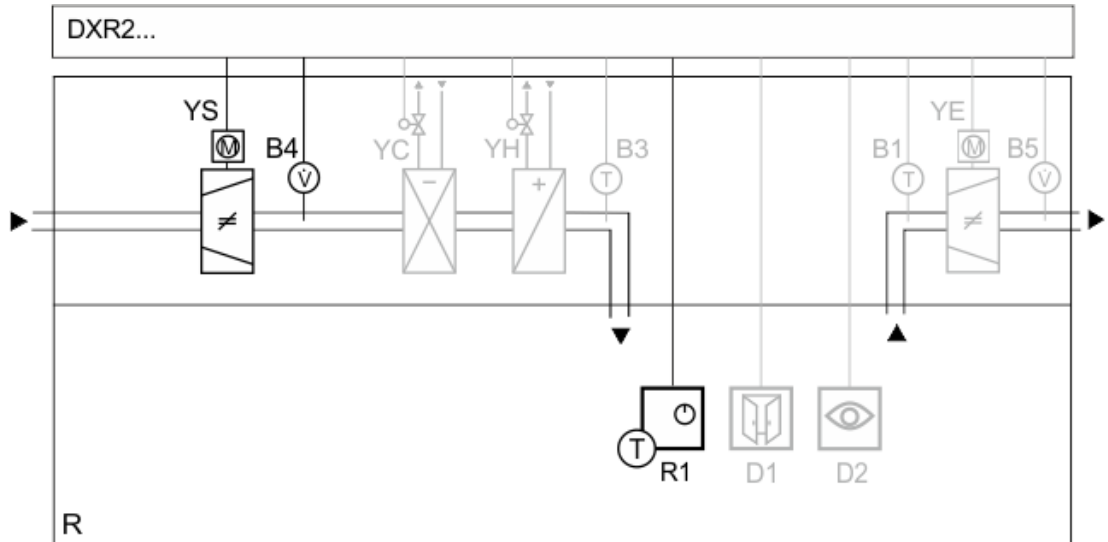
DXR2…	Room automation station	R	Room
B1	Extract air temperature sensor	R1	Room operator unit with
B3	Supply air temperature sensor		temperature sensor
B4	Differential pressure sensor (supply air – integrated of DXR2)	YC	Cooling coil valve
B5	Differential pressure sensor (extract air)	YE	Extract air control
D1	Window contact	YH	Heating coil valve
D2	Presence detector	YS	Supply air control (integrated of DXR2)

Function diagrams

Heating and cooling valve
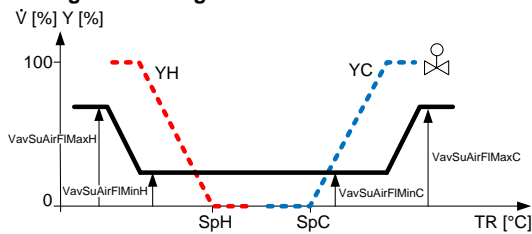
Air flow

SpC	Effective cooling setpoint
SpH	Effective heating setpoint
TR	Room temperature
V	Volume flow rate
VavSuAflMinVent	Min. air flow ventilation
VavSuAirFlMaxC	Max. volume, cooling
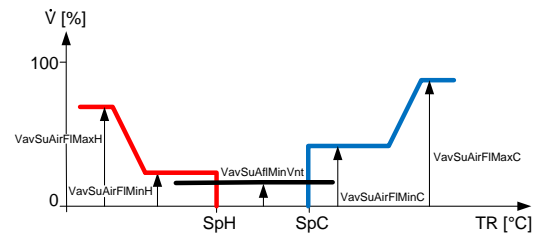
VavSuAirFlMaxH	Max. volume, heating
VavSuAirFlMinC	Min. volume, cooling
VavSuAirFlMinH	Min. volume, heating
Y	Output signal
YC	Cooling valve
YH	Heating valve

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Supply and extract VAV with integrated damper actuator, heating and cooling coil on triac output

Description of functions	

Basic functions

- PID control for supply VAV, temperature and air quality.
- Supply air differential pressure control sensor integrated in controller.
- Internal air flow controller controls supply air damper actuator 0…10 V.
- The temperature and air quality (CO_2) is measured in the room operator unit.
- The application allows customers to adjust the room temperature setpoints and rapid ventilation via the room operator unit.
- Display of room air quality on room unit.
- The operating modes are Comfort, Pre-Comfort, Economy and Protection.
- The air flow for heating and cooling is operated in sequence to the valves. Parallel operation can be configured.

Options

- Extract air differential pressure sensor 0…10 V.
- Heating and cooling coils with 3-position valves controlled by triac outputs.
- Optimal energy efficiency by including the option for room/supply air cascade control, presence detector or window contact.
- Optional system alarms displayed on the management station notify building operators of possible faults.
- Optional trends can be activated for room sensors.

Auxiliary functions

- Rapid ventilation.
- Air volume flow tracking for positive and negative room air pressure.
- Air supply functions to coordinate demand signals for pressure optimized fan control.
- Green Leaf (RoomOptiControl) function.
- Multisegment use of DXR2 automation stations with VAV application.
- The application allows for control via centralized commands (e.g. scheduler program for room operating mode).
- Central optimum start control provides best room comfort at the start of occupancy.
- Central operation or reset of setpoints, timed valve kick function or outside temperature dependent heating limit.
- Central override functions for valves.
- Seasonal compensation of room temperature setpoints.

Variants

- PWM constant (incl. spring return) or PWM thermal control can be selected for valves.
- Room operator unit and sensor variants:
  - KNX PL-Link wall-mount sensor
  - KNX PL-Link flush-mount room operator unit
  - KNX PL-Link flush-mount sensors
  - Analog extract air temperature sensor
- Presence can be detected by KNX PL-Link sensor or binary sensor.

Siemens devices	Legend	Type of unit	Data sheet	Product No.	Qty.
	DXR2…	Compact room automation station, BACnet/IP, 24 V, 1 DI, 2 UI, 1 AO, 4 triac, with integrated damper actuator and differential pressure sensor	A6V11259964	DXR2.M10PL-102B DXR2.M10PLX-102B	1
			A6V11259958	DXR2.E10PL-102B DXR2.E10PLX-102B	
	R1	KNX PL-Link room operator unit with sensors for temperature, humidity, CO_2, segmented backlit display, touchkeys	N1602	QMX3.P74	1

Optional [1]	Legend	Type of unit	Data sheet	Product No.	Qty.
	B1	Cable temperature sensor PVC 2 m, LG-Ni1000	N1831	QAP22	1
	B3	Cable temperature sensor PVC 2 m, LG-Ni1000	N1831	QAP22	1
	B5	Differential pressure sensor, AC 24 V, DC 0...10 V, 5 Nm, 150 s, 300 Pa	N1910-1	QBM2030-…	1
	D1	Door/window contact, white	[2]	S 290/11	[3]
	D2	KNX PL-Link presence detector with brightness sensor	[2]	UP 258D12	1 - 4
	YE	VAV compact controller, AC 24 V, DC 0...10 V, 5 Nm, 150 s, 300 Pa	N3544	GDB181.1E/3	1
	YC	2-port, 3-port valve or 3-port valves with bypass, PN16	N4847	V..P47..	1
		Motorized 3-positioning actuator for V..P47.., AC 24 V	N4864	SSP81..	1
	YH	2-port, 3-port valve or 3-port valves with bypass, PN16	N4847	V..P47..	1
		Motorized 3-positioning actuator for V..P47.., AC 24 V	N4864	SSP81..	1

[1] Can be combined according to available on-board I/Os on controller.
[2] Further documents on www.siemens.com/gamma-td.
[3] Type of operation (NO or NC). Multiple devices of the same type can be connected.

Variants	Legend	Type of unit	Data sheet	Product No.	Qty.
	R1$_a$	KNX PL-Link wall-mount room sensor for temperature	N1602	QMX3.P30	1
	R1$_b$	KNX PL-Link flush-mount room operator unit	N1601	QMX3.P36	1
	R1$_c$	KNX PL-Link flush-mount room sensors	N1411	AQR253… AQR257…	1
	YE$_a$	Rotary air damper actuator, AC 24 V, 3-position, 5 Nm, 150 s	N4634	GDB131.1E	1
	YC$_a$	2-port, 3-port valve or 3-port valves with bypass, PN16	N4847	V..P47..	1
		Thermal actuator, AC/DC 24 V, NO, 2P, 1 m	N4884	STP73	1
	YH$_a$	2-port, 3-port valve or 3-port valves with bypass, PN16	N4847	V..P47..	1
		Thermal actuator, AC/DC 24 V, NO, 2P, 1 m	N4884	STP73	1

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Connection diagram
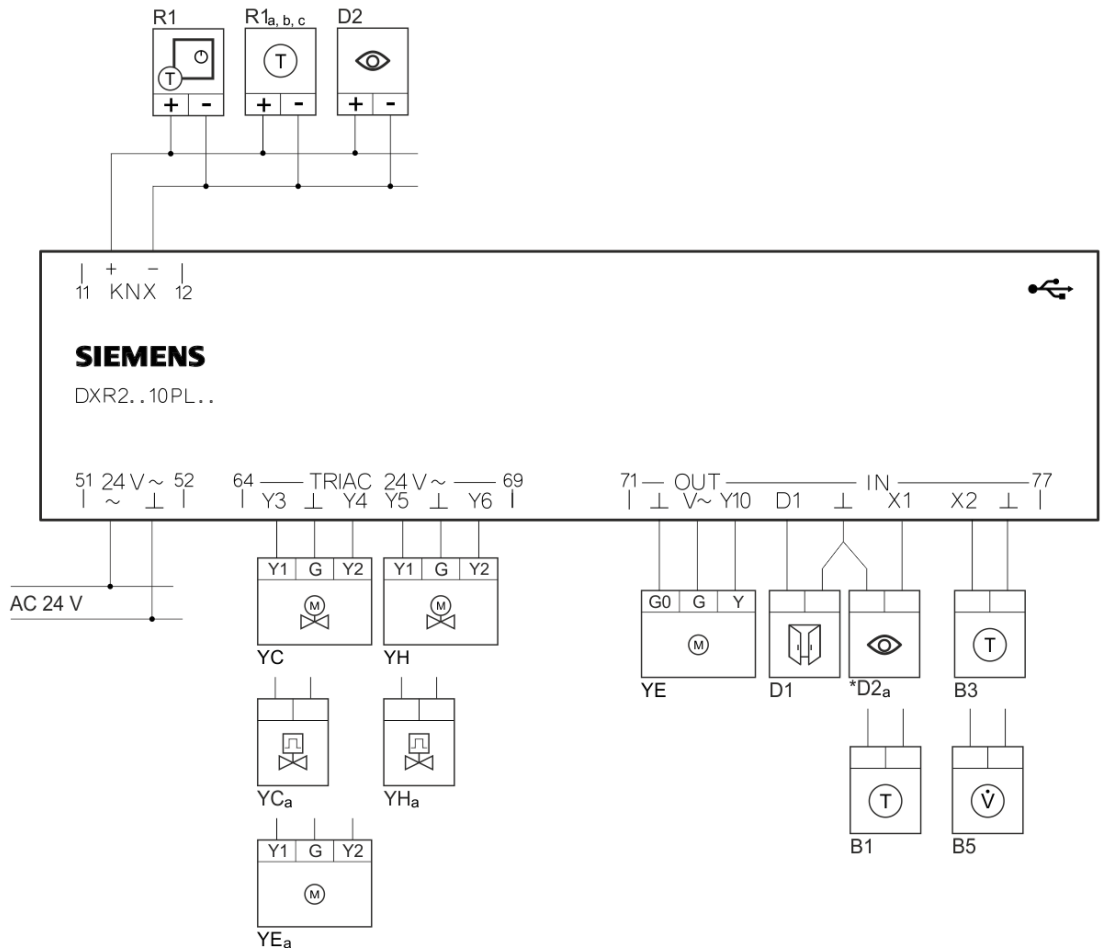
* 3rd party device

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Application configuration

	Equipment	Values/Range	Template settings
Integrated actuator	Supply air VAV position	Y1, Y2; 3-position Y10; 0...10 V Air volume flow; Y10; 0...10 V	Y1, Y2
On-board output	Supply air VAV differential air pressure	X1; 0...10 V X2; 0...10 V P1	P1
KNX PL-Link devices	Room operator unit device 1	QMX3.P02, QMX3.P34, QMX3.P36, QMX3.P37, QMX3.P74	QMX3.P74
HVAC	Supply air VAV	Supply air VAV 12, press, duct area, ctr. Supply air VAV 13, press, flow conv, ctr.	Supply air VAV 13, press, flow conv, ctr.

Optional configuration

	Equipment	Values/Range	Template settings
On-board output	Cooling coil valve position	Water; Y3, Y4; 3-position Water; Y3; Pulse width modulation thermal Water; Y3; Pulse width modulation spring return Water; Y10; 0..10 V	Water; Y3, Y4; 3-position
	Heating coil valve position	Water; Y5, Y6; 3-position Water; Y5; Pulse width modulation thermal Water; Y5; Pulse width modulation spring return Water; Y10; 0...10 V Electric 1-stage; Y5; Normally open Electric 2-stage; Y5, Y6; Normally open Electric modulating; Y5; Pulse width modulation constant period Electric modulating; Y10; 0...10 V	Water; Y5, Y6; 3-position
	Extract air VAV position	Y1, Y2; 3-position Y3, Y4; 3-position Y5, Y6; 3-position Y10; 0...10 V Air volume flow; Y10; 0...10 V	Y10; 0...10 V
	Extract air VAV differential air pressure	X1; 0...10 V X2; 0...10 V P1	X2; 0...10 V
On-board input	Room temperature (B1)		X1; LG-Ni1000
	Supply air temperature (B3)		X2; LG-Ni1000
	Presence detector 2 (D2a)		X1, Normally open
	Window contact (D1)		D1; Normally closed
KNX PL-Link devices	Sensor device 1…4 (D2)		UP 258D12
HVAC	Extract air VAV	Extract air VAV 12, press, duct area, ctr. Extract air VAV 13, press, flow conv, ctr.	Extract air VAV 13, press, flow conv, ctr.

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Default values

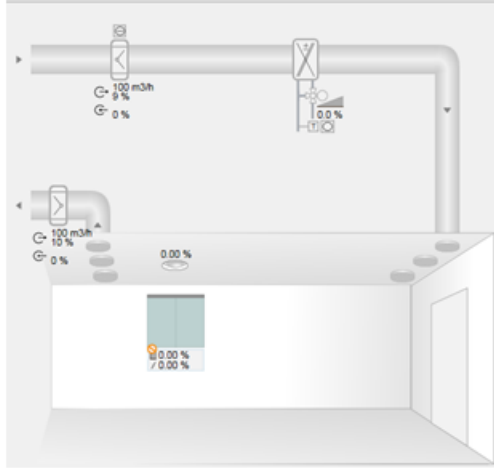|	Parameter	Values/Range	Template settings
Temperature setpoints	Cooling setpoint for Comfort	0 … 50 °C	24 °C
	Delta cooling setpoint for Pre-comfort	0 … 10 K	1 K
	Cooling setpoint for Economy	0 … 50 °C	35 °C
	Cooling setpoint for Protection	0 … 50 °C	40 °C
	Heating setpoint for Comfort	0 … 50 °C	21 °C
	Delta heating setpoint for Pre-comfort	0 … 10 K	1 K
	Heating setpoint for Economy	0 … 50 °C	15 °C
	Heating setpoint for Protection	0 … 50 °C	12 °C
Ventilation Control	Setpoint room air quality for comfort	0 … 2000 ppm	900 ppm
	Setp. room air quality for pre-comfort	0 … 2000 ppm	1100 ppm
	Setpoint room air quality for economy	0 … 2000 ppm	1500 ppm
	Setpoint room air quality for protection	0 … 2000 ppm	1500 ppm
Supply air VAV	Supply air VAV max.air vol.flow f.cool	0 … 10'000 m³/h	100 m³/h
	Supply air VAV min.air vol.flow f.cool	0 … 10'000 m³/h	50 m³/h
	Supply air VAV max.air vol.flow f.heat	0 … 10'000 m³/h	100 m³/h
	Supply air VAV min.air vol.flow f.heat.	0 … 10'000 m³/h	50 m³/h
	Supply air VAV min.air vol.flow f.vent.	0 … 10'000 m³/h	0 m³/h
	Supply air VAV box coefficient	0 … 10'000 m³/h/SqrtPa	150 m³/h/SqrtPa
Room operator unit	Room unit, display temperature	None Display room temperature	Display room temperature
	Room unit, display windows status	Yes, No	No
	Room unit, display air quality	None Display room air quality	None
	Room unit, air quality display	Numeric (in ppm) Symbolic (with the symbols +, ++, and +++) Textual (Poor, Ok, Good)	Textual
	Room unit, display heat./cool. status	Yes, No	Yes
	Enable operation: room temp. setpoint	Yes, No	Yes
	Room unit, room temp. setpoint display	Absolute temperature setpoint Relative setpoint shift	Relative setpoint shift
	Enable operation: fan speed setpoint	Yes, No	Yes
	Enable operation: presence button	Yes, No	No
	Enable operation: temporary Comfort	Yes, No	No
	Enable operation: room op. mode	Yes, No	No
	Enable operation: Green Leaf	Yes, No	Yes

Engineering	• ABT Site engineering tool is required to configure the DXR2 automation stations.
	• See the Siemens Download Center at www.siemens.com/bt/download for the latest application configuration and workflow tutorials.
	• Option combination according to available on-board I/Os on controller.
	• B1 (optional extract air temperature sensor) to be configured under ‚Room temperature' in order to serve for room temperature control.
	• D2$_a$ (on-board presence detector) to be configured in ABT Site under ‚Presence detector 2' for maximum combination of optional devices. Type of operation (NO or NC). Multiple devices of the same type can be connected.

Management station

Sample presentation of a VAV application on the Desigo CC management station.

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