Critical Environment Technology

Measurement, control, and monitoring of air volume flows and room pressures in buildings.

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CET – Critical Environment Technology

Critical Environment Technology (CET) is a range of reliable air volume flow controllers and supplementary components for the secure, precise, and fast measurement, control, and monitoring of air volume flows and room pressures in buildings. CET can be easily integrated into building automation systems. The overall system thus provides maximum **efficiency, cost effectiveness,** and **security.**

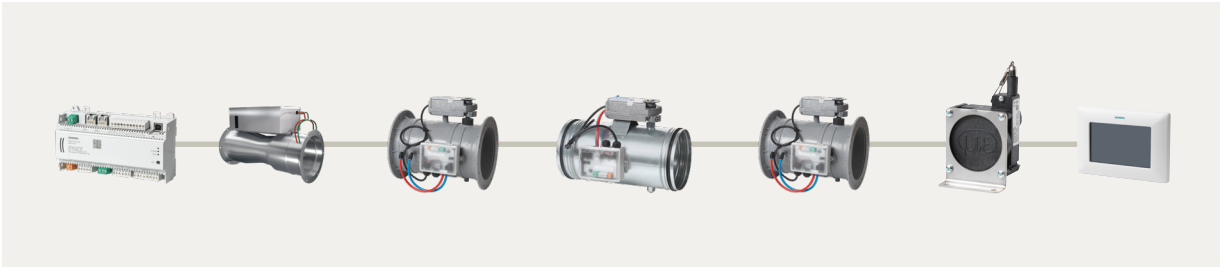
CET is basically designed for:

- Room ventilation and general extractions
- Room pressure control
- Laboratory fume hood control
- Room air conditioning

CET is suitable for the following areas of application:

- Chemistry room
- Clean room
- Laboratory room
- Operating room
- Isolation room
- Patient room
- Production room
- Storage room
- Laboratory fume hood
- Canopy hoods and extractions

This manual describes the CET components and uses many application examples to demonstrate how individual solutions can be implemented.



Contents

Following a thorough introduction to the system, practical application examples are presented that demonstrate how basic and supplementary components can be combined for various room, laboratory fume hood, canopy hood, and extraction applications.

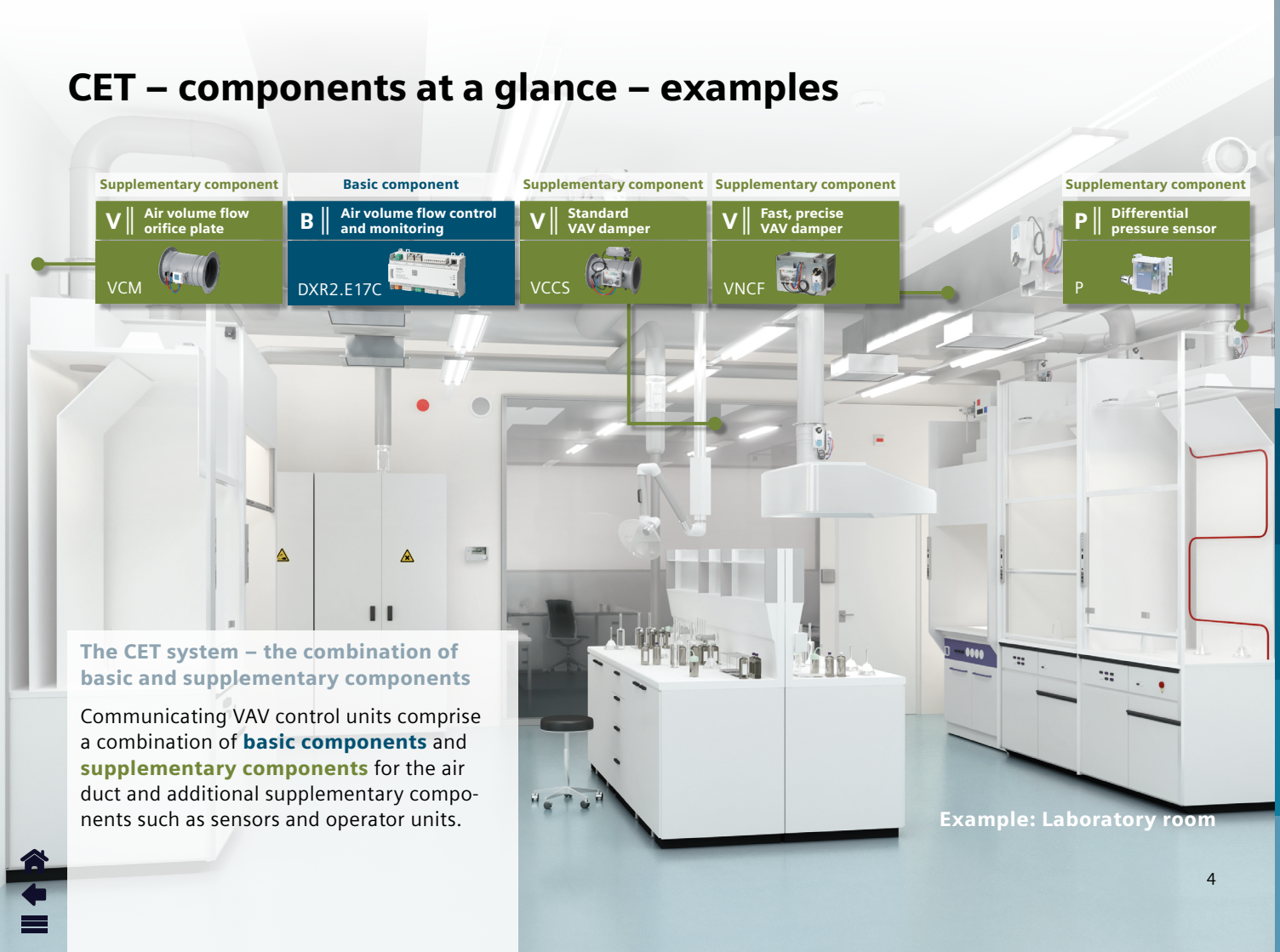
The “Functions” chapter describes the basic functionalities implemented in CET applications and the feasible system functions. The “Design” chapters contain additional technical details to support project planning.

Additional chapters on “Room automation,” “Building Automation,” “Building solutions,” and “Building services” provide complementary information on the overall applicability of the system in a building with critical environments.

Glossary

CET Critical Environment Technology
ATEX ATmosphères EXplosibles
CAV Constant air volume flow
VAV Variable air volume flow

CET – components at a glance – examples



The CET system – the combination of basic and supplementary components

Communicating VAV control units comprise a combination of **basic components** and **supplementary components** for the air duct and additional supplementary components such as sensors and operator units.

Example: Laboratory room

Basic components

B
Air volume flow control and monitoring

The basic components are communicating, independently functioning control units on which the parameterizable, exchangeable applications run. The application determines the functions of the particular basic component.

Supplementary components

V
Air volume flow

P
Pressure

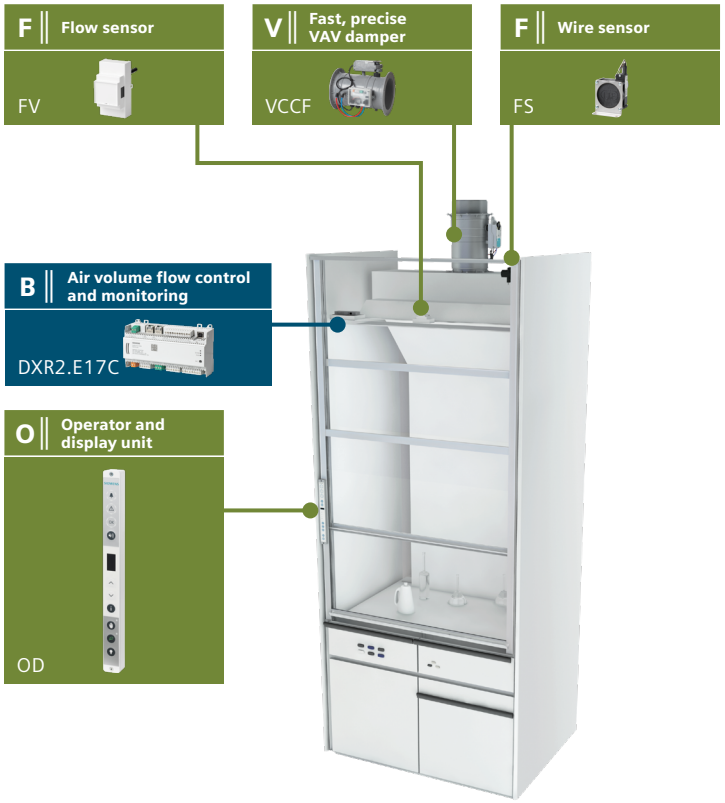
T
Temperature

O
Operation

F
Laboratory fume hood sash

As far as possible, the supplementary components have no integrated control units. They are controlled by the basic components or supply these components with information, such as room temperature or pressure.

Example: Laboratory fume hood



Supplementary components – legend

The supplementary components are divided into five groups.

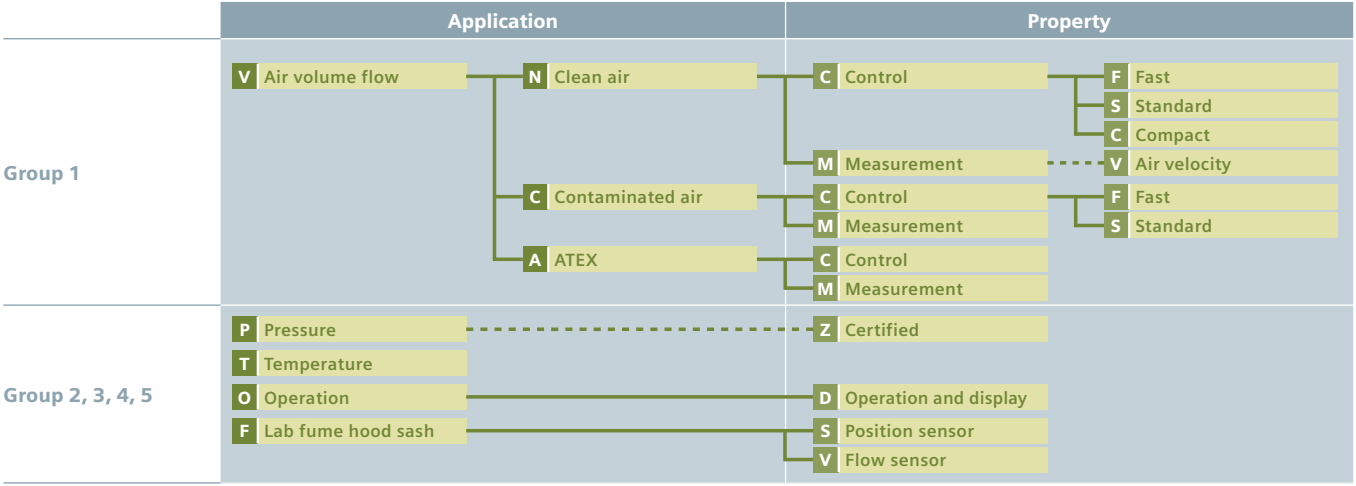
Group 1: V = Air volume flow

This group includes the entire range of VAV dampers and air volume flow orifice plates. Within the group, these devices are sorted by application (VN, VC, VA) and property (VxC, VxM and VxxF, VxxS, VxxC, VxxV). If the application and desired property are known, the appropriate supplementary component can be quickly and easily identified.

With the aid of the detailed description of the components in the "Supplementary components" chapter and the information in the "Design" chapter, the VAV damper or air volume flow orifice plate is clearly specified and designated by the **VAV damper type code.**

Group 2: P = Pressure
Group 3: T = Temperature
Group 4: O = Operation
Group 5: F = Laboratory fume hood sash

These four groups comprise supplementary products that were selected for CET areas of application. They are also sorted by application and property.



Example of an implementation for this system: Fast, precise VAV damper (VCCF)

We support compliance with the following codes and standards

American Society of Heating, Refrigerating and Air-Conditioning Engineers	ASHRAE 110	Method of testing performance of laboratory fume hoods
	ASHRAE 170	Ventilation rate and room pressurization requirements for distinct types of spaces in hospitals
American Society of Safety Engineers	AIHA/ASSE Z9.5	Applies to the ventilation in most laboratories. Emphasis on providing a safe laboratory
Scientific Equipment & Furniture Association	SEFA	Promoting quality and safety in the design, manufacture, and utilization of laboratory-grade furniture and equipment
Occupational Safety and Health Standards	OSHA	Ensure safe and healthy working conditions
European committee for standardization	CEN EN14175	Offer assistance in the construction, controlling as well as testing of fume cupboards

Certified laboratory fume hood control according to EN 14175 Part 6

Certification to EN 14175 Part 6

The communicating VAV control unit, consisting of the basic component DXR2.E17C and the supplementary components VCCF, FV, FS, and OD, is specifically designed for controlling and monitoring the exhaust air volume flow of laboratory fume hoods. This VAV control unit was tested and certified in accordance with the ventilation test required in EN 14175 Part 6.


CERTIFICATE

VAV system CET Solution for laboratories and clean rooms

Siemens Switzerland Ltd

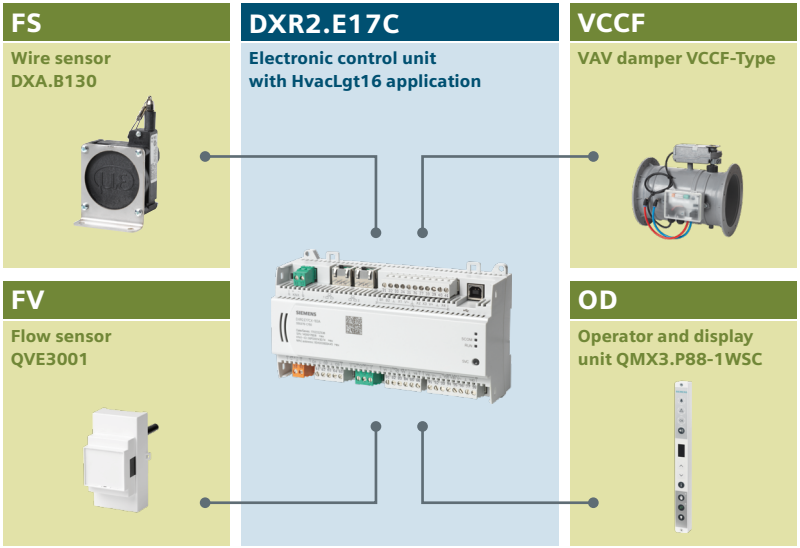
EN 14175 part 6


CERTIFICATE

VAV system CET Solution for laboratories and clean rooms

Siemens Switzerland Ltd

EN 14175 part 6



Test as per EN 14175 Part 6

The test to EN 14175 Part 6 is a type test for laboratory fume hood control components that is performed on a standardized test unit under comparable, ideal conditions – even flow of supply and extract air with low turbulence, precise acquisition of air volume flow parameters, etc.

Basic components at a glance

DXR2.E17C	Air volume flow control and monitoring	For VAV* applications with 1 Segment with 30 datapoints
Communicating controller with VAV application HvacLgtShd14 HvacLgtShd15 HvacLgt16		

DXR2.E17CX	Air volume flow control and monitoring	For VAV* applications with 2 Segments with 60 datapoints
Communicating controller with VAV application HvacLgtShd14 HvacLgtShd15 HvacLgt16		

* VAV: variable air volume

eu.bac Cert

Siemens uses not only its own laboratories for testing but also eu.bac-accredited testing facilities. The eu.bac certification according to European standards confirms the high quality, control accuracy and energy efficiency of the Desigo Room Automation devices.

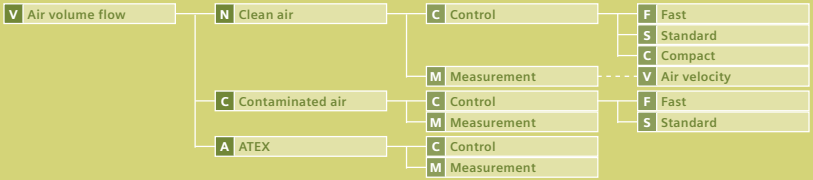
BACnet BTL Testing Laboratories

BACnet is an open communication standard for building automation used worldwide. Independent testing and certification authorities guarantee the reliability of BACnet devices.

Desigo room automation stations use BACnet to communicate with each other and with the management level. This ensures universal communication from the room to the management level.

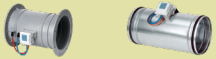
Supplementary components at a glance

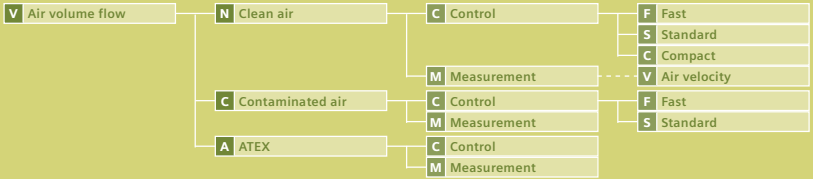
VNCF	**Fast, precise VAV* damper**	**For fast and precise air volume flow control, room supply, and exhaust air**	**Clean air**
VAV damper with mounted high-speed actuator and pressure sensor			
VNCS	**Standard VAV damper**	**For air volume flow control (modular), room supply, and exhaust air**	**Clean air**
VAV damper with mounted actuator and pressure sensor			
VNCC	**Compact VAV damper**	**For air volume flow control, room supply, and exhaust air**	**Clean air**
VAV damper with mounted VAV compact controller			
VNM	**Air volume flow orifice plate**	**For air volume flow acquisition**	**Clean air**
Orifice plate with mounted pressure sensor			
VNMV	**Flow sensor**	**For air volume flow acquisition**	**Clean air**
Sensor			



* VAV: variable air volume

Supplementary components at a glance

VCCF	**Fast, precise VAV* damper**	**For fast and precise air volume flow control, laboratory fume hood, extractions, room exhaust air**	**Contaminated air**
VAV damper with mounted high-speed actuator and pressure sensor			
VCCS	**Standard VAV damper**	**For air volume flow control (modular), extractions, room exhaust air**	**Contaminated air**
VAV damper with mounted actuator and pressure sensor			
VCM	**Air volume flow orifice plate**	**For air volume flow acquisition**	**Contaminated air**
Orifice plate with mounted pressure sensor			
VAC	**ATEX** VAV damper**	For fast air volume flow control in Ex areas***	**Contaminated air**
VAV damper with mounted high-speed actuator and pressure sensor			
VAM	**ATEX air volume flow orifice plate**	**For air volume flow acquisition in Ex areas**	**Contaminated air**
Orifice plate with mounted pressure sensor			



* VAV: variable air volume

** ATEX: Atmosphère explosive; synonymous with the European Union's ATEX directive. This directive contains guidelines for explosion protection.

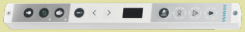
*** Ex area: potentially explosive atmosphere

Supplementary components at a glance

P	**Differential pressure sensor**	**For room pressure acquisition**	
Sensor		dp	
PZ	**Certified differential pressure sensor**	**For room pressure acquisition**	
Sensor with calibration certificate and special cable connection		dp	
T	**Temperature sensor**	**For temperature acquisition**	**In room or air duct**
Sensor		T	
OD	**Operator and display unit**	**For room condition monitoring**	**For critical environment rooms**
Operator and display unit			
OD	**Operator and display unit**	**For monitoring and control**	**For rooms**
Operator and display unit			

P	Pressure	Z	Certified
T	Temperature		
O	Operation	D	Operation and display
F	Lab fume hood sash	S	Position sensor
		V	Flow sensor

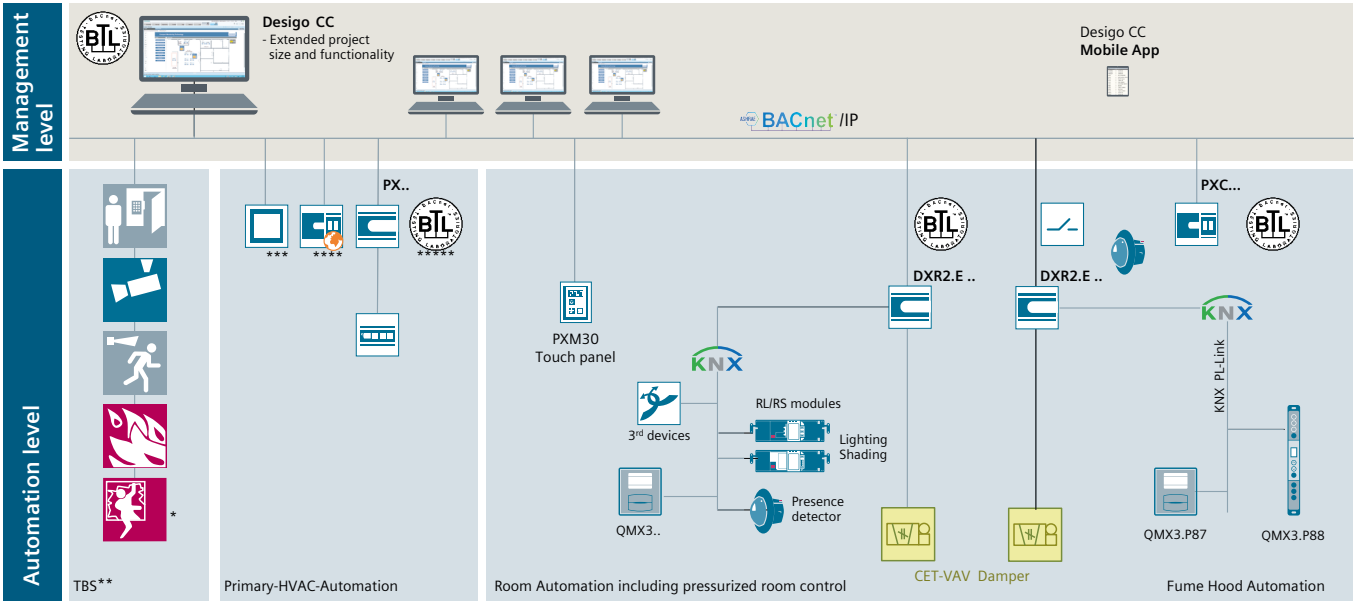
Supplementary components at a glance

OD	**Operator and display unit**	**For monitoring and control**	**For laboratory fume hood**
Operator and display unit			
OD	**Operator and display unit**	**For monitoring and control**	**For laboratory fume hood**
Operator and display unit			
FS	**Draw-wire sensor**	**For sash position measurement**	**Vertical**
Sensor			S
FV	**Flow sensor**	**For sash position measurement**	**Vertical and horizontal**
Sensor			V
F	**Front sash aggregator**	**For sash opening surface measurement**	**Vertical and horizontal**
Sensor accessory			Σ

- P Pressure
- T Temperature
- O Operation
- F Lab fume hood sash
- Z Certified
- D Operation and display
- S Position sensor
- V Flow sensor

Communication and system integration

Communication between the controllers is via BACnet/IP. The components are fitted with a 2-port Ethernet switch. The devices can also communicate directly with the Desigo CC™ building management platform and other BACnet automation stations, e.g. PX, with no need for gateways. Parameterization can be performed using the Siemens ABT Site Tool or directly via the controller's password-protected web server.



* Access control
Video surveillance
Evacuation
Fire detection
Intrusion protection

** Total Building Solution *** Desigo Touch and Web **** Web Interface BACnet/IP ***** Tested according to global BACnet Standard

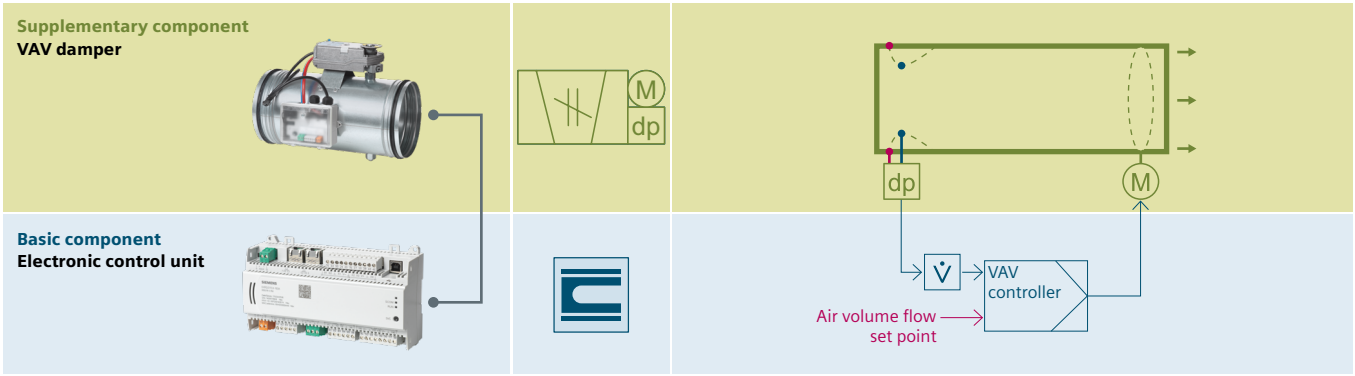
Control principles at a glance

Principle of air volume flow control

At the VAV damper, a differential pressure is measured at the integrated measuring device. The pressure is measured by the mounted static pressure sensor.

The linear pressure signal is converted to the air volume flow signal $\dot{V}$ in the electronic control unit.

This air volume flow signal is regarded as an actual value by the air volume flow controller and is compared with the air volume flow set point. Based on the control difference, the VAV controller specifies the necessary damper angle.

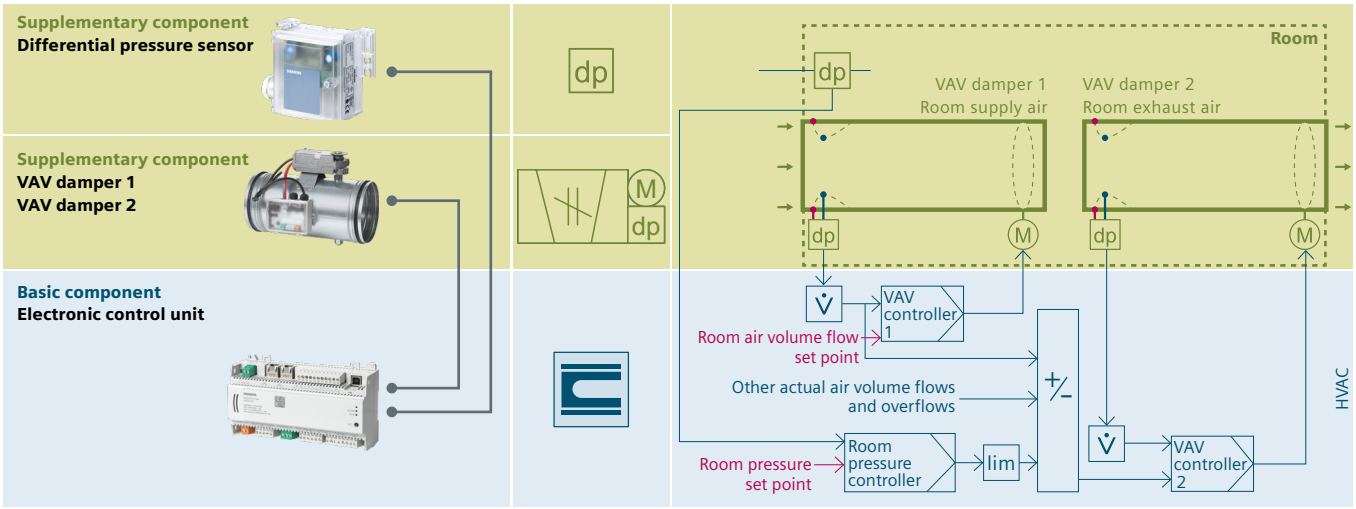


Principle of room pressure control

Room pressure is measured by means of a static room pressure sensor. The room pressure is cascade-controlled with supportive balancing. This type of control is highly precise, fast, and stable. Door contacts, which would freeze the room pressure control during door opening, can be eliminated.

The basis for room pressure control is a balancing of the air volume flows in the room.

The balancing limits to a large extent the set point of the VAV damper 2 that controls the room pressure. The room pressure controller corrects this balance within limits (lim). The VAV controller 2 adjusts the air volume flow set point for a constant room pressure. The set point of the VAV damper 1, i.e. the room air volume flow set point can be changed independently of the room pressure set point. The actual value of the VAV damper 1 is the basis for the room air balancing.



Application examples

The CET system is suitable for the measurement, control, and monitoring of air volume flows and room pressures in simple and complex applications. This chapter contains examples of useful combinations of basic and supplementary components for the applications room, laboratory fume hood, canopy hood, and extraction. For other applications and for specific requirements, other combinations of the components are also possible.


Room
RC1 – RC12
Laboratory fume hood
FC1 – FC12
Canopy hood
HC1 – HC2
Extraction
SC1 – SC4

Application examples

Application examples

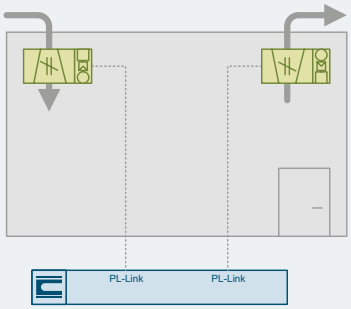
Code	Description	Suitable for	Page
FC1	Laboratory fume hood	VAV duct system	29
FC2	Low-bench laboratory fume hood	VAV duct system	29
FC3	Walk-in laboratory fume hood	VAV duct system	30
FC4	Laboratory fume hood	VAV duct system	30
FC5	Laboratory fume hood	VAV duct system	31
FC6	Laboratory fume hood control by face velocity	VAV duct system	31
FC7	Laboratory fume hood with stabilizing jet	VAV duct system	32
FC8	Pass-through fume hood acc. to EN 14175 Part 6	VAV duct system	32
FC9	Day/night laboratory fume hood	VAV duct system	33
FC10	High-temperature laboratory fume hood	VAV duct system	33
FC11	Filter/fume scrubber laboratory fume hood	VAV duct system	34
FC12	24-hour constant controlled laboratory fume hood	CAV duct system	34
HC1	Canopy hood with 2-step switch	VAV duct system	35
HC2	Canopy hood, automated	VAV duct system	35
SC1	Extraction arm, 24/7	VAV duct system	36
SC2	Extraction arm, manually switched	VAV duct system	36
SC3	Extraction arms, manually switched (variant 1)	VAV duct system	37
SC4	Extraction arms, manually switched (variant 2)	VAV duct system	37

RC1 — Room with simple VAV ventilation (example: corridor)

Situation
- VAV supply air
- VAV exhaust air

Control
- Air volume flow control
- Room air balancing

Monitoring
- VAV air volume flows



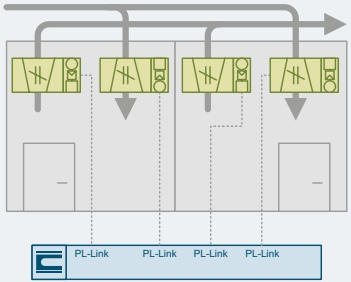
Clean air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgtShd14	DXR2.E17
Compact VAV damper	VNCC-Type GDB181.1E/KN	VNCC
Compact VAV damper	VNCC-Type GDB181.1E/KN	VNCC

RC2 — Two room segments with simple VAV ventilation

Situation
- VAV supply air
- VAV exhaust air

Control
- Air volume flow control
- Room air balancing

Monitoring
- VAV air volume flows



Clean air	For VAV duct system	Code
VAV controller with application	DXR2.E17CX HvacLgtShd14	DXR2.E17
Compact VAV damper	VNCC-Type GDB181.1E/KN	VNCC
Compact VAV damper	VNCC-Type GDB181.1E/KN	VNCC

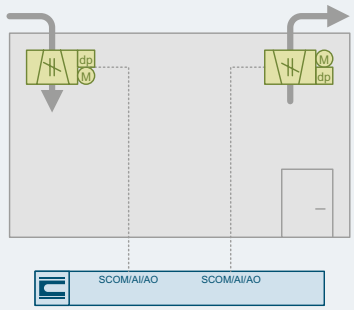
RC3 Room ventilation

Situation
- VAV supply air
- VAV exhaust air

Control
- Room air balancing
- Dynamic set points for room air volume flow

Monitoring
- VAV air volume flows
- Min. room air volume flow

Also suitable for
- Single fan with variable-speed drive



Clean air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgtShd14	DXR2. E17
Standard VAV damper	VNCS-Type GDB161.1E DXA.S04P1-B	VNCS
Standard VAV damper	VNCS-Type GDB161.1E DXA.S04P1-B	VNCS

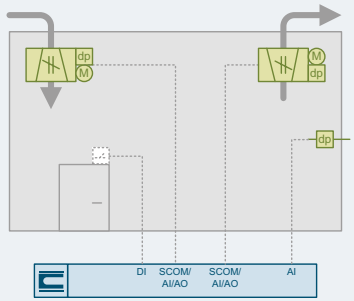
RC4 Pressure-controlled room with variable air volume flow

Situation
- VAV supply air
- VAV exhaust air

Control
- Room air balancing and room pressure control in cascade
- Dynamic set points for room air volume flow

Monitoring
- VAV air volume flows
- Min. room air volume flow
- Room pressure

Also suitable for
- Single fan with variable-speed drive



Clean air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgtShd14	DXR2. E17
Fast, precise VAV damper	VNCF-Type GAP191.1E DXA.S04P1-B	VNCF
Fast, precise VAV damper	VNCF-Type GAP191.1E DXA.S04P1-B	VNCF
Differential pressure sensor	QBM3020-1U Alternative: QBM4100-1U	P

CAV controller | Optional door contact

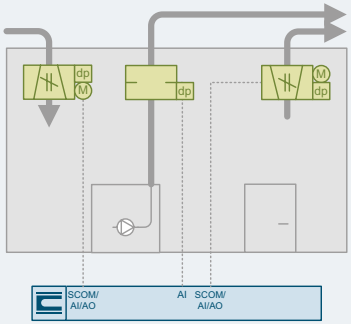
RC5 — Room with VAV ventilation and extraction

Situation
- VAV supply air
- VAV exhaust air
- Switchable extraction unit

Control
- Room air balancing
- Dynamic set points for room air volume flow

Monitoring
- VAV air volume flows
- Min. room air volume flow

Also suitable for
- Single fan with variable-speed drive



Clean air	For VAV duct system	Code
VAV controller with application	DXR2.E17CX HvacLgtShd14	DXR2. E17
Fast, precise VAV damper	VNCF-Type GAP191.1E DXA.S04P1-B	VNCF
Fast, precise VAV damper	VNCF-Type GAP191.1E DXA.S04P1-B	VNCF
Air volume flow orifice plate	VNM-Type QBM3020-3	VNM

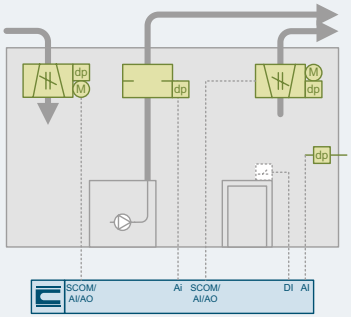
RC6 — Pressure-controlled room with VAV ventilation and extraction

Situation
- VAV supply air
- VAV exhaust air
- Switchable extraction unit

Control
- Room air balancing and room pressure control in cascade
- Dynamic set points for room air volume flow

Monitoring
- VAV air volume flows
- Min. room air volume flow
- Room pressure

Also suitable for
- Single fan with variable-speed drive



Clean air	For VAV duct system	Code
VAV controller with application	DXR2.E17CX HvacLgtShd14	DXR2. E17
Fast, precise VAV damper	VNCF-Type GAP191.1E DXA.S04P1-B	VNCF
Fast, precise VAV damper	VNCF-Type GAP191.1E DXA.S04P1-B	VNCF
Air volume flow orifice plate	VNM-Type QBM3020-3	VNM
Differential pressure sensor	QBM3020-1U Alternative: QBM4100-1U	P

Single fan Optional door contact

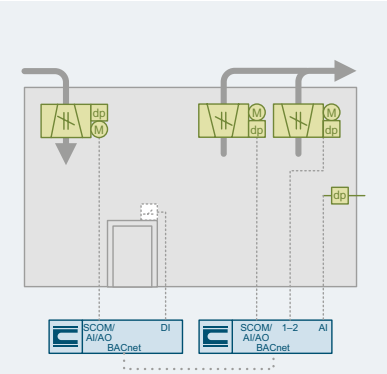
RC7 — Pressure-controlled room with high air exchange rates

Situation
- VAV supply air
- VAV exhaust air
- VAV exhaust air used in parallel for pressure control

Control
- Room air balancing and room pressure control in cascade
- Dynamic set points for room air volume flow

Monitoring
- VAV air volume flows
- Min. room air volume flow
- Room pressure

Also suitable for
- Single fan with variable-speed drive



Clean air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgtShd14	DXR2. E17
VAV controller with application	DXR2.E17C HvacLgtShd14	DXR2. E17
Fast, precise VAV damper	VNCF-Type GAP191.1E DXA.S04P1-B	VNCF
Fast, precise VAV damper	VNCF-Type GAP191.1E DXA.S04P1-B	VNCF
Differential pressure sensor	QBM3020-1U Alternative: QBM4100-1U	P

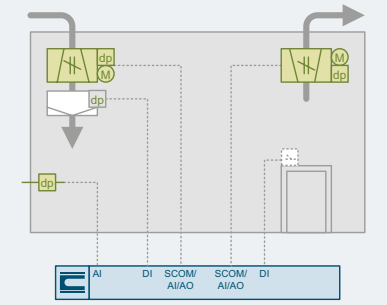
RC8 — Pressure-controlled room with filter monitoring

Situation
- VAV supply air
- VAV exhaust air
- Filter pressure switch

Control
- Room air balancing and room pressure control in cascade
- Dynamic set points for room air volume flow
- Selectable room pressure

Monitoring
- VAV air volume flows
- Min. room air volume flow
- Differential pressure (filter)

Also suitable for
- Single fan with variable-speed drive



Clean air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgtShd14	DXR2. E17
Fast, precise VAV damper	VNCF-Type GAP191.1E DXA.S04P1-B	VNCF
Fast, precise VAV damper	VNCF-Type GAP191.1E DXA.S04P1-B	VNCF
Differential pressure sensor	QBM3020-1U Alternative: QBM4100-1U	P
Pressure switch	QBM81	

Filter | Room pressure changeover switch | Optional door contact

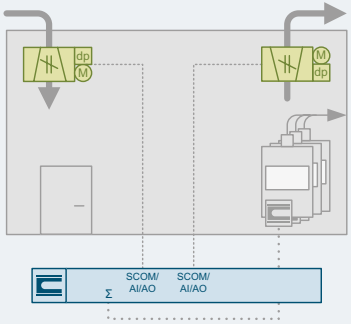
RC9 — Laboratory room ventilation

Situation
- VAV supply air
- VAV exhaust air
- VAV laboratory fume hoods

Control
- Room air balancing
- Demand-controlled room air volume flow

Monitoring
- VAV air volume flows
- Min. room air volume flow

Also suitable for
- Single fan with variable-speed drive



Contaminated air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgtShd14	DXR2. E17
Fast, precise VAV damper	VCCF-Type GAP191.1E DXA.S04P1-B	VCCF
Fast, precise VAV damper	VNCF-Type GAP191.1E DXA.S04P1-B	VNCF

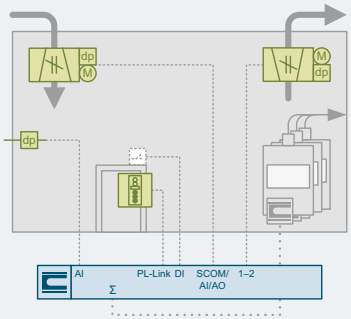
RC10 — Pressure-controlled laboratory room with ventilation

Situation
- VAV supply air
- VAV exhaust air
- VAV laboratory fume hoods

Control
- Room air balancing and room pressure control in cascade
- Demand-controlled room air volume flow

Monitoring
- VAV air volume flows
- Min. room air volume flow
- Room pressure

Also suitable for
- Single fan with variable-speed drive



Contaminated air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgtShd14	DXR2. E17
Fast, precise VAV damper	VCCF-Type GAP191.1E DXA.S04P1-B	VCCF
Fast, precise VAV damper	VNCF-Type GAP191.1E DXA.S04P1-B	VNCF
Operator and display unit	PXM30	OD
Differential pressure sensor	QBM3020-1U Alternative: QBM4100-1U	P

Laboratory fume hood lighting ⊗ Optional door contact

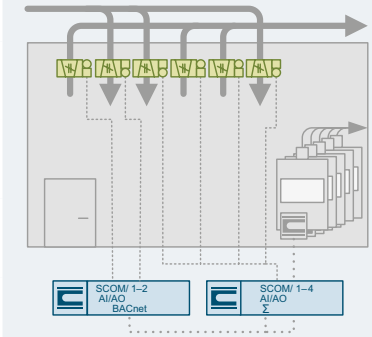
RC11 — Open-space laboratory room

Situation
- VAV supply air, n-times
- VAV exhaust air, n-times
- Air volume flow orifice plate, n-times
- VAV laboratory fume hoods

Control
- Room air balancing
- Demand-controlled room air volume flow

Monitoring
- VAV air volume flows
- Min. room air volume flow

Also suitable for
- Single fan with variable-speed drive



Contaminated air	For VAV duct system	Code
VAV controller with application	DXR2.E17CX HvacLgtShd14	DXR2. E17
VAV controller with application	DXR2.E17C HvacLgtShd14	DXR2. E17
Fast, precise VAV damper	VCCF-Type GAP191.1E DXA.S04P1-B	VCCF
Fast, precise VAV damper	VNCF-Type GAP191.1E DXA.S04P1-B	VNCF

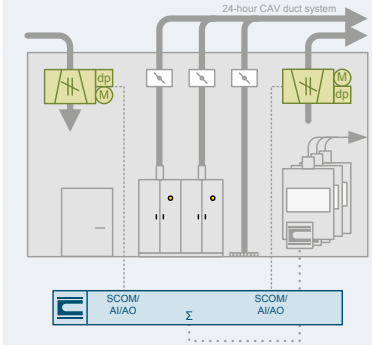
RC12 — Laboratory room ventilation with 24-hour CAV duct system for chemical cabinets and floor extraction

Situation
- VAV supply air
- VAV exhaust air
- VAV laboratory fume hoods
- 24-hour chemical cabinets
- 24-hour floor extraction

Control
- Room balancing, including room-specific 24-hour fixed values
- Demand-controlled room air volume flow

Monitoring
- VAV air volume flows
- Min. room air volume flow

Also suitable for
- Single fan with variable-speed drive



Contaminated ai	For VAV duct system	Code
VAV controller with application	DXR2.E17CX HvacLgtShd14	DXR2. E17
Fast, precise VAV damper	VNCF-Type GAP191.1E DXA.S04P1-B	VCCF
Fast, precise VAV damper	VNCF-Type GAP191.1E DXA.S04P1-B	VNCF

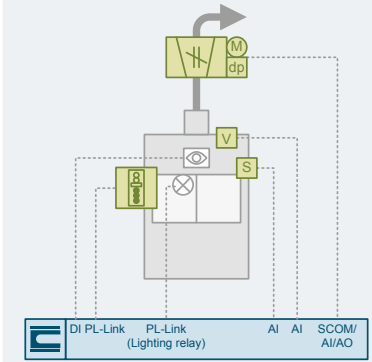
Laboratory fume hood lighting ⊗ Throttle valve

FC1 Laboratory fume hood

Situation
- Laboratory fume hood with vertically and horizontally opening sash

Control
- Continuous, sash opening-dependent air volume flow control of laboratory fume hood exhaust air

Monitoring
- Air volume flow
- Face velocity
- Sash opening



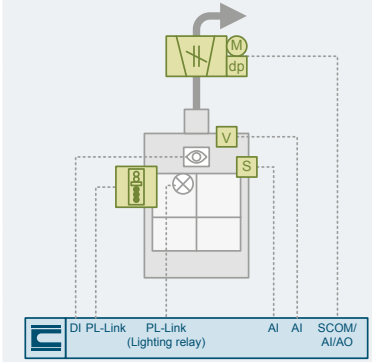
Contaminated air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgt16	DXR2. E17
Fast, precise VAV damper	VCCF-Type GAP191.1E DXA.S04P1-B	VCCF
Draw-wire sensor	DXA.B130	FS
Flow sensor	QVE3001	FV
Operator and display unit	QMX3.P87 or QMX3.P88	OD

FC2 Low-bench laboratory fume hood

Situation
- Low-bench laboratory fume hood with vertically and horizontally opening sash

Control
- Continuous, sash opening-dependent air volume flow control of laboratory fume hood exhaust air

Monitoring
- Air volume flow
- Face velocity
- Sash opening



Contaminated air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgt16	DXR2. E17
Fast, precise VAV damper	VCCF-Type GAP191.1E DXA.S04P1-B	VCCF
Draw-wire sensor	DXA.B200	FS
Flow sensor	QVE3001	FV
Operator and display unit	QMX3.P87 or QMX3.P88	OD

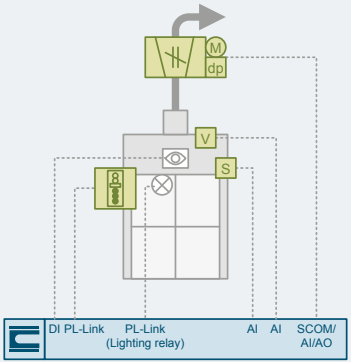
Laboratory fume hood lighting Presence detector

FC3 Walk-in laboratory fume hood

Situation
- Walk-in laboratory fume hood with vertically and horizontally opening sash

Control
- Continuous, sash opening-dependent air volume flow control of laboratory fume hood exhaust air

Monitoring
- Air volume flow
- Face velocity
- Sash opening – 500 mm



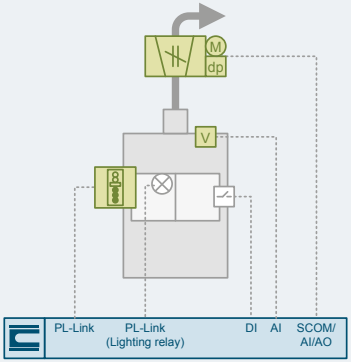
Contaminated air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgt16	DXR2. E17
Fast, precise VAV damper	VCCF-Type GAP191.1E DXA.S04P1-B	VCCF
Draw-wire sensor	DXA.B200	FS
Flow sensor	QVE3001	FV
Operator and display unit	QMX3.P87 or QMX3.P88	OD

FC4 Laboratory fume hood with flow sensor

Situation
- Laboratory fume hood with vertically and horizontally opening sash

Control
- Continuous, sash opening-dependent air volume flow control of laboratory fume hood exhaust air by flow sensor

Monitoring
- Air volume flow
- Face velocity
- Sash opening – 500 mm



Contaminated air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgt16	DXR2. E17
Fast, precise VAV damper	VCCF-Type GAP191.1E DXA.S04P1-B	VCCF
Flow sensor	QVE3001	FV
Operator and display unit	QMX3.P87 or QMX3.P88	OD

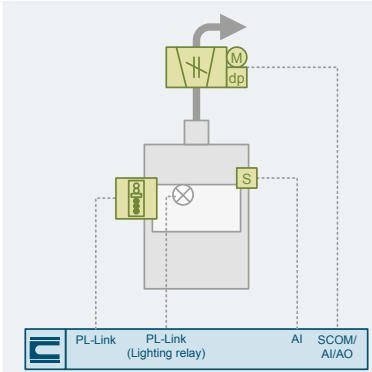
Laboratory fume hood lighting | Presence detector | Sash switch 500 mm

FC5 Laboratory fume hood

Situation
- Laboratory fume hood with vertically opening sash

Control
- Continuous, sash opening-dependent air volume flow control of laboratory fume hood exhaust air

Monitoring
- Sash opening – 500 mm
- Air volume flow



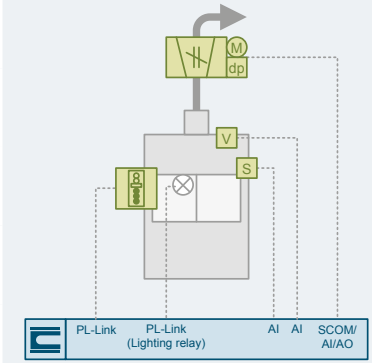
Contaminated air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgt16	DXR2. E17
Fast, precise VAV damper	VCCF-Type GAP191.1E DXA.S04P1-B	VCCF
Draw-wire sensor	DXA.B130	FS
Operator and display unit	QMX3.P87 or QMX3.P88	OD

FC6 Laboratory fume hood control by face velocity

Situation
- Laboratory fume hood with vertically and horizontally opening sash

Control
- Sash opening-dependent control of face velocity

Monitoring
- Air volume flow
- Face velocity
- Sash opening – 500 mm



Contaminated air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgt16	DXR2. E17
Fast, precise VAV damper	VCCF-Type GAP191.1E DXA.S04P1-B	VCCF
Draw-wire sensor	DXA.B130	FS
Flow sensor	QVE3001	FV
Operator and display unit	QMX3.P87 or QMX3.P88	OD

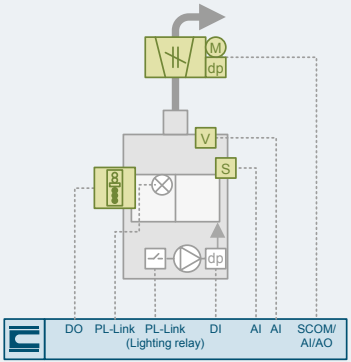
Laboratory fume hood lighting ⊗

FC7 — Laboratory fume hood with stabilizing jet

Situation
- Laboratory fume hood with stabilizing jet and vertically and horizontally opening sash

Control
- Continuous, sash opening-dependent air volume flow control of laboratory fume hood exhaust air

Monitoring
- Air volume flow
- Face velocity
- Sash opening – 500 mm



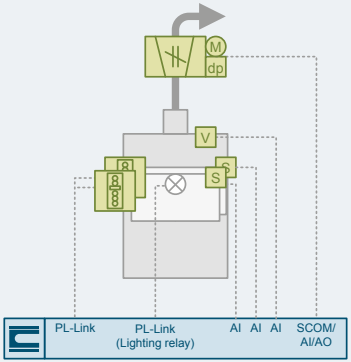
Contaminated air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgt16	DXR2. E17
Fast, precise VAV damper	VCCF-Type GAP191.1E DXA.S04P1-B	VCCF
Draw-wire sensor	DXA.B130	FS
Flow sensor	QVE3001	FV
Operator and display unit	QMX3.P87 or QMX3.P88	OD

FC8 — Pass-through fume hood

Situation
- Pass-through fume hood with 2 vertically and horizontally opening sashes

Control
- Continuous, sash opening-dependent air volume flow control of laboratory fume hood exhaust air

Monitoring
- Air volume flow
- Face velocity
- Sash opening – 500 mm



Contaminated air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgt16	DXR2. E17
Fast, precise VAV damper	VCCF-Type GAP191.1E DXA.S04P1-B	VCCF
Draw-wire sensor	DXA.B130	FS
Flow sensor	QVE3001	FV
Operator and display unit	QMX3.P87 or QMX3.P88	OD

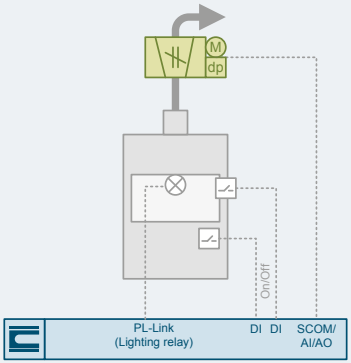
Stabilizing jet fan — Laboratory fume hood lighting

FC9 Day/night laboratory fume hood

Situation
- Laboratory fume hood with vertically opening sash

Control
- On/off switching of laboratory fume hood exhaust air

Monitoring
- Air volume flow
- Face velocity
- Sash opening – 500 mm



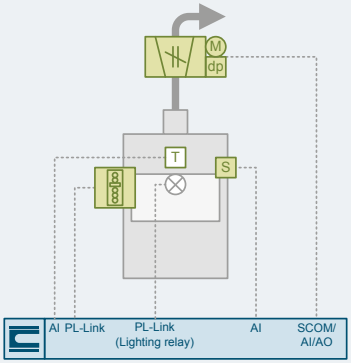
Contaminated air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgt16	DXR2. E17
Fast, precise VAV damper	VCCF-Type GAP191.1E (GDB161.1E) DXA.S04P1-B	VCCF (VCCS)

FC10 High-temperature laboratory fume hood

Situation
- Laboratory fume hood with vertically opening sash

Control
- Continuous, sash opening-dependent or temperature-dependent air volume flow control of laboratory fume hood exhaust air

Monitoring
- Air volume flow
- Face velocity
- Sash opening – 500 mm
- Temperature



Contaminated air	For VAV duct system	Code
VAV controller with application	DXR2.E17C HvacLgt16	DXR2. E17
Fast, precise VAV damper	VCCF-Type GAP191.1E DXA.S04P1-B	VCCF
Draw-wire sensor	DXA.B130	FS
Operator and display unit	QMX3.P87 or QMX3.P88	OD

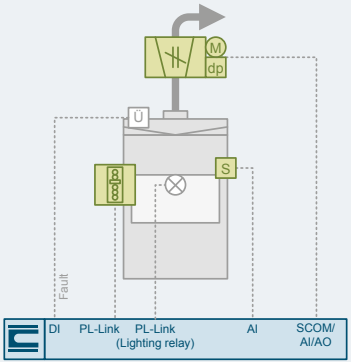
Temperature sensor acid-resistant T
Laboratory fume hood lighting
Sash switch 500 mm
Lab fume hood on/off switch

FC11 | Filter/fume scrubber laboratory fume hood | Contaminated air | For VAV duct system | Code

Situation
- Laboratory fume hood with vertically opening sash

Control
- Continuous, sash opening-dependent air volume flow control of laboratory fume hood exhaust air

Monitoring
- Air volume flow
- Face velocity
- Sash opening – 500 mm
- Fume scrubber

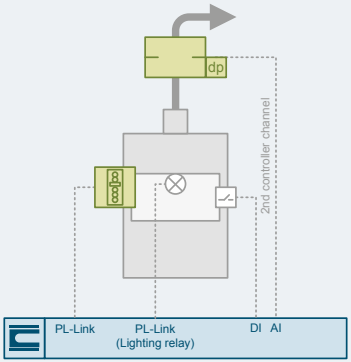


			Code
	VAV controller with application	DXR2.E17C HvacLgt16	DXR2. E17
M dp	Fast, precise VAV damper	VCCF-Type GAP191.1E DXA.S04P1-B	VCCF
S	Draw-wire sensor	DXA.B130	FS
	Operator and display unit	QMX3.P87 or QMX3.P88	OD

FC12 | 24-hour constant controlled laboratory fume hood | Contaminated air | For CAV duct system | Code

Situation
- Laboratory fume hood with vertically opening sash

Monitoring
- Air volume flow
- Face velocity
- Sash opening – 500 mm



			Code
	VAV controller with application	DXR2.E17C HvacLgt16	DXR2. E17
dp	Air volume flow orifice plate	VCM-Type DXA.S04P1-B	VCM
	Operator and display unit	QMX3.P87 or QMX3.P88	OD

Monitoring U | Laboratory fume hood lighting | Sash switch 500 mm | Fume scrubber on/off switch

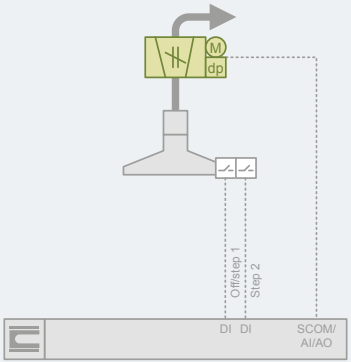
HC1 Canopy hood with 2-step switch

Contaminated air	For VAV duct system	Code
Fast, precise VAV damper	VCCF-Type GAP191.1E (GDB161.1E) DXA.S04P1-B	VCCF (VCCS)

Situation
- Canopy hood with step switch via room VAV controller

Control
- Two-step constant air volume flow control
- Display off/1/2

Monitoring
- None



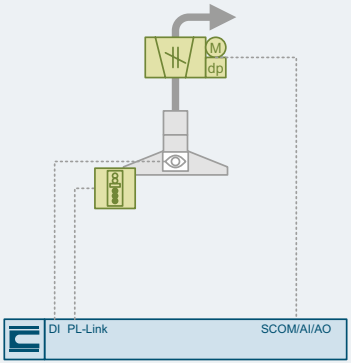
HC2 Canopy hood, automated

Contaminated air	For VAV duct system	Code
VAV controller with application	DXR2.E17CX HvacLgt16	DXR2. E17
Fast, precise VAV damper	VCCF-Type GAP191.1E DXA.S04P1-B	VCCF
Operator and display unit	QMX3.P87	OD

Situation
- Canopy hood with presence detector

Control
- Multi-step constant air volume flow control

Monitoring
- Air volume flow



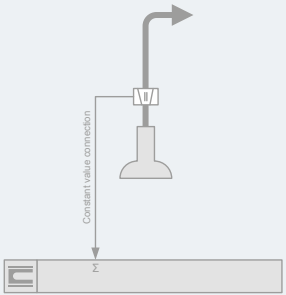
Presence detector | On/Off switch | Operating mode switch | Control unit

SC1 — Extraction arm, 24/7 — Contaminated air — For VAV duct system — Code

Situation
- Constant value is part of room air balancing
- Constant value connected connected to DXR2.E17C with HvacLgtShd14

Control
- Constant value connection in overall room balance

Monitoring
- None

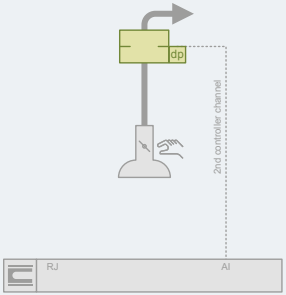


SC2 — Extraction arm, manually switched — Contaminated air — For VAV duct system — Code

Situation
- Extraction arm with mechanically operated on/off manual damper
- Air volume flow measured value is part of room air balancing

Control
- Constant value connection in overall room balance

Monitoring
- None



Air volume flow orifice plate

VCM-Type DXA.S04P1-B

VCM

Control unit  CAV controller 

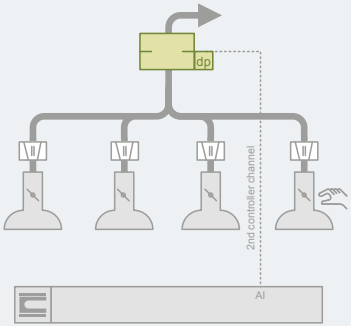
SC3 — Extraction arms, manually switched (variant 1)

Contaminated air | For VAV duct system | Code

Situation
- Extraction arms with
  - CAV controller
  - mechanically operated on/off manual damper
- Air volume flow measured value is part of room air balancing

Control
- Collective volume measurement integrated into overall room balance

Monitoring
- None



Air volume flow orifice plate

VCM-Type DXA.S04P1-B

VCM

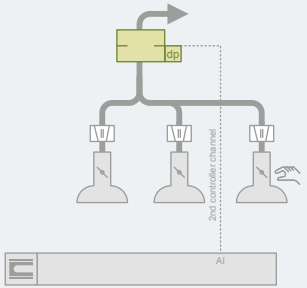
SC4 — Extraction arms, manually switched (variant 2)

Contaminated air | For VAV duct system | Code

Situation
- Extraction arms with
  - CAV controller
  - mechanically operated on/off manual damper
- Air volume flow measured value is part of room air balancing

Control
- Collective volume measurement integrated into overall room balance

Monitoring
- None



Air volume flow orifice plate

VCM-Type DXA.S04P1-B

VCM

Control unit | CAV controller

Functions

CET is a VAV control system based on the described basic and supplementary components. All components in the system are connected using interfaces according to open standards. The system can also be expanded by adding components from third-party suppliers, and it can be easily integrated into a building automation system. This gives users the necessary flexibility to ensure the total functionality of the building automation system.

The CET applications implement basic functionalities such as air volume flow control, laboratory fume hood control, and room pressure control. System functions result from the connection of multiple CET controllers. The expanded functions are produced by integrating the system into building automation.

Additional information and application descriptions are available at www.siemens.com/lifescience


Reports and analyses
Room air volume flow
Demand-controlled room air conditioning
Room occupancy concept
Demand-based fan activation
Test and override functions
Emergency functions
Operation and monitoring
Measuring, controlling, regulating, and monitoring air volume flows
Laboratory fume hood air volume flow control and monitoring
Laboratory fume hood alarm signaling and emergency functions
Room balancing and room pressure control

CET basic functionality – VAV functionality

Measuring, controlling, regulating, and monitoring air volume flows	In HvacLgtShd14, HvacLgtShd15, HvacLgt16
	• Measuring – Any 0...10 V or 4...20 mA indicating pressure, velocity or flow – Supports multiple air flow sensing technologies. Optimized for fast, high resolution digital APS* – Evaluating linear and square-root extracted, analog air volume flow signals DC 0(2)...10 V • Open loop controlling – Modulating control via DC 0(2)...10 V signal or PL-Link – Suitable for continuous standard, rapid response, and VAV compact actuators • Closed loop controlling – PI control algorithm – Open and closed loop control operation • Monitoring – Parameterizable alarm limits and delay times • Communication interface according to BACnet/IP	• Prioritized set point setting – Emergency functions – Test and overwrite functions – Direct set point settings by operating mode (closed, min, mid, max, nominal value) over digital inputs or network variables – Application (e.g. sash position, room pressure controller, balancing) • Possibility of allocating air volume flow set points to multiple air volume flow controllers (parallel operation) • Measurement signal filter, zero point, control parameters and set point ramps adjustable • Relay activation for automatic zero-point calibration with magnetic value • Configurable failure modes • Maintenance free pressure sensor with auto calibration and diaphram sensor and digital communication (SCOM)

*APS Air pressure sensor

CET basic functionality – VAV functionality

Emergency functions		In HvacLgtShd14, HvacLgtShd15, HvacLgt16
	• Emergency functions have highest priority among the set points. • Triggering emergency functions – Via digital inputs on controller (HvacLgt16) – Via building automation • Indication of active emergency functions on the operator unit • Emergency purge button to force the purge	**Available emergency functions** • Emergency negative pressure: open exhaust air dampers, close supply air dampers • Emergency positive pressure: open supply air dampers, close exhaust air dampers • Emergency purge: open all dampers • Emergency closing: close all dampers • Fire: close or open the dampers, depending on parameterization

Test and override functions		In HvacLgtShd14, HvacLgtShd15, HvacLgt16
	• Individual opening or closing of air volume flow controllers at time of commissioning and for test purposes • Command individual flow controller to a named, functional level • Command multiple dampers through mass operation function in tool	

Room functions

Room air volume flow		In HvacLgtShd14, HvacLgtShd15
	• Setting of minimum room air volume flow using – Variable minimum room air volume flow – Stepwise setting based on occupancy and use of the laboratory (4 laboratory room operating modes) using schedule, button, presence detector, laboratory fume hood operating mode, room operator unit • Monitoring of room air volume flow – Parameterizable alarm limits and delay times – Ensuring minimum room air volume flow by means of room exhaust air increase and parameterizable set point increase of the laboratory fume hood air volume flows – Increase in room air volume flow by increasing room exhaust air with subsequent increase in laboratory fume hood air volume flows – Reduction in room exhaust air possible when laboratory fume hood exhaust air increases (open sash), at constant supply air set point – Room exhaust air increase possible through temperature control; with readjustment of supply air for a constant room pressure	• Room air balancing: Room/segment concept accommodates expansion • Calculation of set points for room supply and exhaust air, taking into account the air volume flows of laboratory fume hoods, additional extractions, operating modes and room temperature and humidity control • Functions only in the HvacLgtShd14, HvacLgtShd15 application – 4 room occupancy operating modes – Network variables to display the actual and set point total room air volume flow, to specify the room air volume flow, and to trigger room air volume flow alarms

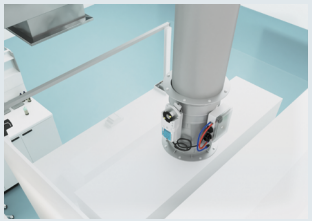
Room functions

Expanded functionality: room air volume flow	In HvacLgtShd14, HvacLgtShd15
	• Maximum simultaneous utilization monitoring of air volume flows in one room • Alarm at all laboratory fume hoods in the room if more laboratory fume hoods are open at the same time than specified in the design; user is instructed to close laboratory fume hoods to avoid a negative effect on other rooms and to ensure a sufficient supply air volume flow.

Room functions

Room balancing and room pressure control	In HvacLgtShd14, HvacLgtShd15
	• Room pressure control through room air balancing and constant difference between total supply air and total exhaust air • Room pressure control – Room air balancing with correcting overlaid cascade room pressure control for very fast, stable control behavior – Use of supply air or exhaust air controller as room pressure controller possible – Simple room pressure control also possible without cascade control and balancing • Room pressure monitoring – Parameterizable alarm limits and delay times	**Adjustable control parameters for pressure control** • Network variables to display the actual and set point room pressure, to specify the room pressure, and to trigger room pressure alarms • Door contacts to freeze controllers can be added

Laboratory fume hood functionality

Laboratory fume hood air volume flow control and monitoring	In HvacLgt16
	• The system provides components to equip a laboratory fume hood, from laboratory fume hood monitoring to sash position-dependent controls according to EN 14175 Part 6. **Possible variants** • Air volume flow monitoring for constant controlled laboratory fume hoods – Monitoring of air volume flow – Monitoring of face velocity – Monitoring of air volume flow and face velocity • Air volume flow monitoring and control based on operating mode-dependent set points – Monitoring and control of air volume flow – Monitoring of face velocity – Monitoring of air volume flow and face velocity • Air volume flow monitoring and control based on operating mode-dependent and sash position-dependent set points – Monitoring and control of air volume flow – Monitoring and control of face velocity – Monitoring and control of air volume flow and face velocity	• Suitable for laboratory fume hoods from any manufacturer • Operator and display unit with clear signaling of safe laboratory fume hood operation • Measuring sash position using wire sensor, flow sensor, and switches • Air volume flow and face velocity set points possible • Warning if 500 mm sash opening is exceeded • Communication monitoring of the operator and display unit • Control signals for direct activation of an individual fan (continuous) • Activation and monitoring of stabilizing jet fans • Increased safety due to simultaneous monitoring of face velocity and air volume flow • Network variables to display sash position, face velocity, etc. • Support of simultaneous utilization function • Support of variable minimum air volume flow settings, e.g. to increase the laboratory fume hood air volume flow based on the temperature control • Maintenance free pressure sensor with auto calibration and diaphram sensor and digital communication (SCOM)

Laboratory fume hood functionality

Laboratory fume hood – alarm signaling, emergency, additional functions	In HvacLgt16

- Operating mode setting using
  - Operator and display unit
  - Presence detector
  - Room controller/presence button/ occupancy schedule
  - Sash opening
- Local display of the current operating modes
- Acoustic signaling indicates automatic change of operating mode
- Red alarm LED and buzzer for alarm
- Yellow warning LED and buzzer for warning
- Green display showing safe operation
- Display of air volume flow set point or face velocity on the operator and display unit
- Laboratory fume hood lighting is switchable using button on the operator and display unit
- Activation of a sash closing device using button on the operator and display unit
- Emergency function activation using digital inputs, e.g. fire detectors for emergency closing or emergency opening of air volume flow controller

- Up to 20 laboratory fume hood operating modes can be used or blocked depending on individual project.
- Acoustic signals indicating automatic change of operating mode are parameterizable
- Automatic reduction of operating mode only possible if front sash is closed (parameterizable)
- Automation of laboratory fume hood lighting via controller or module
- Acoustic reminder function to instruct users to close sash

Expanded functions

Demand-controlled room air conditioning

- Possibility to expand CET applications to include integrated room temperature

In HvacLgtShd14 and HvacLgtShd15

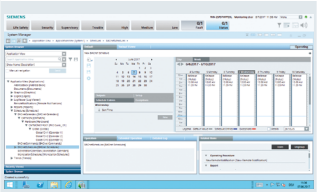
- Connection of NI1000 or PT1000 temperature sensors and others are possible for the application
- Connection available for heating and cooling valves

Demand-based fan activation

- Information about damper positions
  - All CET air volume flow controllers provide this information (exception: air volume flow controllers with compact controllers).
- Can be used to optimize the duct pressure set point

In HvacLgtShd14, HvacLgtShd15, HvacLgt16

Room occupancy concept

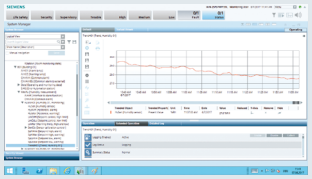


- Integration of CET controllers into occupancy concepts of the building and room automation is possible across systems (temperature, blinds, lighting, access, schedules), example: switching on the lighting can be used as occupancy information
- This information can be used for switching operating modes in the CET applications

Expanded functions

Operation and monitoring		In HvacLgtShd14, HvacLgtShd15, HvacLgt16
	• Graphic visualization on the user interface of the management station: clear presentation of the abundant information provided by the CET controllers • Information on every air volume flow controller – Actual air volume flow – Damper position – Air volume flow set point – Air volume flow alarm • Emergency ventilation level can be set by user in room or remotely • Room air exchange rate may be set as constant, vary with operating mode, or change dynamically based on measured contaminants • Ability to set flow rates in physical units or air changes per hour or flow per unit of floor space • Ability to see room air flow driver dynamically • Ability to display calculated flow levels: – Total supply – Total extract – Transfer flow (difference) • Ability to display alarm indicators for the calculated flows: – Transfer – Ventilation (can be supply or extract) • Occupancy – Setting of room occupancy – Current room occupancy	• Room pressure – Actual room pressure – Room pressure set point – Room pressure alarm – Setting of room pressure – Status of door contact • Laboratory fume hood – Current laboratory fume hood operating mode – Current fume hood air flow or the total of the fume hood air flows in the room – Status of presence detector – Setting of laboratory fume hood operating mode • Sash – Total opening area – Current face velocity set point – Current face velocity • Additional information – Alarm status – Warning status – Setting of alarms, warnings, blocked operation

Expanded functions

Reports and analyses	In HvacLgtShd14, HvacLgtShd15, HvacLgt16
	• All information of the data points is suitable for detecting trends and generating reports. • Air flow driver object answers the most important energy analysis questions • Calculated alarm objects for room and hood make it easy to confirm safe operation over any time interval

Design

This chapter contains tables with more detailed technical information regarding the design of VAV dampers and air volume flow orifice plates.

Additional information and data sheets can be found at www.siemens.com/lifescience

Air volume flow, pressure drop – VAV dampers and orifice plates made of plastic, round, with pressure sensor DXA.S04P1-B

DN [mm]	Length* installed [mm]	$\dot{V}_{nom}$ [m³/h]	$\dot{V}_{2\,m/s}$ [m³/h]***	$\dot{V}_{5\,m/s}$ [m³/h]***	$\dot{V}_{7\,m/s}$ [m³/h]***	Pressure drop** at $\dot{V}_{7\,m/s}$ [Pa]
160	310	630	140	360	510	18
200	350	850	230	570	790	18
250	400	1400	350	880	1240	18
315	490	2370	560	1400	1960	18
110	400	300	70	170	240	33
125	400	400	90	220	310	33
140	400	500	110	280	390	33
160	450	650	140	360	510	33
180	490	840	180	460	640	33
200	510	1020	230	570	790	33
225	700	1300	290	720	1000	33
250	700	1600	350	880	1240	33
280	760	2000	440	1110	1550	33
315	760	2540	560	1400	1960	33
355	1050	3230	710	1780	2490	33
400	1100	4100	900	2260	3170	33
450	1250	5180	1150	2860	4010	33
500	1400	6410	1410	3530	4950	33

Typical standard sizes

Other sizes

Additional information and data sheets can be found at www.siemens.com/lifescience

$\dot{V}_{nom}$: Nominal air volume flows are based on 250 Pa pressure sensors.

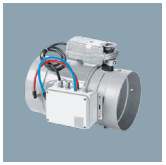
* Lengths are based on dampers with a plug-in connection. The lengths of dampers with a flanged connection or orifice plates may differ from the information in this table. Additional information is provided in the damper data sheet.

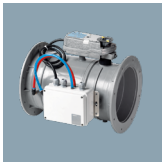
** Pressure drop values apply only to VAV dampers.

*** Air volume flow value at 2 m/s, 5 m/s, 7 m/s air velocity in the damper.

Air volume flow, pressure drop – VAV dampers and orifice plates made of plastic, round, with pressure sensor QBM

DN [mm]	Length* installed [mm]	$\dot{V}_{nom}$ [m³/h]	$\dot{V}_{2\,m/s}$ [m³/h]***	$\dot{V}_{5\,m/s}$ [m³/h]***	$\dot{V}_{7\,m/s}$ [m³/h]***	Pressure drop** at $\dot{V}_{7\,m/s}$ [Pa]
160	310	690	140	360	510	18
200	350	930	230	570	790	18
250	400	1530	350	880	1240	18
315	490	2600	560	1400	1960	18
110	400	330	70	170	240	33
125	400	440	90	220	310	33
140	400	550	110	280	390	33
160	450	710	140	360	510	33
180	490	920	180	460	640	33
200	510	1120	230	570	790	33
225	700	1420	290	720	1000	33
250	700	1750	350	880	1240	33
280	760	2200	440	1110	1550	33
315	760	2780	560	1400	1960	33
355	1050	3540	710	1780	2490	33
400	1100	4490	900	2260	3170	33
450	1250	5670	1150	2860	4010	33
500	1400	7020	1410	3530	4950	33





Typical standard sizes

Other sizes

Additional information and data sheets can be found at www.siemens.com/lifescience

$\dot{V}_{nom}$: Nominal air volume flows are based on 300 Pa pressure sensors.

* Lengths are based on dampers with a plug-in connection. The lengths of dampers with a flanged connection or orifice plates may differ from the information in this table. Additional information is provided in the damper data sheet.

** Pressure drop values apply only to VAV dampers.

*** Air volume flow value at 2 m/s, 5 m/s, 7 m/s air velocity in the damper.

Air volume flow, pressure drop – VAV dampers and orifice plates made of metal, round, with pressure sensor DXA.S04P1-B

DN [mm]	Length* installed [mm]	$\dot{V}_{nom}$ [m³/h]	$\dot{V}_{2\,m/s}$ [m³/h]***	$\dot{V}_{5\,m/s}$ [m³/h]***	$\dot{V}_{7\,m/s}$ [m³/h]***	Pressure drop** at $\dot{V}_{7\,m/s}$ [Pa]
100	298	250	60	140	200	60
125	298	410	90	220	310	60
140	298	520	110	280	390	60
150	298	550	130	320	450	60
160	308	700	140	360	510	60
180	318	890	180	460	640	60
200	328	1120	230	570	790	60
224	353	1420	290	720	1000	60
250	363	1900	350	880	1240	60
280	393	2150	440	1110	1550	60
300	423	2150	510	1270	1780	60
315	423	2690	560	1400	1960	60
355	492	3480	710	1780	2490	60
400	553	4280	900	2260	3170	60
450	590	4280	1150	2860	4010	60
500	700	5380	1410	3530	4950	60
560	740	6450	1770	4430	6210	60
630	800	8060	2240	5610	7860	60

Typical standard sizes

Other sizes

Additional information and data sheets can be found at www.siemens.com/lifescience

$\dot{V}_{nom}$: Nominal air volume flows are based on 250 Pa pressure sensors.

* Lengths are based on dampers with a plug-in connection. The length of dampers with a flanged connection or orifice plates may differ from the information in this table.

** Pressure drop values apply only to VAV dampers.

*** Air volume flow value at 2 m/s, 5 m/s, 7 m/s air velocity in the damper.

Air volume flow, pressure drop – VAV dampers and orifice plates made of metal, round, with pressure sensor QBM

DN [mm]	Length* installed [mm]	$\dot{V}_{nom}$ [m³/h]	$\dot{V}_{2\,m/s}$ [m³/h]***	$\dot{V}_{5\,m/s}$ [m³/h]***	$\dot{V}_{7\,m/s}$ [m³/h]***	Pressure drop** at $\dot{V}_{7\,m/s}$ [Pa]
100	298	280	60	140	200	60
125	298	450	90	220	310	60
140	298	570	110	280	390	60
150	298	600	130	320	450	60
160	308	760	140	360	510	60
180	318	970	180	460	640	60
200	328	1230	230	570	790	60
224	353	1560	290	720	1000	60
250	363	2080	350	880	1240	60
280	393	2356	440	1110	1550	60
300	423	2356	510	1270	1780	60
315	423	2940	560	1400	1960	60
355	492	3810	710	1780	2490	60
400	553	4690	900	2260	3170	60
450	590	4690	1150	2860	4010	60
500	700	5890	1410	3530	4950	60
560	740	7070	1770	4430	6210	60
630	800	8830	2240	5610	7860	60

Typical standard sizes

Other sizes

Additional information and data sheets can be found at www.siemens.com/lifescience

$\dot{V}_{nom}$: Nominal air volume flows are based on 300 Pa pressure sensors.

* Lengths are based on dampers with a plug-in connection. The length of dampers with a flanged connection or orifice plates may differ from the information in this table.

** Pressure drop values apply only to VAV dampers.

*** Air volume flow value at 2 m/s, 5 m/s, 7 m/s air velocity in the damper.

Air volume flow $\dot{V}_{nom}$ [m³/h], $\dot{V}5_{m/s}$ [m³/h] – VAV dampers made of metal, rectangular, with pressure sensor DXA.S04P1-B

Width \ Height	100	140	150	160	180	200	220	250	300	320	350	400	450	500	550	600	700	800	900	1000
100	250 180																			
140	250 250																			
150	250 270		520 410																	
160	250 -		520 430																	
180	250 -		520 490																	
200	500 360		520 540			1120 720														
220	500 -		520 590			1120 790														
250	500 450		820 680			1120 900		2150 1130												
300	750 540		1040 810			1390 1080		2150 1350	3470 1620											
320	750 -		1040 860			1390 1150		2150 1440	3470 1728											
350	750 630		1040 950			1770 1260		2150 1580	3470 1890		3470 2210									
400	1010 720		1230 1080			2240 1440		2850 1800	3470 2160		3470 2520	4280 2880								
450	1010 810		1560 1220			2240 1620		3790 2030	3470 2430		3470 2840	4280 3240	7580 3650							
500	1260 900		1560 1350			2650 1800		4300 2250	4300 2700		4300 3150	4280 3600	7580 4050	8600 4500						
550	1260 990		2080 1490			3360 1980		4300 2480	5370 2970		5370 3470	5370 3960	7580 4460	8600 4950	8600 5450					
600	1510 1080		2080 1620			3360 2160		4300 2700	6950 3240		6950 3780	6950 4320	9010 4860	8600 5400	8600 5940	13910 6480				
700			2600 1890			3540 2520		5690 3150	6950 3780		6950 4410	6950 5040	11380 5670	11380 6300	11380 6930	13910 7560	13910 8820			
800			3130 2160			4490 2880		6450 3600	6950 4320		6950 5040	8560 5760	11380 6480	12900 7200	12900 7920	13910 8640	13910 10080	17140 11520		
900			3130 2430			4520 3240		7580 4050	10430 4860		10430 5670	10430 6480	15170 7290	15170 8100	15170 8910	20870 9720	20870 11340	20870 12960	31300 14580	
1000																				

Typical standard sizes

Other sizes

Additional information and data sheets can be found at www.siemens.com/lifescience

$\dot{V}_{nom}$: Nominal air volume flows are based on 250 Pa pressure sensors – upper value in cell is $\dot{V}_{nom}$ [m³/h]; bottom value in cell is $\dot{V}_{5\,m/s}$ [m³/h].
$\dot{V}_{5\,m/s}$: Air volume flow value at 5 m/s air velocity in the damper.

Air volume flow $\dot{V}_{nom}$ [m³/h], $\dot{V}5_{m/s}$ [m³/h] – VAV dampers made of metal, rectangular, with pressure sensor QBM

Height / Width	100	140	150	160	180	200	220	250	300	320	350	400	450	500	550	600	700	800	900	1000
100	270 180																			
140	270 250																			
150	270 270	570 380	570 410																	
160	270 -		570 430																	
180	270 -		570 490																	
200	550 360	570 500	570 540	760 580	960 650	1220 720														
220	270 -		570 590			1220 790														
250	550 450	900 630	900 680	900 720	960 810	1220 900	1550 990	2350 1130												
300	830 540	1140 760	1140 810	1520 860	1520 970	1520 1080	1550 1190	2350 1350	3810 1620											
320	830 -		1140 860			1520 1150		2350 1440	3810 1728											
350	830 630	1140 880	1140 950	1520 1010	1930 1130	1930 1260	1930 1390	2350 1580	3810 1890	3810 2020	3810 2210									
400	1100 720	1350 1010	1350 1080	1520 1150	1930 1300	2450 1440	3110 1580	3110 1800	3810 2160	3810 2300	3810 2520	4690 2880								
450	1100 810	1710 1130	1710 1220	2280 1300	2280 1460	2450 1620	3110 1780	4150 2030	3810 2430	3810 2590	3810 2840	4690 3240	8310 3650							
500	1380 900	1710 1260	1710 1350	2280 1440	2900 1620	2900 1800	3110 1980	4710 2250	4710 2700	4710 2880	4710 3150	4690 3600	8310 4050	9420 4500						
550	1380 990	2280 1390	2280 1490	2280 1580	2900 1780	3680 1980	3680 2180	4710 2480	5880 2970	5880 3170	5880 3470	5880 3960	8310 4460	9420 4950	9420 5450					
600	1660 1080	2280 1510	2280 1620	3040 1730	3040 1940	3680 2160	4670 2380	4710 2700	7620 3240	7620 3460	7620 3780	7620 4320	9870 4860	9420 5400	9420 5940	15240 6480				
700		2850 1760	2850 1890	3040 2020	3870 2270	3870 2520	4670 2770	6230 3150	7620 3780	7620 4030	7620 4410	7620 5040	12470 5670	12470 6300	12470 6930	15240 7560	15240 8820			
800		3420 2020	3420 2160	3810 2300	3870 2590	4910 2880	6230 3170	7060 3600	7620 4320	7620 4610	7620 5040	9380 5760	12470 6480	14130 7200	14130 7920	15240 8640	15240 10080	18770 11520		
900		3420 2270	3420 2430	4570 2590	4840 2920	4950 3240	6230 3560	8310 4050	11430 4860	11430 5180	11430 5670	11430 6480	16620 7290	16620 8100	16620 8910	22860 9720	22860 11340	22860 12960	34290 14580	
1000																				

Typical standard sizes

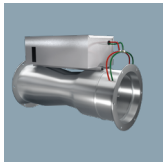
Other sizes

Additional information and data sheets can be found at www.siemens.com/lifescience

$\dot{V}_{nom}$: Nominal air volume flows are based on 300 Pa pressure sensors – upper value in cell is $\dot{V}_{nom}$ [m³/h]; bottom value in cell is $\dot{V}_{5\,m/s}$ [m³/h].
$\dot{V}_{5\,m/s}$: Air volume flow value at 5 m/s air velocity in the damper.

Air volume flow $\dot{V}_{nom}$ [CFM // m³/h] – Venturi terminal unit

	DN [Zoll // mm]	Length installed [Zoll // mm]	V@1.8 m/s [CFM // m3/h]	75 to 750 Pa Low min [CFM // m³/h]	75 to 750 Pa Low max [CFM // m3/h]	150 to 750 Pa Medium min [CFM // m³/h]	150 to 750 Pa Medium max [CFM // m3/h]
	Single venturi flow controller						
106	5 15/16 // 151	21 3/4 // 552	70 // 120	30 // 40	200 // 340	40 // 70	250 // 425
108	7 7/8 // 200	27 1/2 // 699	125 // 210	40 // 70	400 // 680	40 // 70	500 // 850
110	9 7/8 // 251	27 // 686	190 // 325	60 // 100	700 // 1190	60 // 100	1000 // 1700
112	11 7/8 // 302	32 1/8 // 816	275 // 470	100 // 170	1250 // 2125	100 // 170	1500 // 2550
114	13 7/8 // 353	35 1/2 // 902	373 // 630	200 // 345	1500 // 2550	200 // 345	2500 // 4250
	Dual venturi flow controller (Single venturi flow controller Dimension)						
210	9 7/8 // 251	27 // 686	380 // 650	80 // 208	1400 // 2380	120 // 200	2000 // 3400
212	11 7/8 // 302	32 1/8 // 816	550 // 930	200 // 345	2500 // 4250	200 // 345	3000 // 5100
214	13 7/8 // 353	35 1/2 // 902	747 // 1270	400 // 690	3000 // 5100	400 // 680	5000 // 8500
	Triple venturi flow controller (Single venturi flow controller Dimension)						
312	11 7/8 // 302	32 1/8 // 816	825 // 1400	300 // 510	3750 // 6370	300 // 510	4500 // 7650



Additional information and data sheets can be found at www.siemens.com/lifescience

For details see data sheet
Altitude Correction: Airflow @ Altitude = (Sea Level Flow)*EXP(-0.000019028*[Altitude in feet]).
(* = Consult with factory customer service for details)

Critical Environment Technology in the world of Building Automation

Siemens Building Technologies offers a comprehensive technology and solution portfolio for critical environments of all sizes and complexity. The following chapters give you a brief overview of the areas of Room Automation, Building Automation, Building Solutions, and Services with respect to special functions required by each area. This is supplemented by a description of the special services and functional areas for operation in critical environments.

An integrated solution

An integrated solution for critical environments.

The Siemens Smart infrastructure division offers a comprehensive technology and solution portfolio for room and building automation for critical environments of all sizes and complexity. This portfolio offers solutions for clean rooms, laboratories, operating rooms, etc. These solutions combine our range of reliable flow controllers and additional components for the safe, accurate, and fast measurement, control, and monitoring of volume flows and room pressures in buildings. An integrated solution like this is available only from Siemens, making for easier planning, faster delivery, seamless commissioning, and optimized performance.

An integrated solution for critical environments

Efficiency
- Automatic and manual adaptations to optimize system
- Balancing comfort, safety, and energy demands
- Powerful reports and data analysis

Safety and Security
- Compliance with rules and regulations
- Active personal and asset protection
- Alarming and response on events
- Integration of all disciplines for a safe environment

Room Automation
- Local control
- Room temperature/humidity
- Lighting/shading

Building Automation
- Room Automation
- and remote and local control
- and scalability for small and large projects

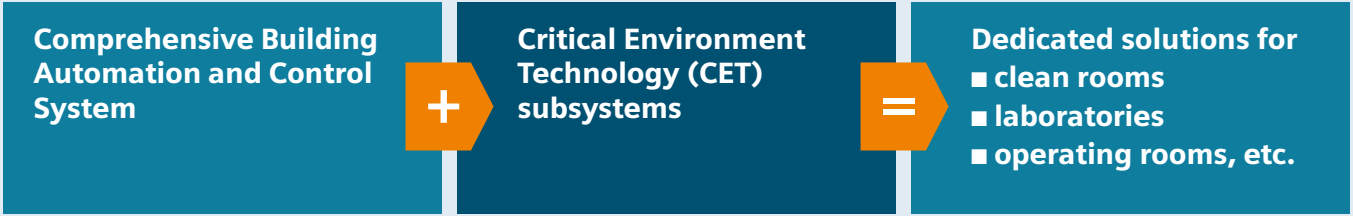
Building Solution
- Building Automation
- and fire safety
- and access and security
- Integrated solution

Comfort
Local and centralized control of
- Room temperature/humidity/pressure
- Ventilation air draft
- Lighting/shading

Planning
- Investment safety
- Future-proof investment with openness to new technologies and services
- Scalable and flexible through modularity
- ...

Operation
- Highly reliable components, functions, tools, and processes
- Seamless communication, optimum transparency
- Intuitive user interface, fewer errors

Services
- Product lifecycle services for reliable operation
- Managed services to minimize risks and costs
- Optimized performance under all circumstances
- Service availability 24/7



Desigo and CET – a perfect match

Highest efficiency, safety, and security and optimized comfort are equally desirable in ordinary rooms and critical environments. The difference is that they are harder to come by in critical environments because of their highly specialized requirements. However, our integrated approach takes care of that, from high-quality single components to a comprehensive overall system, from simplified planning to time-optimized commissioning. The combination of our Desigo CC room and building automation systems and our CET portfolio enables our customers to operate their buildings with optimized efficiency, safety, and security. Comfort and flexibility will also rise to a higher level.

From room automation to an integrated CET solution

The basic structure of this chapter is the presentation of the areas of room automation, building automation, total building solutions, and services and their respective typical functions and supplements that result from the special CET requirements. The fold-out page above serves as an overview of the entire system and its benefits.

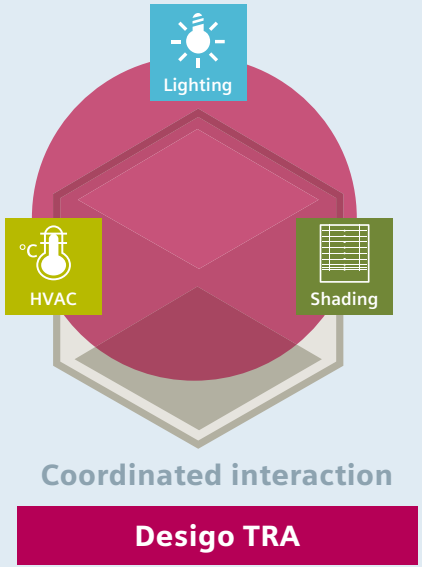
Room automation

Room automation for maximum productivity and assured comfort.

Today, most buildings feature independent controls for lighting, shading, and HVAC, and the individual rooms have a rather limited functionality. Desigo Room Automation (DRA) integrates intelligent functionalities from all disciplines into coordinated interaction. The result: substantial energy savings and productivity gains, and utmost flexibility.

Desigo DRA for profitable rooms
- Maximized productivity and comfort made to measure
- Intuitive operation and unrivaled quality
- True cost savings and investment protection

Desigo DRA – the powers of integration
- Overcome the boundaries between disciplines
- From the single-discipline solution for HVAC, lighting, and shading to a coordinated approach
- Coordinated approach of optimizing the individual disciplines to achieve an overall optimization of the room's condition



Desigo DRA – at the core of the process

- Intuitive and customizable operation, easy adaptation to local requirements
- Optimum flexibility in changing room layouts by assigning control functions to areas rather than rooms, even in operation without rewiring
- Involving the room user for additional energy savings, change of user's mindsets

Desigo DRA – the benefits

- Higher energy efficiency for the building – savings of up to 25% in energy by involving room users
- Intelligent comfort ensures optimal working environment: pleasant room climate, good air quality and optimal lighting conditions with as little energy as possible, at the touch of a button
- More flexibility for future plans: easy adaptation of Desigo DRA for long-term investment protection.
- Maximum safety and reliability from an experienced partner
- Configuration instead of programming: ease of installation and operation
- Distributed functionality in multiple segments or rooms

Flexible room configuration

Room Automation – Features & Functions

Desigo DRA – everything under control

- Central function viewer for the visualization and management of all rooms in a building and their individual functions
- Control of all rooms disciplines including HVAC, lighting, and shading, easy reconfiguration and setting of new room layout assignment
- More security through control of emergency lighting applications and reports on test runs
- Flexible room management by detailed information on room configuration, device settings, events, and the status of all objects of a discipline (e.g. lights or blinds)
- Embedded Room Automation web server access

BACnet is an open communication standard for building automation used worldwide. Independent testing and certification authorities guarantee the reliability of BACnet devices.

Desigo room automation stations use BACnet to communicate with each other and with the management level. This ensures universal communication from the room to the management level.

Desigo RoomOptiControl for room user involvement

- Green Leaf signals an energetically favorable setting of the room's parameters
- If energy saving settings are manually changed, the Green Leaf symbol will turn red
- By touching the Green Leaf symbol, favorable room parameter settings will be restored
- Easy rules for automatic decision making

Communication in all directions

- Direct control of fan coils, radiators, VAV, chilled ceilings, and lighting with communication controllers
- Individual settings with communicating room thermostats
- Predefined applications for HVAC and basic settings for lighting and shading
- Integration of using open protocol networks into a building automation solution for additional functions
- Energy savings of up to 14% through eu.bac-certified single-room controllers

Green Leaf makes energy consumption visible and enables room users to actively save up to 25% in energy

RoomOptiControl automatically detects unnecessary energy consumption in the room

Room operates energy-optimized

Potential for energy savings
→ Press symbol and return to most energy-efficient operation

Room automation and CET

Critical environments place particular demands on room automation, especially in the areas of comfort, efficiency, flexibility, and safety and security. This chapter presents selected features and characteristics of the Siemens CET solutions for these four areas.

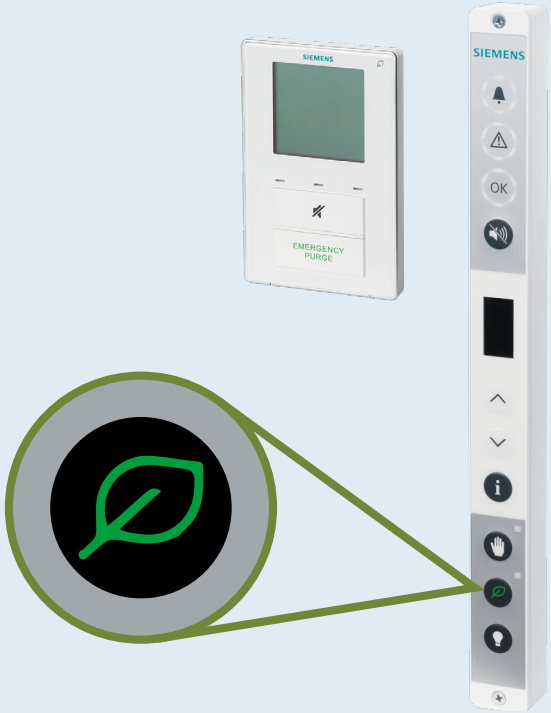
Comfort:
Optimized comfort in critical environments

The effects of proper comfort on work results are frequently underestimated in critical environments in favor of technical room infrastructures. However, good room climate and optimal lighting are an integral part of the technical prerequisites under which work is being carried out here, especially because the level of comfort is responsible not only for productivity, but also for a significant proportion of energy consumption and thus operating costs. Room Automation for CET sensitizes employees to these contexts.

- Room controls with the Green Leaf button help to restore room conditions in case of a manual override of the ideal settings, combining optimized comfort and energy consumption
- Shading forms an integral part of lighting control to support room users with as much natural light as possible
- Room control can be achieved through various interfaces, from the local room control unit to remote control, from a web browser to apps for cell phones and other mobile devices

Efficiency:
Highest efficiency for critical environments

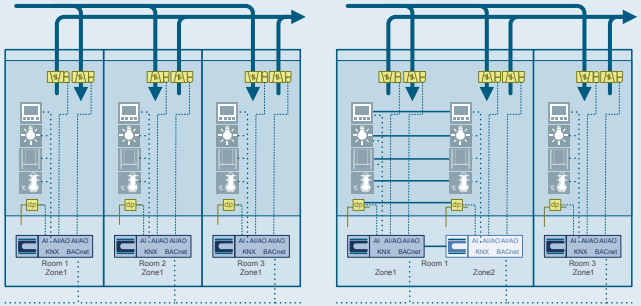
- The cost-effectiveness of critical environments depends not only on the productivity of employees but also on the effort required by the rooms to fulfill their respective functions. In the long term, the energy consumption with which they do this becomes the decisive factor. With Total Room Automation, there are numerous possibilities that go far beyond the scope of conventional room control devices – in particular, optimization measures within the framework of a scheduled use of the rooms:
- Intelligent room operating modes to match the increased complexity of the rooms with a variety of control points; analysis of the target values in coordination with the customer
- The occupancy and utilization criteria of the rooms are used to define fixed operating modes within the concept of Total Room Automation, whose energy consumption optimally reflect the task of the room and the comfort for the employees (e.g. energy saving mode)
- 24/7 remote control of room conditions through web browser or even mobile devices; optimization around the clock even in times of unplanned room usage (ex-schedule)
- Integration of fume hood lighting into the overall room lighting controls
- Shading as an integral part of the room lighting concept saves energy by ensuring as much natural light and as little artificial light as possible



Flexibility: Already prepared for changes at the planning stage

Even if the tasks of a critical environment can change with time, the basic requirements of efficient, reliable room operation stay the same. Within the concept of Desigo Room Automation, a high degree of flexible room usage is built in from the outset to allow the working environment to be aligned to the needs of the processes and/or employees:

- Tailor-made concepts for every application (research, clean room, operating room) with high flexibility
- Rearrangement of the devices in the DRA concept possible at any time – easy adaptation of the rooms to new tasks
- Forming of working islands with related functions anywhere in the room
- Optional combination of, for example, clean room and offices (e.g. in a manufacturing area, with less strict requirements in terms of air quality)



Safety and security:
Safety and security for critical environments

In critical environments, security and fire safety are of particular importance. For example, in laboratories the future of the entire company may be at stake. Therefore, a dedicated safety and fire protection system can be installed. In addition, the security applications of the room automation system restricts access to the premises or individual equipment to authorized persons.

- Added security through access verification (e.g. for fume hoods to ensure operation only by authorized personnel)
- Discussion of set values for air quality, temperature, lighting, and safety of employees, patients, etc., depending on room usage to ensure proper conditions at any time and under all circumstances
- In clean rooms, monitoring of air filter and room pressure (overpressure or negative pressure maintained) are important issues (especially in the pharmaceutical industry, in hospitals, health services, and with disaster protection, etc.)
- Specific fire extinguishing systems for laboratory fume hoods, possibly integrated into a superior fire extinguishing system and controlled by a building automation system
- Additional fire safety through coupled functions, such as opening the shading in the event of a fire to give easier access through the windows for the fire brigade
- Fire alarms will be presented on the central control level and initiate mass notification and the evacuation of the building

Building automation

Building automation with Desigo CC – more intelligence, less complexity.

The Desigo CC building management platform integrates various disciplines and allows operator access from any stationary device or web client anytime, anywhere. Open by design, Desigo CC paves the way to greater safety and comfort, better performance and image, as well as significantly lower costs in building operation. Profit from simplified work processes, consistent workflows, and standardized interfaces for single- to multi-discipline applications in all building types.

Desigo CC for complete transparency
- HVAC, shading, and lighting integration into one platform
- Additional features for value-added performance
- Intuitive operation, few training requirements

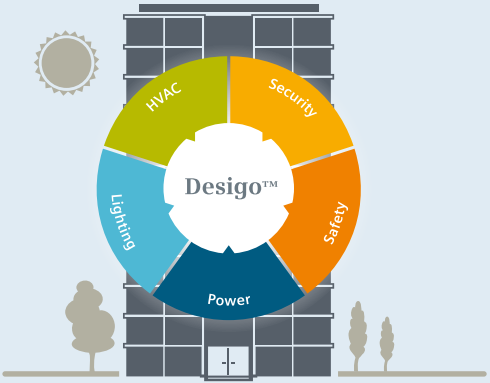
Desigo CC – the powers of perfect control
- Comprehensive control of HVAC, shading, and lighting disciplines
- More insight and improved performance through interdisciplinary analysis
- Workflows, trend analysis, and dedicated notification for optimized awareness of possible problems – and corresponding actions

Desigo CC – future-proof application libraries
- More than 200 tested and proven applications for room functions such as HVAC, shading, and lighting, for reliable performance
- Comprehensive documentation, allowing for excellent service even after many years
- Compatible application library for optimum investment protection
- >25 energy saving applications

Desigo CC – for faster project realization
- Higher flexibility with prefab, adaptable applications
- Shorter configuration time thanks to flexible library structure
- Dedicated components and aggregates serve to realize individual customer requirements
- Detailed components, units, and systems description

Desigo AirOptiControl

- Maximum reduction of air volume flow combined with the best possible comfort to maximize energy savings
- Combination of demand-controlled valve pressure control and supply air temperature control for any number of rooms with Desigo DRA
- Direct exchange of demand signals from the room with the primary air handling unit
- With a reduced pressure drop across the VAV boxes, a smaller fan is sufficient – with correspondingly lower operating costs
- Control of the supply and exhaust air cascade's pressure set point for improved comfort and energy efficiency compared to plants with constant pressure / air temperature regulation



Perfect overview of all disciplines in Desigo CC

Multifunctional user interface

- Workflow-driven, state-of-the-art identical users and client user interfaces to simplify tasks and processes
- Simplified and streamlined navigation with breadcrumbs and extended filter options
- Trend analytics for better tracking of abnormal system behavior and fast, profound decision making
- Report generation using standard templates for faster decisions; root cause analysis improves emergency procedure plans
- Scheduling for all BACnet schedule, calendar, and command objects with easy-to-use user interface for optimized energy costs
- Log Viewer application and Detailed Log for history data and long-term analysis of all historical system and user events
- Openness for easy integration of third-party products and systems
- Standardized web services interface for exchanging data between Desigo CC and external facility management systems, enterprise applications, mobile applications, or other value-added services
- Secure access protection allows for different user authorization levels (e.g. system operation, maintenance, etc.)
- Optimized IT security with encrypted client and server communication, software signing, firewall support, etc.

Building automation and CET

Within the context of operating an entire building, critical environments are only one of many issues. However, in terms of complexity of integration, energy consumption, and special automation requirements, they are a true challenge, calling for highly qualified solutions and high-performance equipment.

Critical environments place particular demands on building automation, especially in the areas of efficiency, safety and security, flexibility, and reliability. This chapter presents selected features and characteristics of the Siemens CET solutions for these four areas.

Efficiency: Optimizing efficiency in critical environment buildings

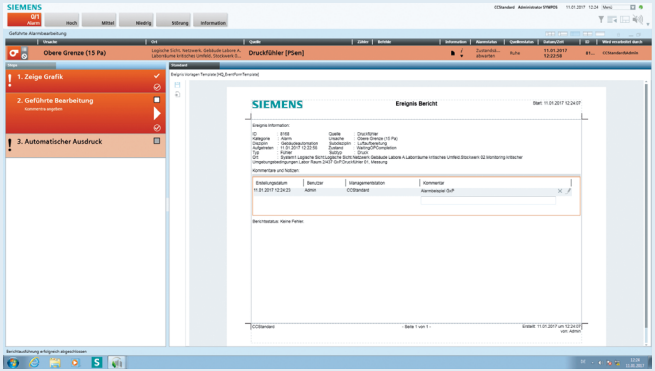
When it comes to the cost-effectiveness of critical environments, the primary focus after the initial investments is the optimization of operating costs. Here, energy consumption is the major issue. To keep it as low as possible, we rely on proven, qualified standard HVAC systems, which we upgrade with a range of supplementary components for these challenging tasks. Together with an intelligent control system and integrated into an overall system for building automation, we are able to maintain the required functionality of a critical spaces and rooms, optimize the comfort for the room users, and at the same time lower the energy consumption of the entire building.

- Reduce pressure loss across VAV dampers by applying optimized damper positions in the CET system triggered by actual demand. Instead of reducing a constantvolume flow individually for each room, the system uses a variable-volume flow with most dampers in 80 percent open position to take care of standard demand: Thus, the overall ventilation can be substantially reduced
- Variable channel pressure (pressure sensors and/or air flow sensors)
- Demand-controlled ventilation system provides minimum air change rate at all times.
- Operating cycles in accordance with room usage schedules (e.g. low demand during night hours)
- Time-saving, intuitive user interface thanks to visualization of laboratory devices (graphic libraries) and operating options in Desigo CC

Safety and security: Integration means improved safety and security for the building

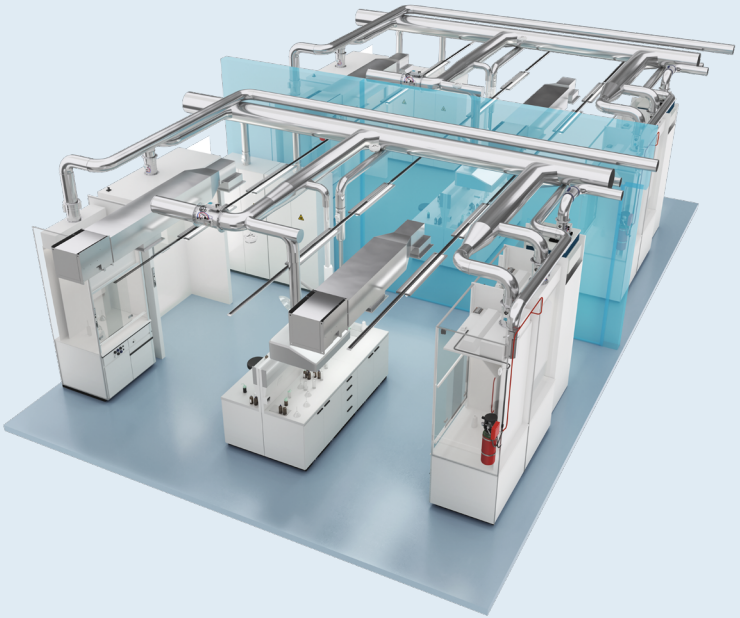
Desigo CC integrates security and fire safety into a common platform. With combined functionality, extra benefits can be achieved. In this context, integration means using data and intelligence from other disciplines to improve safety and security, setting new standards of work safety.

- Desigo CC has direct access to switch on/off the ventilation system in case of an emergency, and react according to preset scenarios for fire, contamination (alarm function), and alarm
- Continued recording of operation data, whenever a set point is changed
- Continued reporting allows for long-term analysis, graphical data visualization and evaluation, as well as training purposes, e.g. for showing improvements
- Integration of specific laboratory extinguishing systems into the building automation platform, combining them with other systems in the building to multiple extinguishing systems
- Desigo CC also collects and provides data on the system state (e.g., on/off, or extinguishing agent filling)



Flexibility:
Planning prepared for change

For first installations and later changes Desigo offers optimum flexibility even for critical environments. With simplified planning and commissioning, our building automation system helps save time and costs.



Reliability:
Economical service and maintenance offerings

Even though a building automation system requires little to no maintenance, things are different for critical environments. They require high-performance ventilation systems and components in order to keep the failure probability low and to increase the reliability, we offer tailored services:

- Provision of spares with shortest notice, e.g. keeping spares available in the nearest service center
- Predictive maintenance: checking on relevant parameters to detect possible future faults in time for a planned outage, thus reducing maintenance time and avoiding extra costs
- Benchmarking of different systems to offer the best alternatives for retrofits or optimizations
- Remote maintenance of operating units, etc.

Building solutions and CET

Total building solutions with Desigo CC – one platform for all requirements.

Operators of modern buildings often have to satisfy a wide range of demands for optimized work conditions, low energy consumption, highest fire safety, reliable security, etc.
A Total Building Solution from Siemens reduces the complexity of satisfying these demands, since we know how to effectively coordinate the disciplines and thus make buildings safer, more comfortable, more economical, and more efficient. Our solution includes defining specific scenarios, testing suitable solution packages, and finally certifying them for use with Desigo CC, our integrated building management platform.

Desigo CC for simplified operation

- Open for global standards by design; improved performance and easy third-party integration
- Reduced complexity for the operation of all kinds of buildings; consistent workflows
- Operational by authorized users from any stationary control room or through web clients from anywhere, at any time
- One intuitive user interface for all disciplines – fewer mistakes

Desigo CC for perfect working environments

- Fire safety and security in an integrated solution
- Perfect room climate, meeting both individual settings and overall control strategies
- Comprehensive monitoring and reporting for continuous optimization
- Control of undesirable events and simplified maintenance

Desigo CC – perfect control of operating costs

- Coordination of HVAC, shading, and lighting disciplines for lowest energy consumption
- More insight and improved performance through interdisciplinary analysis
- Future-proof investment with openness for new technologies and services
- Scalable to any project size, easy adaptation to the building lifecycles, secure investment

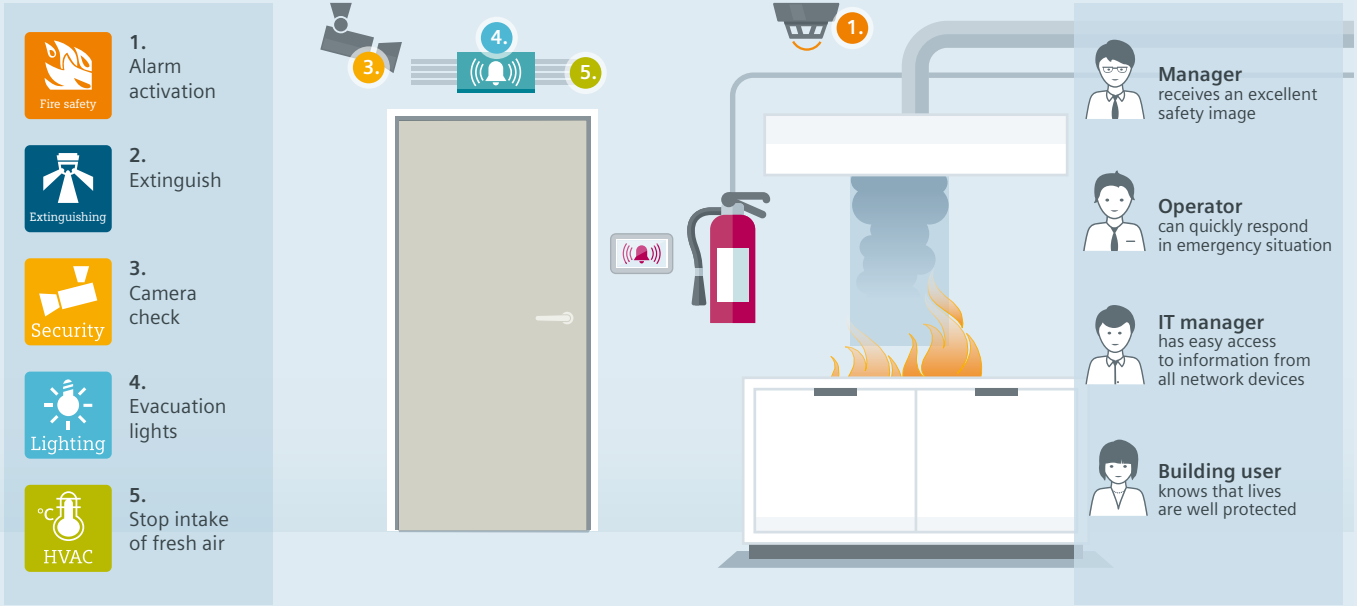
Desigo CC – integrated functionality

- Desigo PX Eco Monitoring, using the Green Leaf concept for real-time monitoring and reporting on energy consumption
- Native Support of fire safety subsystems – EN and UL – with uniform information display and integration of legacy fire protection systems:
  – Sinteso FS20
  – Algorex CS1140 via NK823x gateway (new)
  – STT20 Centralisateur de Mise en Sécurité Incendie
  – Desigo fire safety FS20 UL
  – Xnet FireFinder XLS and MXL
- Support of Siveillance VMS video surveillance and Milestone Xprotect Expert/Corporate v7.0c/7.0d for live video, recording and replay, PTZ control and predefined PTZ positions, video device controls, and event-handling procedures (e.g. alarm verification)
- Support of SiPass integrated (SiPass 2.65 SP2) for access control, monitoring door, area, and device events (e.g. door locked, door forced, anti-passback)
- Intrusion detection by supporting SPC series (v 3.4.5 and v 3.6.5) and an intruder alarm system using infrared detectors, magnetic door contacts, and I/Os as well as video verification

Integrated functions of a Desigo CC-based Total Building Solution

When we talk about the advantages of integrating different disciplines, we specifically mean their interaction in order to achieve an improved state of the room or building. In this respect it is irrelevant whether we have to deal with an emergency such as fire or intrusion, or an everyday situation in the office. Here you can find typical scenarios and typical solutions with Desigo CC (along with results for different stakeholders):

Sample scenario: Fire



If a fire is detected, the alarm can be verified using a surveillance camera. If there is a verification, the alarm is activated, and the ventilation system stops the intake of fresh air. At the same time, power in the room is adjusted and evacuation lights are switched on. With Desigo CC the manager receives an excellent safety image, while the operator can quickly react to emergencies and staff knows they are safe, while the IT manager has easy access to information from all network devices.

Sample scenario: Everyday

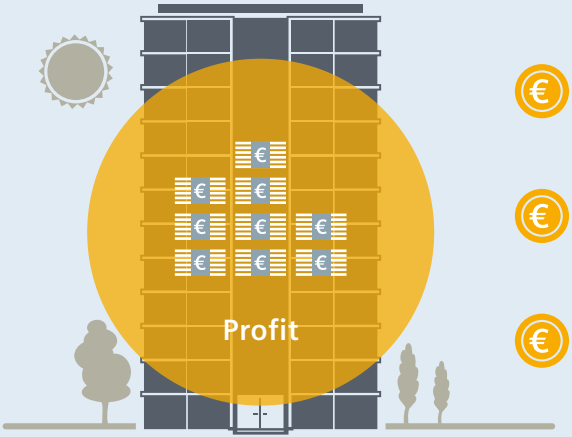
In an everyday work situation, Desigo will notice a person entering the room, and then activate power and light as well as temperature and climate control according to the individual settings to provide a productive and comfortable working environment. The fire check runs irrespective of whether the room is in use or not.

Sample scenario: Intrusion

In case of an intrusion, the surveillance camera will activate an alarm, and Desigo CC will activate the lights in the room to assist guards or official forces investigating. The fire check is active all the time. With Desigo CC, the management can be sure their investments are well protected, and the building users know their working environment is safe. The building operator knows everything is under control. And the IT manager is happy to provide information from all networks to all parties involved in the incident.

Sample scenario

Desigo selects all data …
and turns data into concrete actions to save money.



- Blinds down if the sun is shining
- Ventilation on/off when needed
- Heat only when required
- Employee restaurant plans menus according to number of cars entering parking area or office space
- Only heat and/or cool meeting room when scheduled meeting is pending
- Analyze, compare, and optimize energy usage in different rooms, floors, or buildings

Desigo CC – basic features and functions

System
- Client/server architecture
- Windows, web, mobile app
- Multiple screen approach
- Multilingualism
- UL- and ULC-certified
- EN-compliant
- BTL- and OPC-certified
- Virtual and redundant deployment

Engineering
- Online engineering
- Vector graphics
- Floor and plant graphic
- 2D and 3D symbols
- AutoCAD import
- Multilayer
- Native graphic editor
- Rich symbol libraries
- Drag & drop function
- Coverage areas
- BACnet auto discovery

Alarms and events
- Summary bar
- Event list
- Fast treatment
- Investigative treatment
- Assisted event treatment
- Event logging
- Remote event notification
- Related items
- Journaling and printing

Operations
- Workflow-driven navigation
- Current status and commands
- Related items
- Graphical operations
- Historical and dynamic trend, time-shift comparison

Reports
- Extensive report libraries
- Customizable reports
- Graphics, tables and trend plots
- PDF, CSV export
- Report scheduling

Scheduling
- Schedulers like MS Outlook
- Automatic associations to control objects
- Timeline view
- Time triggered commands

Logging
- Flexible deployment of historical database
- Protected database
- Log Viewer application with Detailed Log
- Powerful filtering

Macro and reactions
- Programmable execution of command sequences
- Cross-discipline interactions
- Time and event-based triggers
- Logic operators

Openness
- BACnet (B-AWS)
- OPC client
- OPC server
- ONVIF
- SNMP
- Modbus
- Web services

User management and IT security
- Windows authentication
- Application and object rights
- User groups
- User profiles
- IT security SL1+
- IT certificates

With a total building solution based on Desigo CC, building managers and operators profit from numerous built-in advantages and functions, from an intelligent system setup to excellent reporting, from workflow-driven operation to scheduling and logging for long-term reliability.

Total Building Solutions for CET

Your laboratory must meet high standards for safety and compliance. Today, energy efficiency is another benchmark that will define your success. To meet these challenges, you will need to manage consumption, reduce costs and document sustainability achievements at the same time. We can support our customers in many ways, combining advanced automation technology with extensive industry expertise. We offer unrivaled expertise in achieving critical environment and sustainability goals in a concise, four-step approach:

- Assessing your current operations to identify opportunities
- Implementing energy-saving automation technologies to gain control
- Managing facility operations data for higher efficiency
- Maintaining energy efficiencies and sustainability excellence

As a result, our customers profit from comprehensive solutions for their critical environments, including assessment, technology, information management, and services.

Our energy efficiency solutions are based on our market-leading expertise in designing technologies for critical environments. This includes a complete portfolio of laboratory controls and experience in integrating third-party controls into our solutions for university, healthcare, government, and industrial laboratories and other critical environments.

Desigo for biocontainment solutions

Desigo in order can be adapted to support customers in handling biohazards safely and efficiently with an integrated solution, taking care of economic as well as organizational and regulatory requirements:

- Compliance with applicable regulatory and accreditation requirements
- Improved staff productivity by integrating third-party systems and devices to develop a turnkey operation and to provide proper workplace ambience
- Secure environment to protect staff, product, and research integrity
- Minimized risk and liability in safe and healthy work conditions
- State-of-the-art environment conducive to recruiting and retaining staff
- Optimized solutions for meeting current biosafety guidelines, as well as our customers' long- and short-term goals, program objectives, and monitoring and reporting needs

Desigo and critical storage

For critical storage of vital products/materials used in the treatment of patients and the manufacture or research of drugs/therapeutics, we offer comprehensive Desigo solutions based on an approach covering the entire lifecycle. This begins with an assessment of your current situation and your future goals so we can develop a solution specific to your long-term needs. The final solution incorporates an engineered monitoring/control infrastructure and information management system that monitors, alarms, and reports on temperature in critical storage areas and helps you meet regulatory/accreditation requirements with the least amount of time and resources:

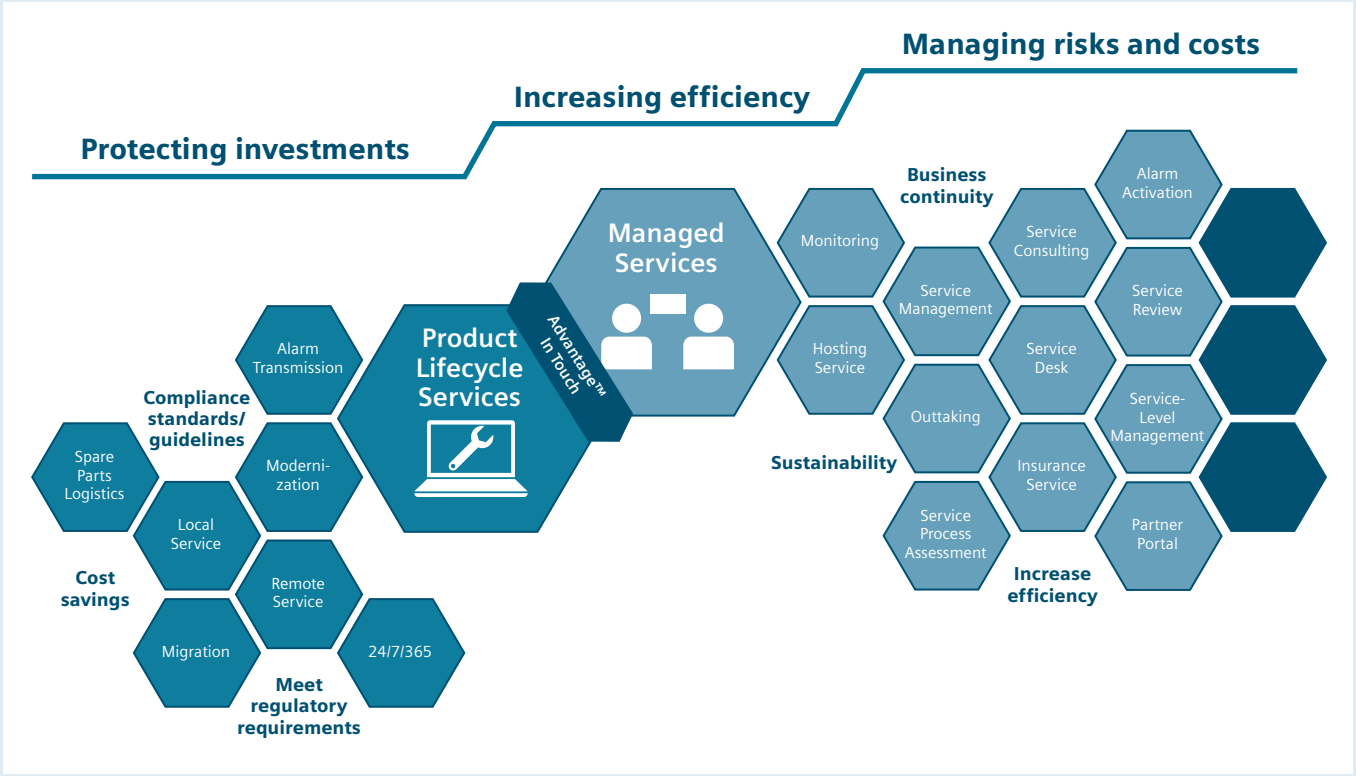
- Concise control of all room climate and air quality measurements
- Consistent monitoring of all critical storage parameters with reports for quality documentation
- Standardized solutions specialized for areas storing vital products or materials used in the treatment of patients, or the manufacture/research of drugs and pharmaceuticals

Lab security and efficiency

We have developed a Desigo solution set for laboratory facilities that takes a comprehensive approach to meeting the safety and security as well as efficiency challenges you face every day. From the initial assessment through ongoing support, we provide the systems, the services, and the resources to ensure that your facility is as compliant, efficient, cost-effective, secure, and safe as it can possibly be. Combining advanced automation technology with extensive industry expertise, the strength of our solution lies in the close integration of its technological and procedural-based elements.

- Better performance and higher energy efficiency by using data from all relevant disciplines and processes
- Improved laboratory performance through improved ambient conditions
- Automatic collection of critical data without manual input – meter readings via email
- Optimum accessibility through local control, centralized control center, web client, or mobile applications
- Scalability to support business growth without standstills/interruptions
- Data security with our proprietary, secure servers
- A more thorough approach to lab service

Building services


Managing risks and costs
Increasing efficiency
Protecting investments
Managed Services
Product Lifecycle Services
Advantage™ In Touch
Alarm Transmission
Compliance standards/ guidelines
Spare Parts Logistics
Moderni-zation
Local Service
Cost savings
Remote Service
Migration
24/7/365
Meet regulatory requirements
Business continuity
Monitoring
Service Management
Hosting Service
Outtaking
Sustainability
Service Consulting
Service Desk
Insurance Service
Service Process Assessment
Increase efficiency
Alarm Activation
Service Review
Service-Level Management
Partner Portal

Building services concepts for CET

Our intelligent service concepts for CET are as diverse as the application areas of these technologies. Their highly modular nature allows us to develop individual service offerings for each customer, which are essentially grouped in the areas of lifecycle services and managed services. Our intelligent service concepts have three main objectives:

- Protecting investments
- Increasing efficiency
- Managing risks and costs

To allow for best possible support, our service concepts combine local service and maintenance activities at the customer's premises with remote services, e.g. long-term monitoring of critical equipment, and data analysis. All of our services are available around the world whenever and wherever our customers need us.

Building services concepts for CET*

Dedicated services for best performance
With a special focus on strengthening CET operators' business continuity, we have designed specialized service modules for tailored support in the most important business areas of CET.

Operational assistance, diagnosis, and repair
- Minimal interruption
- Lower running costs
- High operating and system availability

Performance reporting and consulting
- Increased safety for people, systems, processes
- Energy efficiency and savings through system optimization
- Compliance with legal requirements

Event monitoring and response
- High business continuity
- Maximum protection through 24/7 monitoring
- High transparency

Maintaining an established state of control
With the relevant service modules in place, we can ensure your day-to-day operations are maintained to established standards on a 24/7 basis. Our Service Solutions will help you maintain the state of control needed to meet regulatory requirements, improve operational efficiencies, support a 24/7 operation, ensure immediate recovery, and lock in long-term system performance. Within our global organization, we have local service technicians who are highly experienced to provide quality service when and where you need it.

We offer a full complement of services, including Customer Support, Compliance Services, Facility Information Services, and a wide range of Technical Support Services to keep your systems up and running now and in the future.

* Services may differ depending on local expertise

The Green Labs solution*

Preinstallation phase

Assessment

- Lab safety & compliance assessment
- Lab energy assessment & recommendations
- Report

Technical solutions (FIMs**)

- Lab ventilation rate management
- Constant volume to VAV
- Demand control ventilation
- Fume hood sash management
- Equipment decommissioning

Postinstallation phase

Measurement and Verification (M&V)

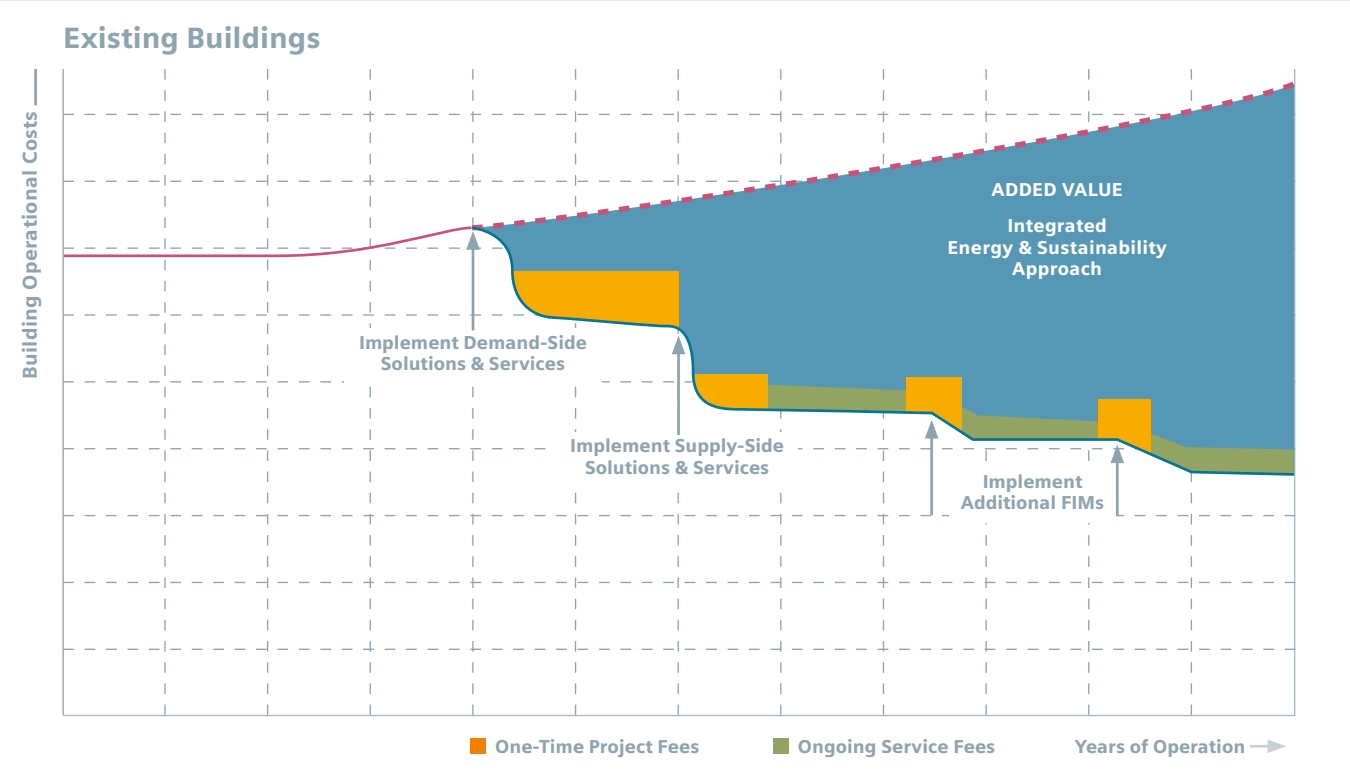
- Navigator & lab dashboards
- Real-time monitoring
- Data trending & archiving
- Reporting
- Alarm information & remote notification

Services

- Navigator analytics
- Continuous commissioning
- Room pressurization services
- Chemical fume hood testing
- Calibration services
- Validation services

* Services may differ depending on local expertise
** FIM = Facility Improvement Measure

BPS value proposition



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Smart Infrastructure intelligently connects energy systems, buildings and industries, enhancing the way we live and work to significantly improve efficiency and sustainability.

We work together with customers and partners to create an ecosystem that both intuitively responds to the needs of people and helps customers achieve their business goals.

It helps our customers to thrive, communities to progress and supports sustainable development to protect our planet for the next generation.

Creating environments that care.
siemens.com/life-science

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