

Variable flow systems

EKVÜ toetajate päev- Praktikult praktikule
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Good indoor climate conditions & energy efficiency

Features

- Cooling (and heating) energy is transferred to space with the air flow
- All-air systems either
 - dedicated outdoor air systems or
 - return air systems
- Optimal in spaces where varying occupancy is the main contaminant load

Benefits

- Energy-efficient operation
- Demand controlled ventilation
- Free cooling with cool outdoor temperatures
- Excellent air quality due to high outdoor airflow rates
- No separate chilled water pipework needed

Restrictions

- Substantial space requirement (typical preliminary planning issue)
- Balance between supply and exhaust need to be taken care of

TYPICAL INPUT VALUES AND OPERATION RANGES

Energy-efficient system	
Room temperature	23...25 °C
Supply air temperature	14...28 °C
Outdoor airflow rate/ floor area	1.5...5 (8) l/s/m ²
Cooling capacity / floor area	... 40 (80) W/m ²
Heating capacity / floor area	... 25 (40) W /m ²
Target duct zone pressure level	50 ... 100 Pa
Sound pressure level	< 33 dB(A)

Traditional system	
Room temperature	23...25 °C
Supply air temperature	14...28 °C
Outdoor airflow rate/ floor area	2...6 (10) l/s/m ²
Cooling capacity / floor area	... 80 (120) W/m ²
Heating capacity / floor area	... 40 (60) W /m ²
Target duct zone pressure level	100 ... 200 Pa
Sound pressure level	< 35 dB(A)

Applications & Building Types

Most beneficial in buildings and spaces where occupancy And heat loads vary strongly

- daily
- hourly

Assembly buildings

theatres, cinemas, concert halls
exhibition halls

Conference facilities

convention centers

Hospitals

patient care rooms
laboratories, isolation rooms

Commercial buildings

Shopping centers
Restaurants, hotels

Educational Buildings

universities, schools
laboratories

Office buildings

Meeting, team and conference rooms
Landscape offices

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Variable Flow Systems

Variable Pressure Ductwork Zones

Pressure-independent airflow control

Supply air control

Cooling & air quality control

Terminal Reheat Unit

Separate Heating System

Exhaust air control

Local exhaust units in laboratories

Room / Zone airflow balance

Exhaust based on tracking supply airflow rate

Constant Pressure Ductwork Zones

Pressure-dependent airflow control

Active Diffusers

Variable Chilled Beams

Zone Pressure Control (ZPC)

Active diffuser & Radiant ceiling

Zone Pressure Control (ZPC)

Room / Zone airflow balance

Exhaust based on tracking supply airflow rate

Variable Pressure Plenum

Cooling & air quality control

Under-floor air distribution

Airflow Control, pressure-independent operation

Room controller

- control signal based on measured temperature / air quality deviation from the setpoint and proportional band (P- & PI -control)
- control signal is analogue standard signal ; 0...10 VDC or 4...20 mA

Airflow controller

- measures air flow rate continuously
- calculates the respective airflow control setpoint based on defined airflow range (min-max)
- adjusts the damper blade position to achieve the desired airflow rate

Room controller and airflow controller can be integrated into a same unit.

Air flow rate	Voltage signal	Current signal
Min	0 VDC	4 mA
Max	10 VDC	20mA

$$\Delta P_m = \zeta * \frac{1}{2} * \rho * v^2 \quad v = \frac{q_v}{A}$$

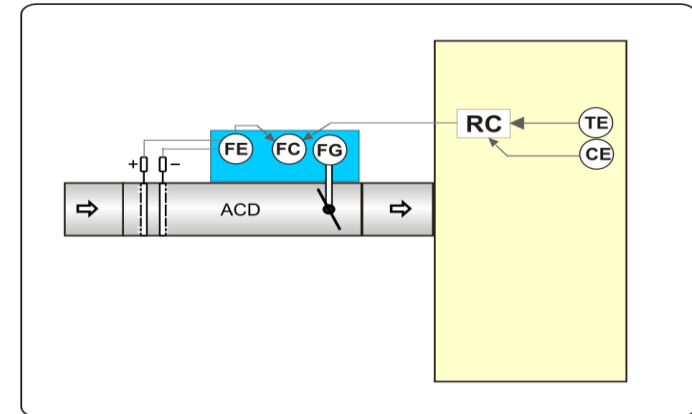
$$q_v = A * \sqrt{\frac{2 * \Delta P_m}{\zeta * \rho}} \quad k = \frac{A * \sqrt{2}}{\sqrt{\zeta * \rho}}$$

$$q_v = k * \sqrt{\Delta P_m}$$

Attention

- airflow measurement conditions ; sufficient safety distances
- airflow range; measurable min. air flow rate :
 - cross pipe measurement ; duct velocity >1.5 m/s
 - Orifice measurement; duct velocity > 0.6 m/s

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Airflow Control, pressure-dependent operation

Operation

Airflow control is based on known relationship between available duct static pressure and damper opening

No airflow measurement required

Allows low operating static duct pressures

Basic proportional control

- open control loop (no feedback)
- temperature, air quality
- airflow with linear operation of damper blade
- constant pressure ductwork

Minimum and maximum airflow rate adjustment

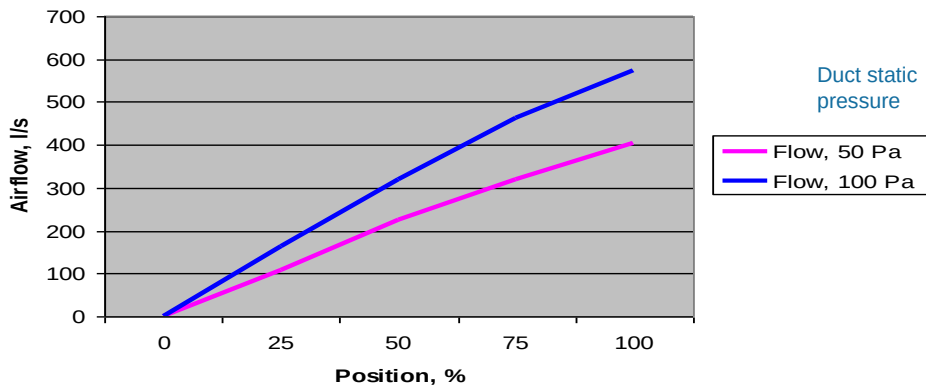
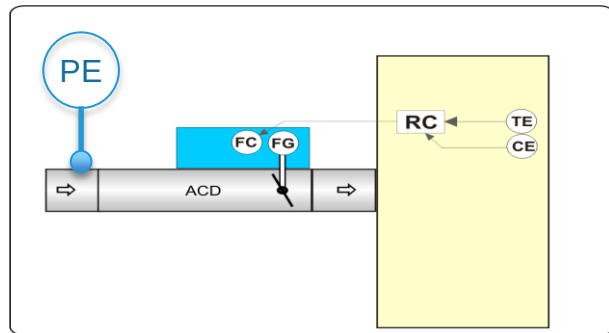
- mechanical or electric limit of the damper actuator movement

Benefits

Airflow control with low airborne sound generation level

Low radiated sound generation level

Stable operation, also with low airflow rate



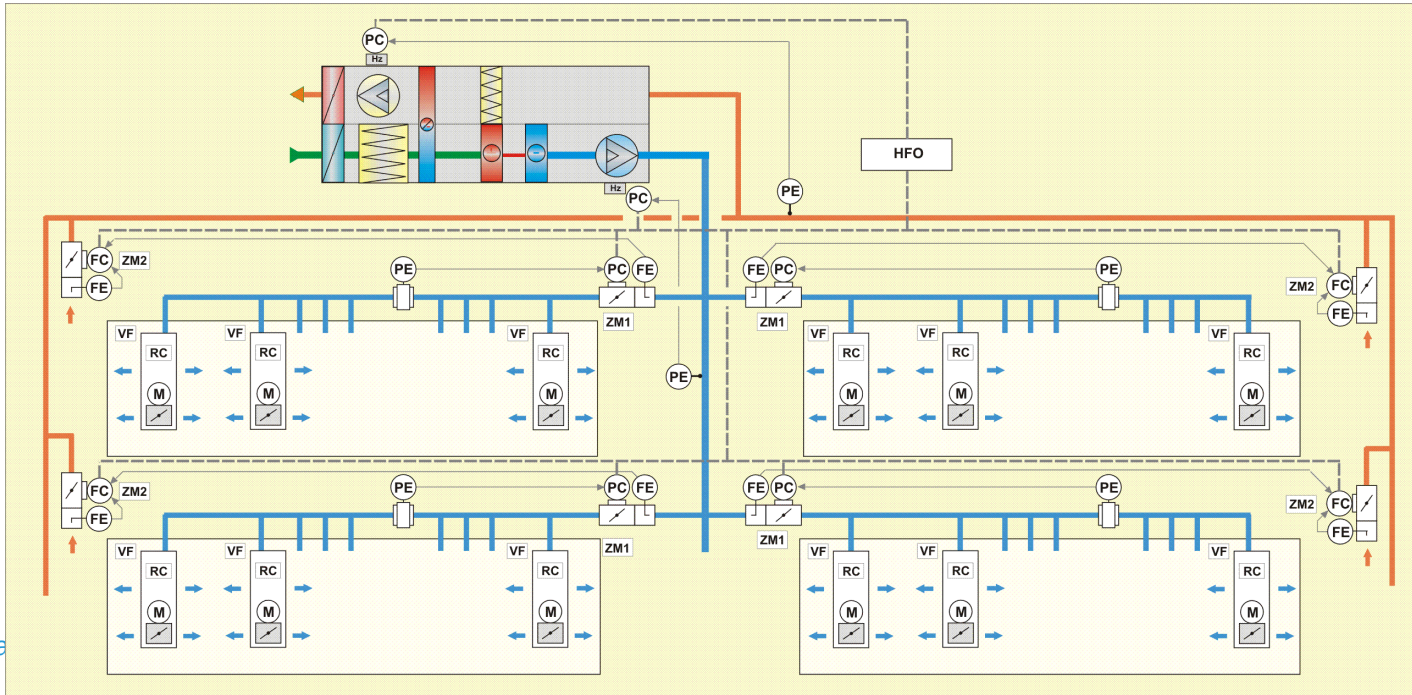
Fan Pressure & Supply Temperature Control

Elimination of Excessive Pressure Levels at low Load Conditions

- Achieve energy savings
- Avoid high sound level generation

Fan Speed Optimization using Fan Optimizers and Frequency Converters

- Pressure sensor location representative of duct pressure conditions



Supply temperature control

- Common constant temperature
- Zone temperature control(reheat / recool)
- Outdoor temperature compensated
- Avoid simultaneous cooling and heating

Fan Pressure Sensor Location

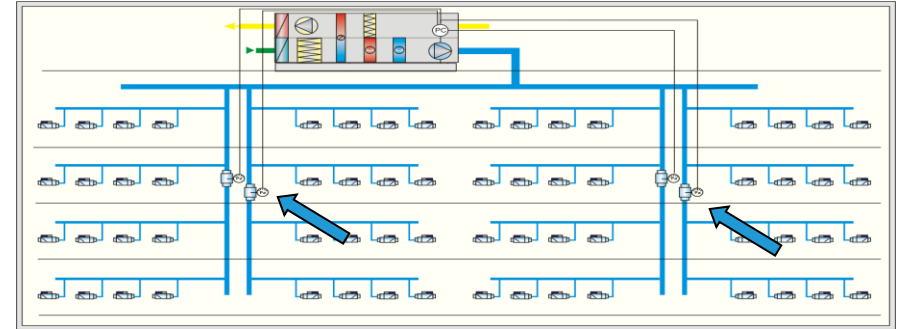
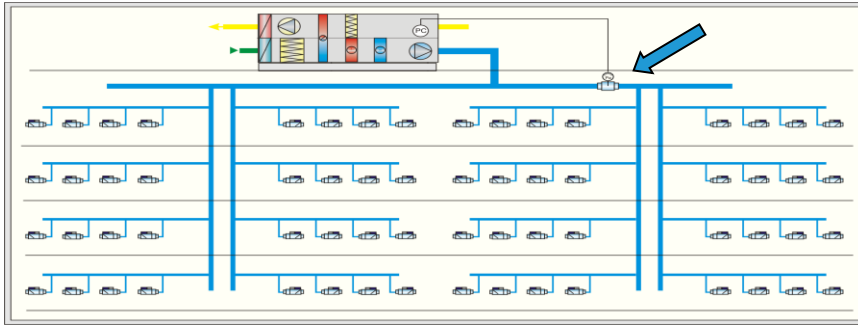
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Avoid excessive high pressure levels

Pressure measurement represents duct pressures conditions in the entire ductwork.

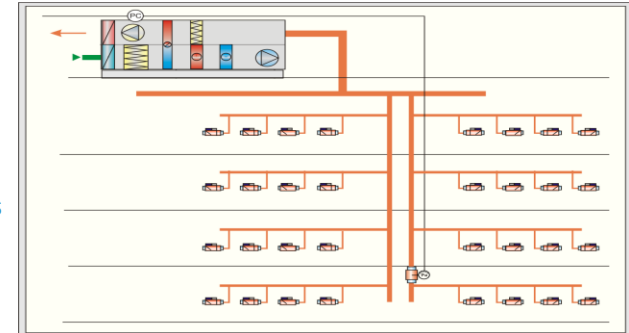
Insensitive for local airflow rate variations in ductwork sections

Non-disturbed flow conditions > Stable static pressure >> tuning of control parameters



Pressure is typically at higher level when pressure sensor is located closer to the fan, because estimated safety marginal is higher.

Pressure sensor location in exhaust duct: At the end of the ductwork to secure the exhaust rates for negative pressure.
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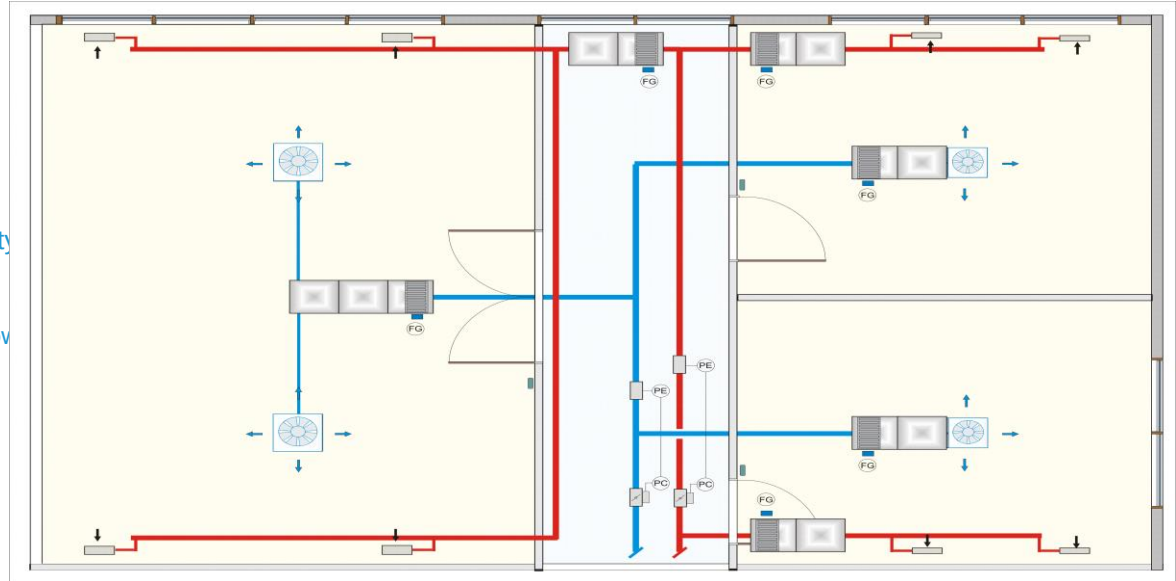


Control zone size

- * Individual room control
 - Individual conditions
- * Flexibility for lay-out changes
 - Smaller modules improve flexibility
- * Uniform/non-uniform load profiles
 - open offices on the same façade allow larger modules
- * Supply & exhaust balance
- * Cost implications

For full flexibility:

every room / work post as its own control zone



Diversity in Design

Diversity of Peak Loads

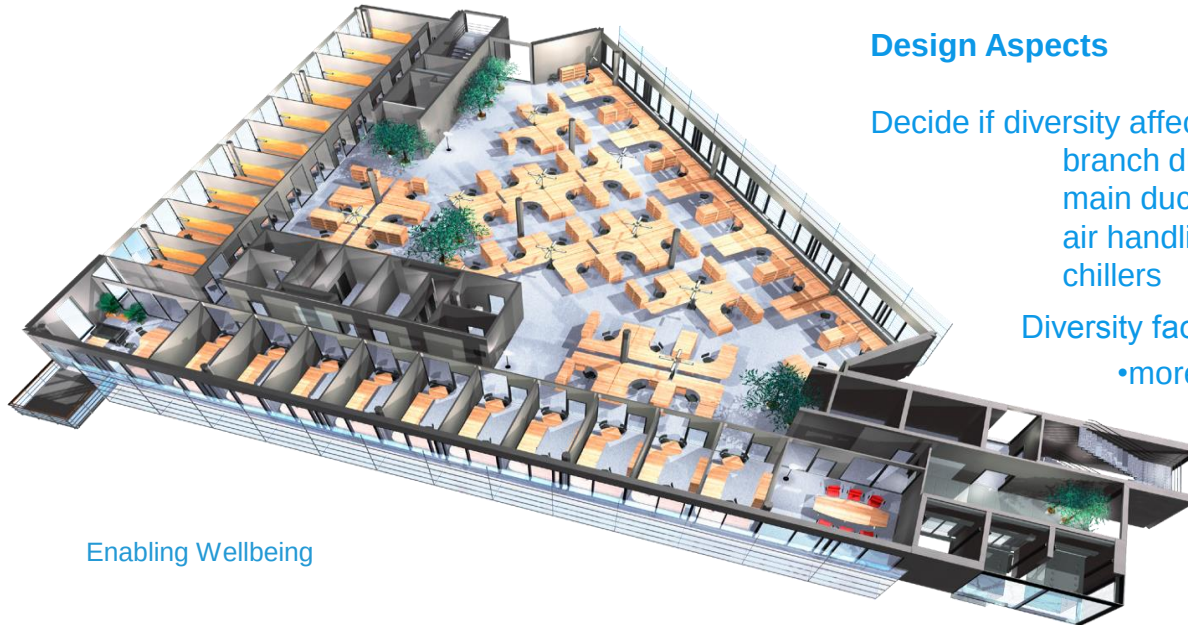
- Occurrence of simultaneous peak loads in various parts of the building affected by
 - Diversity of solar heat gains
 - Diversity and variable capacity level capacity of occupancy loads

Design Aspects

Decide if diversity affects the sizing of
branch ducts
main ducts
air handling units
chillers

Diversity factor ranges between 0,5 ...0.9

- more precise estimation using simulation software



Design Check List

Phase	Topic	Note
Target levels Design data	Indoor climate conditions Heat loads,contaminant loads	Control parameters Sound levels
Preliminary design	Space program Operation hours	Air handling unit service areas
	Space reservations	Plant rooms Shaft Ceiling voids
	Airflow control principle	Pressure independent Pressure-dependent Constant duct pressure
	Supply and exhaust arrangements Ductwork lay-out	
Airflow rates	Minimum airflow rates Maximum airflow rates	Hygiene Temperature control Contaminant control
Duct design	Energy-efficiency Diversity & reservation for load increase Maintenance Noise calculations	Symmetric lay-out, Tightness Main duct sizing Cleaning access Check noise level with max. and min. air flow rates

Supply and Exhaust Balance

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Supply and exhaust units in each space

A. Parallel control

parallel control using common control signal of the room controller

equal airflow min. and max airflow rate settings for neutral pressure conditions

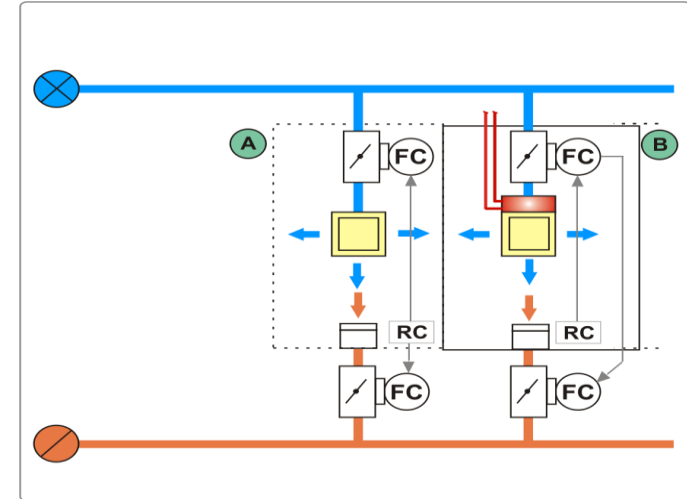
shifted airflow rate settings (+ or - marginal) for pressurization

- absolute difference or percentage difference

B. Master-slave control

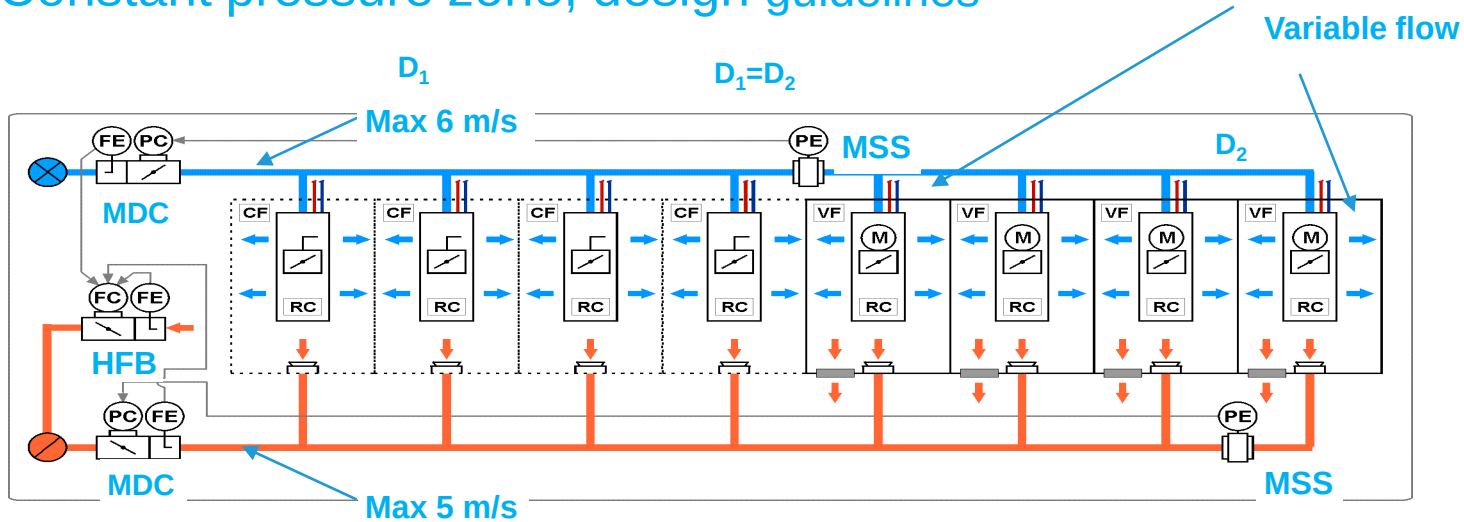
master unit (supply or exhaust) controls the flow between min. and max flow rates based on the control signal of the room controller

slave unit receives the control signal corresponding the actual airflow rate value from the master unit. The slave unit has nominal airflow rate calibration



A. Parallel control B. Master-slave control

Constant pressure zone, design guidelines



0) Calculate the maximum air flow demand on zone, including amount of meeting rooms

1) Size the zone duct

- Maximum air velocity is 6 m/s at the beginning for zone, on supply
- Maximum air velocity is 5 m/s at the beginning for zone, on exhaust
- Same duct size all the way

2) Location of pressure sensor

- On supply – at the middle of zone
- On exhaust – at the far end of zone

3) Constant pressure damper

- Air velocity at damper > 2 m/s

Duct Design; Symmetric topology

optimization of required pressure levels

- energy-efficiency
- acoustic conditions
- commissioning

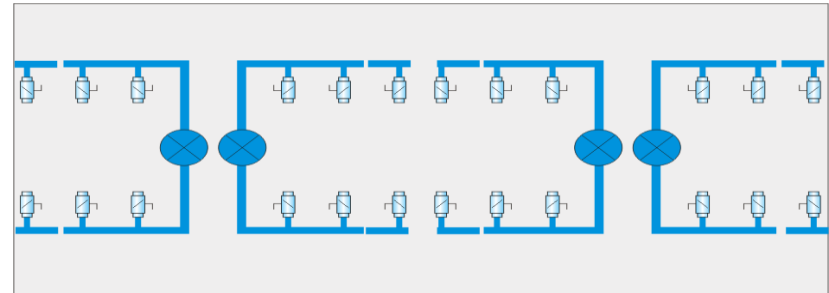
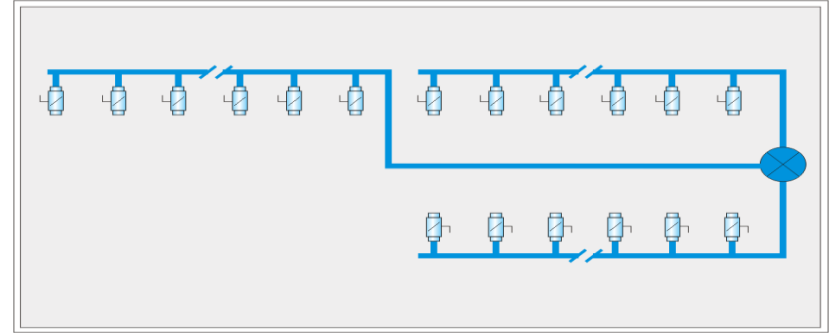
geometrically

aerodynamically , more importantly

- branch with highest pressure level demand dictates the system pressure level
- other branches are adapted by throttling the flow

division of ductwork in symmetric sections

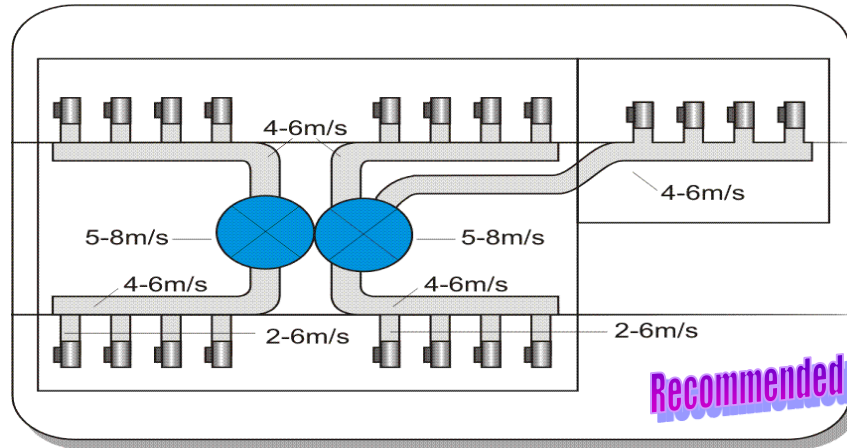
- same pressure loss levels
- longer branches > larger ducts for equal pressure levels in sections.



Duct Design; Duct Velocities

Main main supply ducts

- Equal friction method
- Friction losses in range 0,8...1,2 Pa/m for energy-efficient operation.



Low Pressure (Velocity) Ductwork

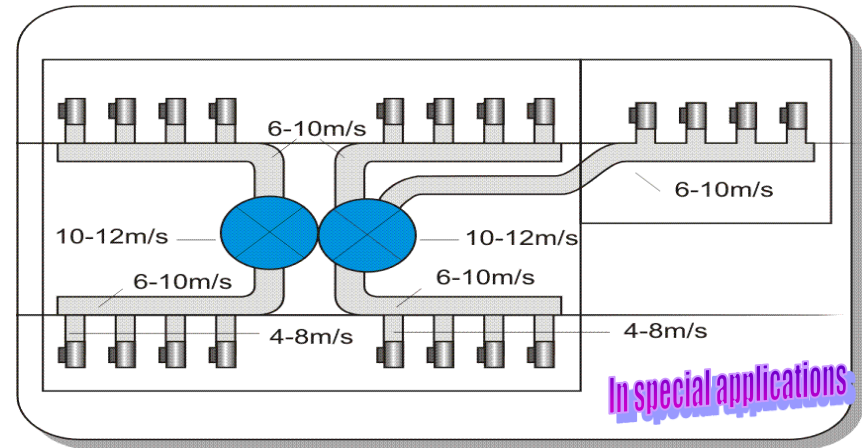
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Supply main branch ducts

- Static regain method
- Objective: same static pressure at diverging duct branches.
- Duct size is not reduced by the air flow rate reduction in diverging T-branches,

Exhaust ductworks

- Equal friction method ; 0,8 ...1 Pa/m for friction losses



High Pressure (Velocity) Ductwork

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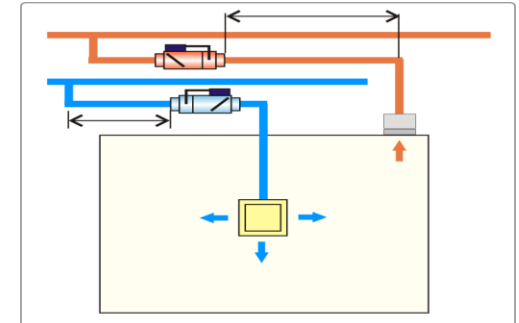
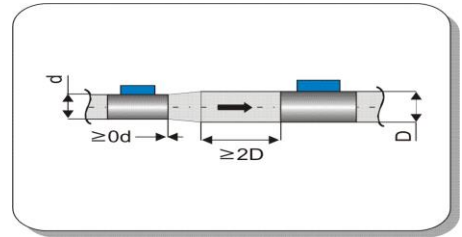
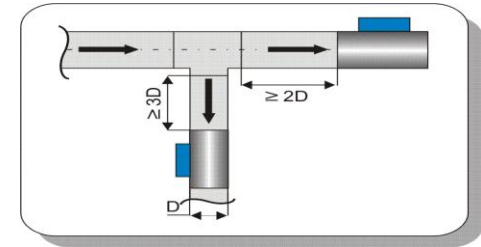
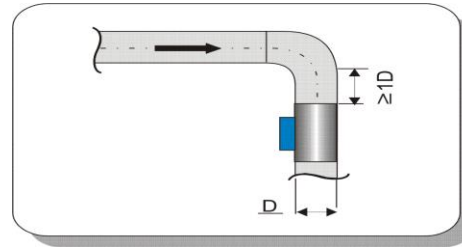
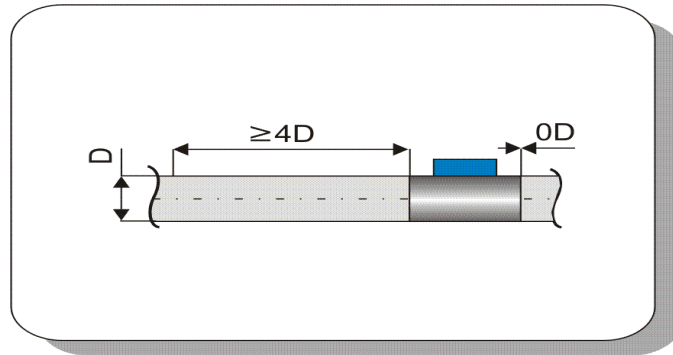
Safety Distances

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The flow disturbances like duct curves, T-branches, baffle sound attenuators (exhaust air !) etc. upstream of the airflow control damper cause turbulence and uneven flow pattern and consequently inaccuracy and fluctuation of the measurement value.

Recommendation

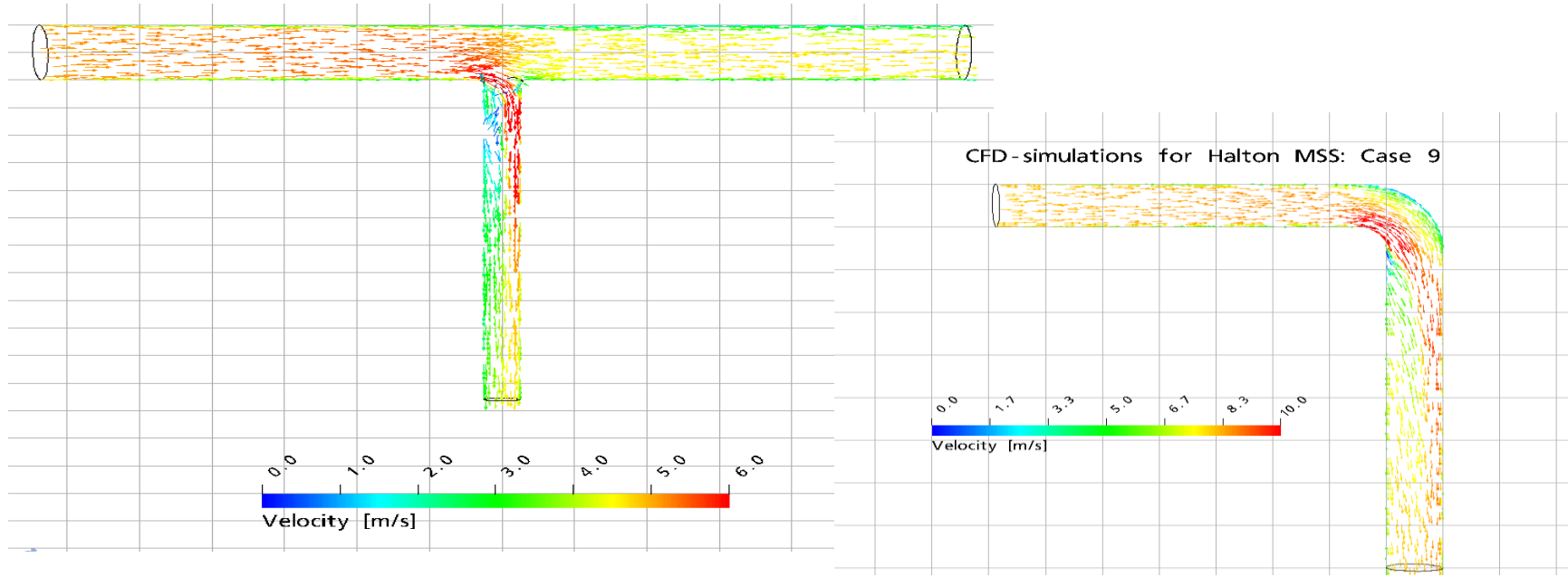
Minimum safety distances between flow disturbances and airflow control damper



Safety Distances

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The flow disturbances like duct bends, T-branches, baffle sound attenuators (exhaust air !) etc. up-flow of the airflow control damper cause turbulence and uneven flow pattern and consequently inaccuracy and fluctuation of the measurement value.



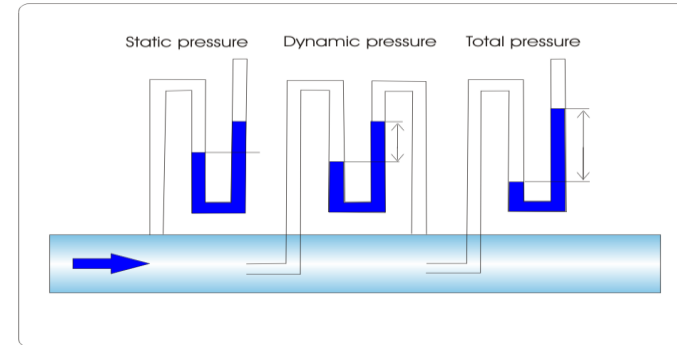
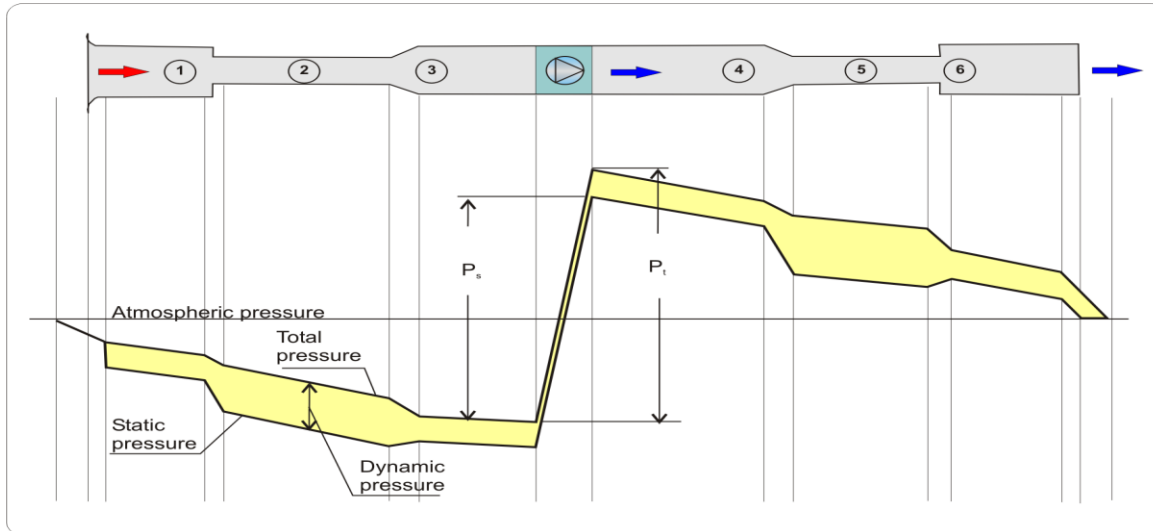
Duct Pressure Conditions

Total pressure = static pressure + dynamic pressure

$$(\Delta p_t = \Delta p_s + \Delta p_{dyn})$$

When dynamic pressure increases due to higher velocity in the duct ; the static pressure decreases and vice versa
Pressure changes along the ductwork with constant airflow rate due to

- friction losses (in straight duct) relative to duct air velocity in power 2 ($k * v^2$)
- dynamic (fitting) losses (duct parts etc.) relative to duct air velocity in power 2, ($k * v^2$)
- fan pressure gain.



Acoustic design; Damper Selection

Air velocity for damper selection

- maximum airflow rate 5...8 m/s
- minimum airflow rate > 1 m/s (model dependent)

Define the required damper pressure difference based on ductwork calculations

Calculate the pressure level ($\Delta p_{s\ md}$) for the aerodynamically most demanding duct branch at max. flow conditions:

- terminal unit (with plenum if selected)
- sound attenuator
- reheat unit
- branch duct and duct parts
- add 30 ..50 Pa for the air flow control damper in order to have stable operation

Calculate the pressure drop (Δp_{s1}) for between the studied branch and aerodynamically most demanding duct branch

Add $\Delta p_{s\ md} + \Delta p_{s1} - \Delta p_{s2}$ to get the pressure level for the studied duct branch

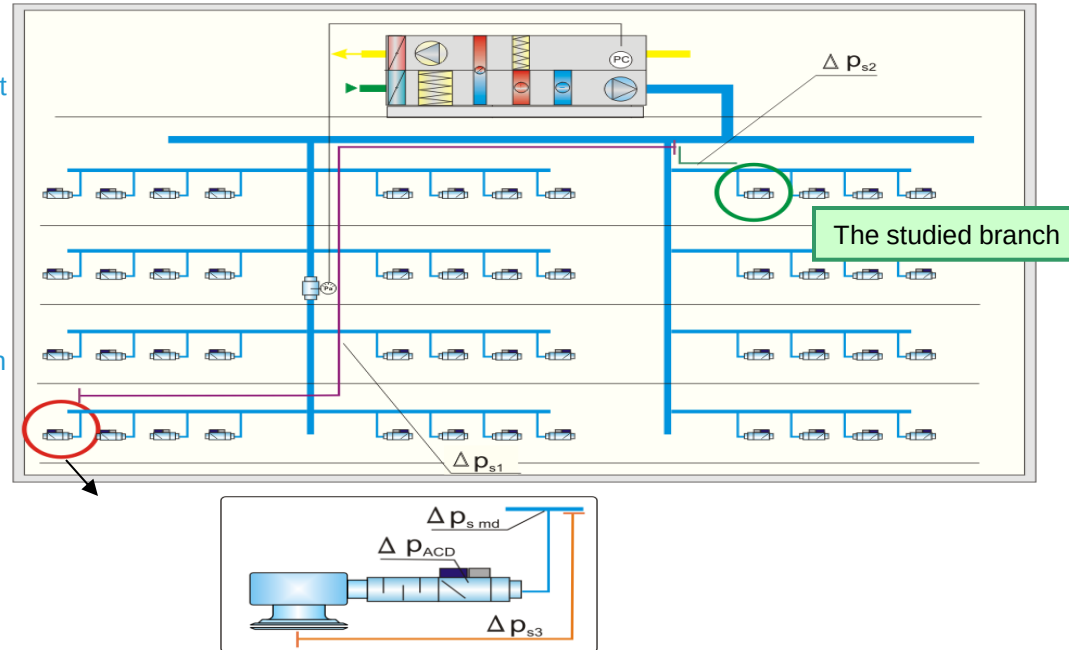
Estimate the pressure drop in the studied duct branch Δp_{s3} and estimate the required damper pressure drop

Δp_{ACD}

- at max flow conditions
- at min. flow conditions

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Note: In practise the airflow control damper is often one size smaller than the branch duct.



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Check sound level for the studied branch

Maximum and minimum airflow rate conditions

Use pressure drops Δp_{ACD} as described above.

Select sound attenuator when needed

Notes

Sound level at min. flow conditions of the branch is normally estimated using the max. flow rates of the other branches in the zone.

Min. flow conditions can also be decisive for the acoustic conditions.

Pressure sensor set value need to be taken into account when it rises the duct work pressure levels.

Pressure sensor set value can be used as the basis of the pressure level estimations.

Selection of Circular Airflow Control Damper												
			Model		Air velocity							
			Control damper	HFB	200	m/s						
Max. flow conditions			Airflow Rate max.	200	l/s	6,4						
			Pressure Drop	200	Pa							
			Type	Hz	63	125	250	500	1000	2000	4000	8000
Airflow Control Damper				dB	55	62	63	60	61	63	64	20
Sound Attenuator			H1	dB	9	15	13	22	33	34	25	17
Terminal Attenuation			THB+TRI	dB	4	3	14	20	18	14	16	18
Room Attenuation				dB	4	4	4	4	4	4	4	4
Sound Pressure Level in Room			28	dB(A)	38	40	32	14	6	11	19	0
Sound generation by terminal			32	dB(A)	46	39	35	35	32	19	5	3
Min. flow conditions			Airflow Rate min.	60	l/s	1,9						
			Pressure Drop	250	Pa							
				Hz	63	125	250	500	1000	2000	4000	8000
Airflow Control Damper				dB	46	51	59	59	58	59	56	19
Sound Attenuator			H1	dB	9	15	13	22	33	34	25	17
Terminal Attenuation			THB+TRI	dB	4	3	14	20	18	14	16	18
Room Attenuation				dB	4	4	4	4	4	4	4	4
Sound Pressure Level in Room			22	dB(A)	29	29	28	13	3	7	11	0
Sound generation by terminal			23	dB(A)	40	36	30	21	20	16	5	3

Airflow control damper selection ; Example

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Airflow rate 180 l/s (Min. 60 l/s)
 Available pressure in duct 180 Pa (168 Pa for damper)
 Airflow control damper HFB/G-200
 Room duct pressure losses diffuser at à 90 l/s 32 Pa
 duct branch 25 Pa >>> 168 Pa

Damper pressure drop (incl. attenuator) 164 Pa (damper position 60 %)

Sound pressure level

Hz	63	125	250	500	1000	2000	4000	8000
Attenuation in	54	55	53	54	53	51	20	
terminal unit	23	17	11	9	10	8	8	8
Without room	30	37	44	44	44	45	43	- Sound pressure level 59 dB(A)

Damper pressure drop (incl. attenuator) 164 Pa (damper position 60 %)

Sound attenuator 600 m ; SA=H1

Damper pressure drop (incl. attenuator) 168 Pa (damper position 61 %)

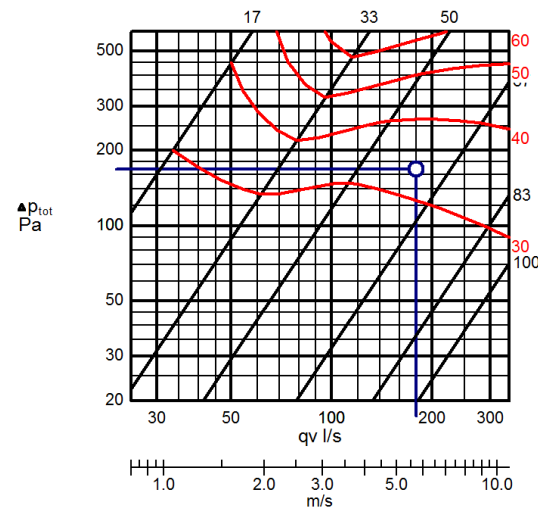
Sound pressure level

	250	500	1000	2000	4000	8000	Hz	63	125
Terminal unit	44	40	43	32	23	22	29	5	
attenuation	23	17	11	9	10	8	8	8	

Without room 21 23 22 24 13 14 21 - Sound pressure level 26 dB(A)

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HFB/G-200, SA=H1							
Air borne sound				2007.02			
qv=180 l/s				▲p _{tot} =168 Pa		a=60.8	
L _p Are 10m ² sab=33 dB(A)				NR/NC=30/28			
L _w dB							
63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
44	40	43	32	23	22	29	5



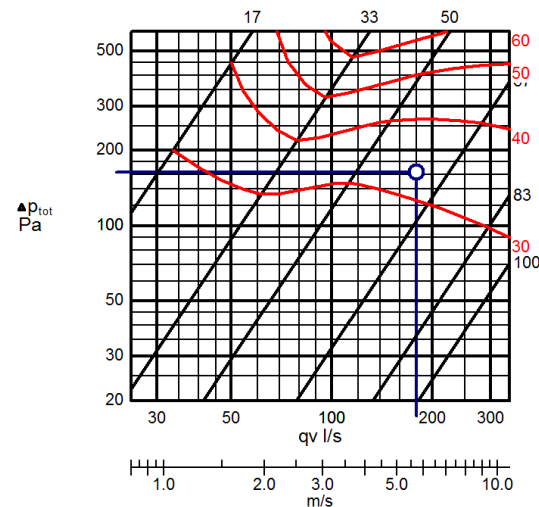
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Airflow control damper selection ; Example

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Airflow rate	180 l/s (Min. 60 l/s)
Airflow control damper	HFB/G-200
Available pressure in duct	220 Pa (168 Pa for damper)
Room duct pressure losses	
diffuser at à 90 l/s	32 Pa
duct branch	25 Pa >>> 168 Pa
Sound attenuator 1000 m ;	-
Damper pressure drop (incl. attenuator)	169 Pa (damper position 60 %)
Sound pressure level	32 dB(A)
Hz	63 125 250 500 1000 2000 4000 8000
	42 40 42 32 23 22 29 5
Terminal unit	23 17 11 9 10 8 8 8
attenuation	
Without room	21 23 31 23 13 14 21 -
Attenuation	
Sound pressure level	27dB(A)

HFB/G-200, SA=H1							
Air borne sound				2007.02			
qv=180 l/s				▲p _{tot} =164 Pa		a=61.1	
L _p Are 10m ² sab=33 dB(A)				NR/NC=30/27			
L _w dB							
63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
44	40	42	32	23	22	29	5

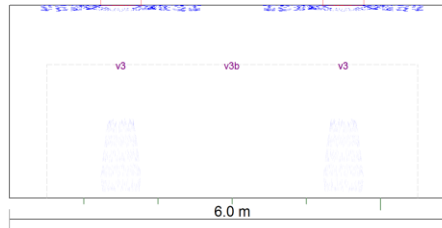


Air Diffusion; Example

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Room dimensions 6x 6 x 2.6 m = 36 m²
 Airflow rate 5 l/s/m² =180 l/s (Min. 60 l/s)
 Diffuser DKS/S 200-600(R4) + TRI/S -200-200-(N)
 Pressure drop 32 Pa (4 Pa)
 Sound pressure level 28 dB(A)

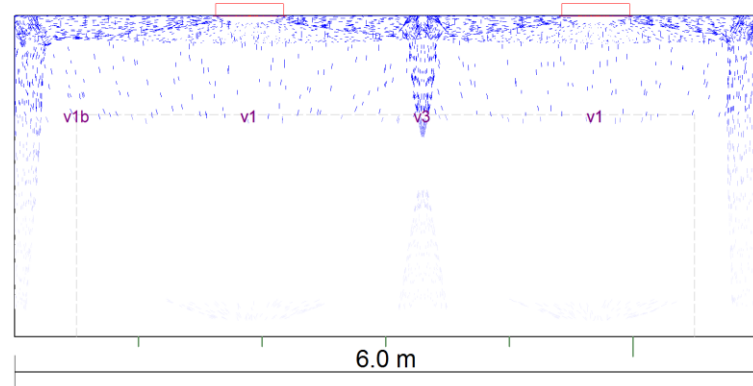
Cooling DKS/S-200-600(R4) + TRI/S-200-200(N) 2016.09			
Room:	6.0 x 6.0 x 2.6 m	Supply air flow rate:	60 l/s (2 x 30 l/s)
Room size:	36 m ²	Supply air temperature:	18.0 °C
Occupied zone:	h=1.8 m / dw=0.5 m	Total pressure drop:	4 Pa
Room air:	24.0 °C / 50 %	Total sound pressure level:	9 dB(A)
Heat gain:	-	Total cooling capacity:	427 W (2 x 214 W)
Installation height:	2.60 m	L _w :	12 W/m ²
		Plenum adjustment:	40.0
Velocity point	v3	v3b	v3
v	~0.20 m/s	~0.10 m/s	~0.10 m/s
ΔT	-0.3 °C	-0.4 °C	-0.4 °C
vlim = 0.20 m/s			



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Min. flow

Cooling DKS/S-200-600(R4) + TRI/S-200-200(N) 2016.09			
Room:	6.0 x 6.0 x 2.6 m	Supply air flow rate:	180 l/s (2 x 90 l/s)
Room size:	36 m ²	Supply air temperature:	18.0 °C
Occupied zone:	h=1.8 m / dw=0.5 m	Total pressure drop:	32 Pa
Room air:	24.0 °C / 50 %	Total sound pressure level:	28 dB(A)
Heat gain:	-	Total cooling capacity:	1282 W (2 x 641 W)
Installation height:	2.60 m	L _w :	36 W/m ²
		Plenum adjustment:	40.0
Velocity point	v1	v1b	v3
v	~0.10 m/s	~0.05 m/s	~0.20 m/s
ΔT	-0.1 °C	-0.1 °C	-0.6 °C
vlim = 0.20 m/s			



Max. flow

Halton Vario Promise

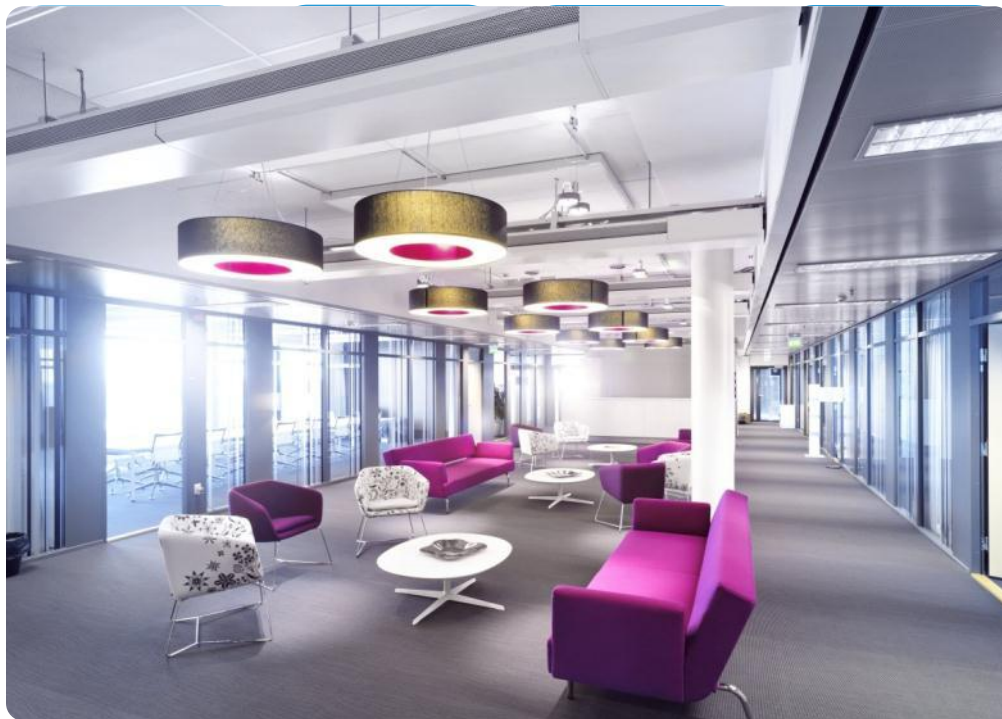


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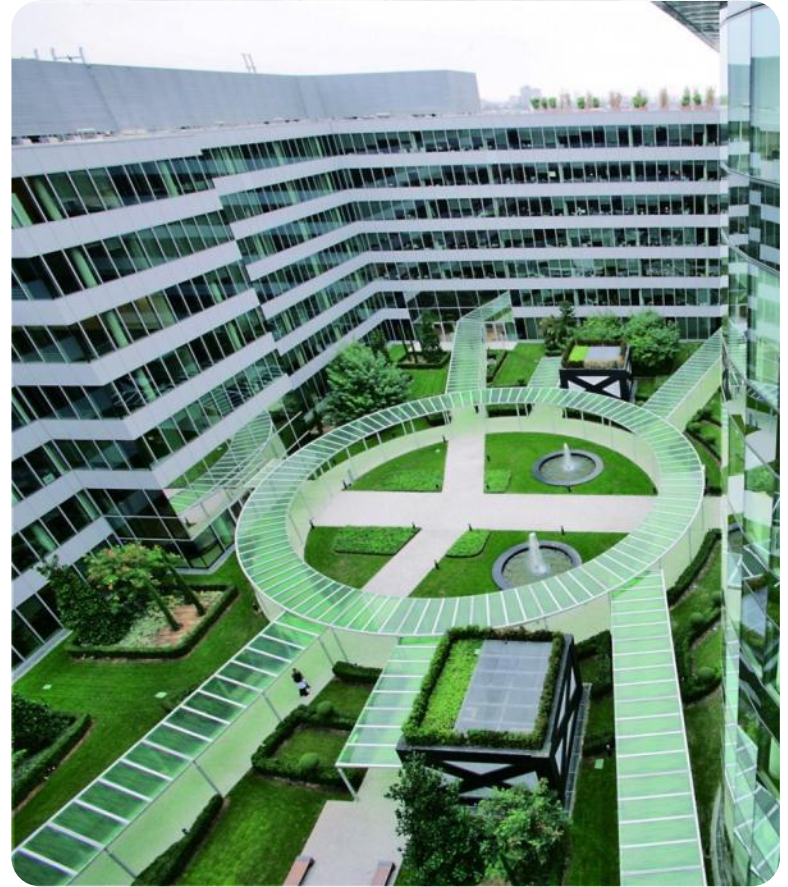


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Halton Vario Solution brings benefits to different target groups



Halton Vario Solution: in brief



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What makes the difference ?



Rooms with Halton Vario

Air – water system



- For offices and meeting rooms with medium to high cooling loads
- Based on Halton Rex 600 chilled beams with smart controls

Hybrid



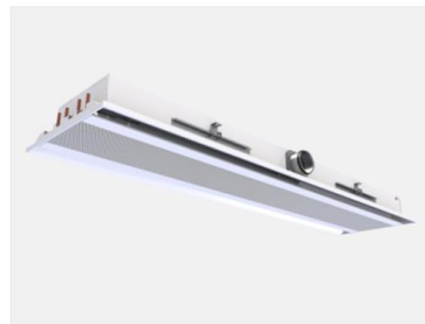
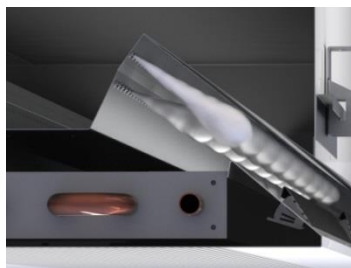
- For offices and meeting rooms with low to medium cooling loads
- Based on Halton Jaz active diffusers with smart controls
- Can also be use with chilled beams in internal zones

Vario; Halton Rex 600 – fully flexible VAV beam



- The first fully flexible chilled beam
- Operation mode controller (unoccupied, occupied, boost)
- 2 coil options: standard, high efficiency
- Lengths with 100 mm interval
- Colours: special and standard colours

Rex for Vario vs. Rex 600



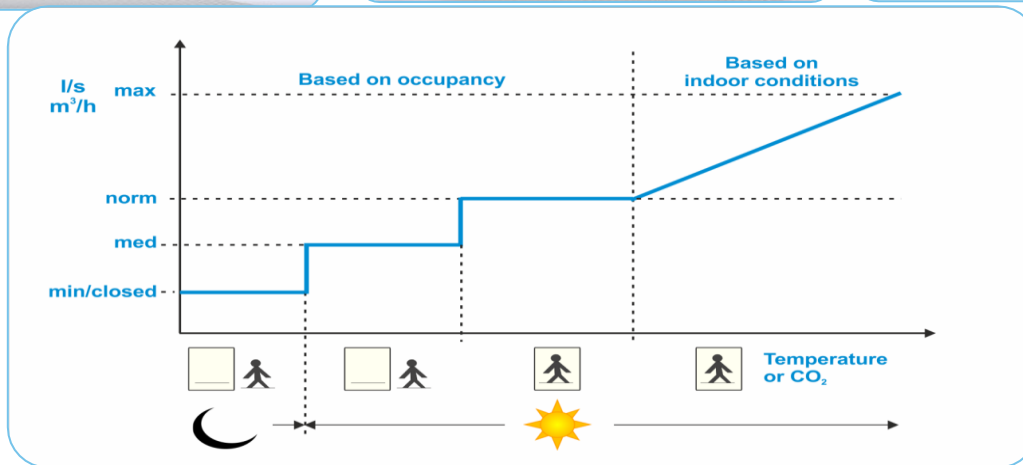
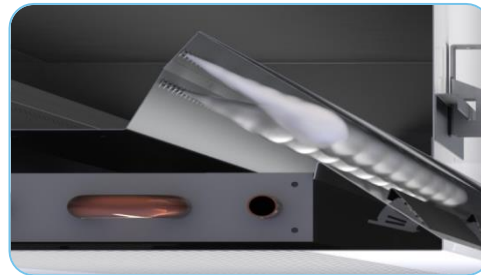
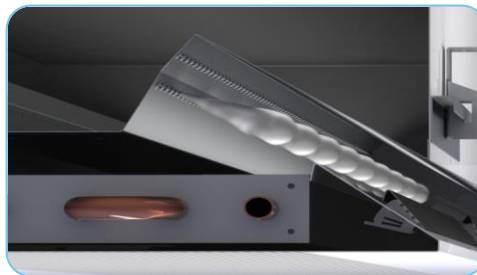
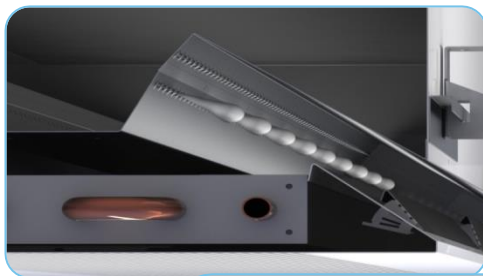
2 plenum application for variable airflow Halton Rex for Vario; (R60)

- Three operation modes:
 - unoccupied office, occupied office and meeting room
- Outdoor air through the two rows of nozzles.
 - First row : Minimum and normal flow
 - Second row: Boost flow

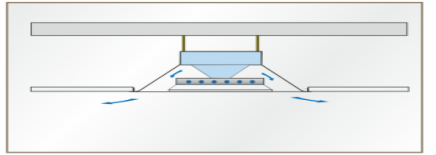
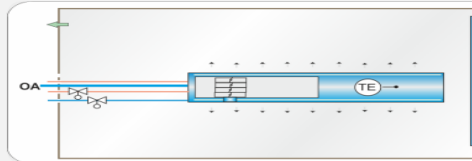
1 plenum with integrated bypass for variable airflow Rex 600; (RE6)

- Two modes: occupied office and meeting room
- Adaptable beam with an HAQ
 - Normal airflow through the nozzles
 - Additional meeting room airflow through the Air Quality Control (HAQ)

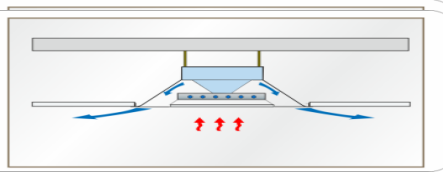
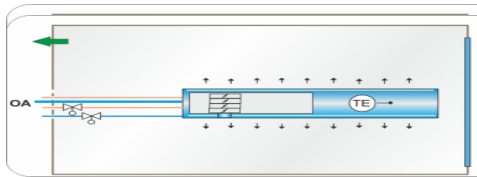
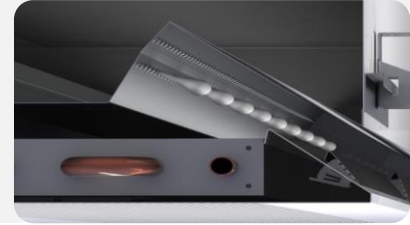
Vario; Airflow control based on occupancy, temperature and CO₂



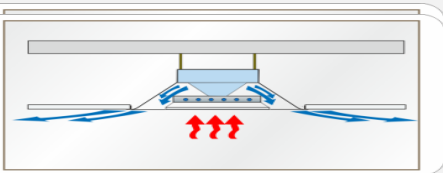
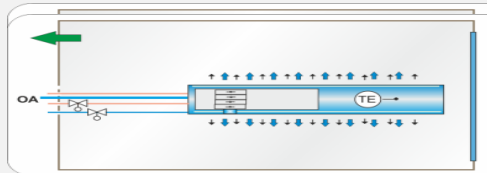
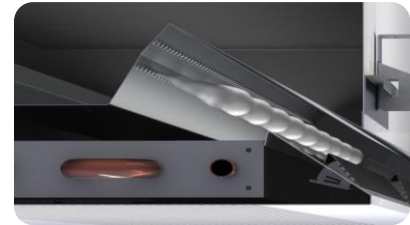
Vario; Throw pattern under control in all operation modes



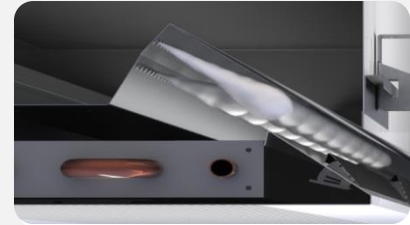
Unoccupied



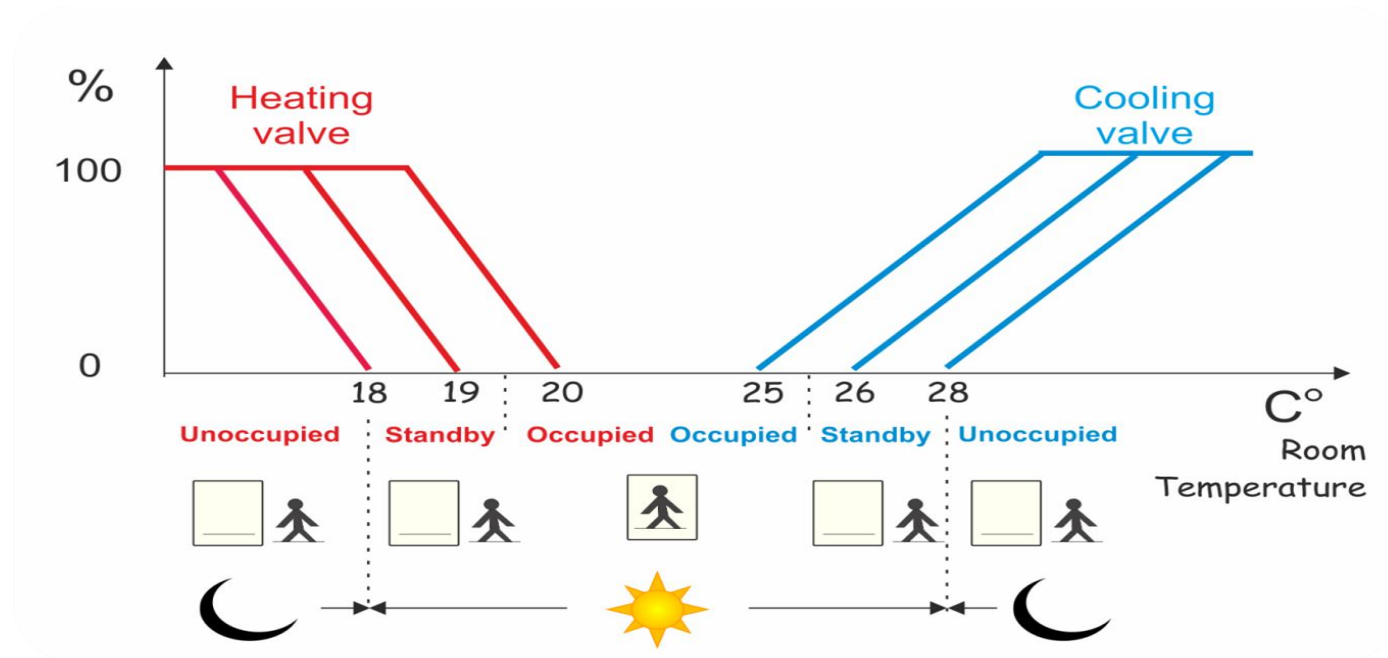
Occupied



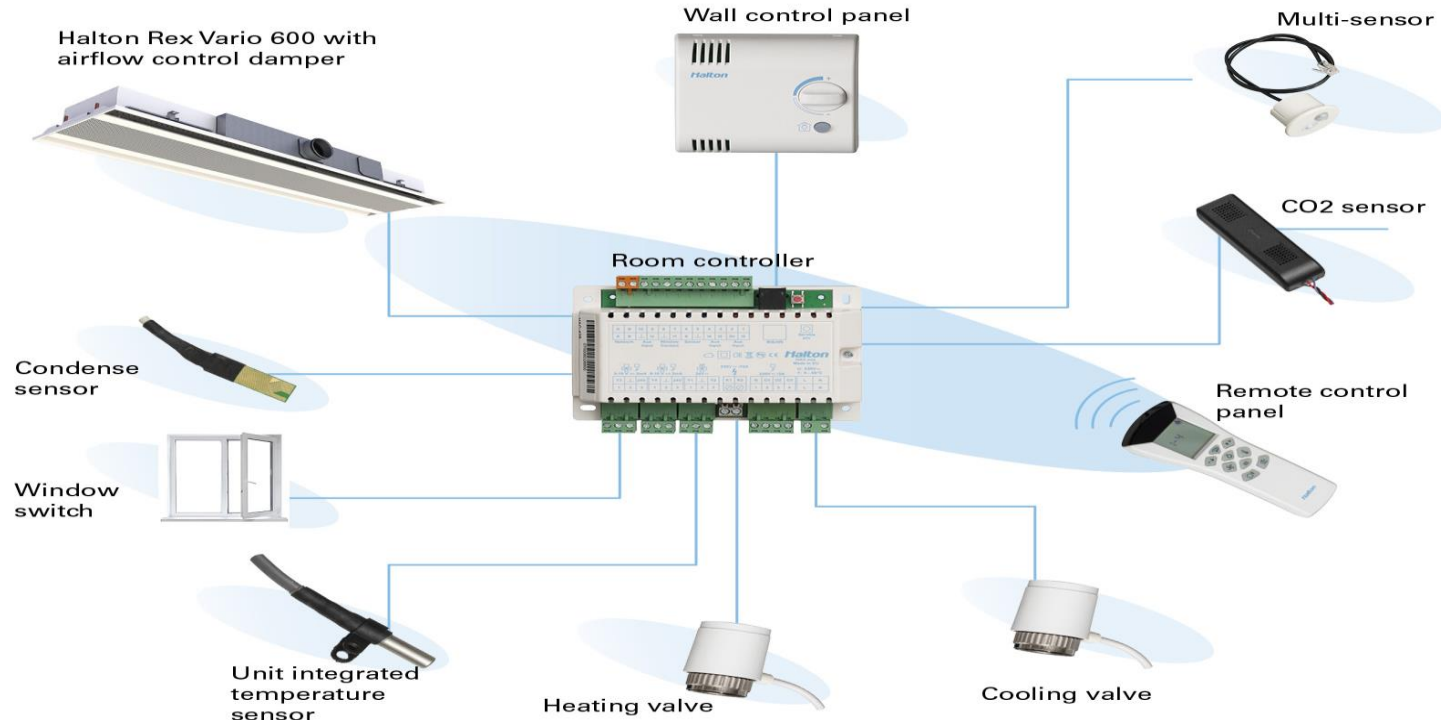
Meeting/Boost^t



Vario; Room air temperature control in heating and cooling



Vario; Room control with air-water system



Halton Vario; Diffuser range Halton Jaz for Vario Solution

Integrated airflow control and diffuser supply throw management

The unit maintains constant supply air outlet velocity between minimum and maximum airflow rates (~ 10 % ... 100 %)

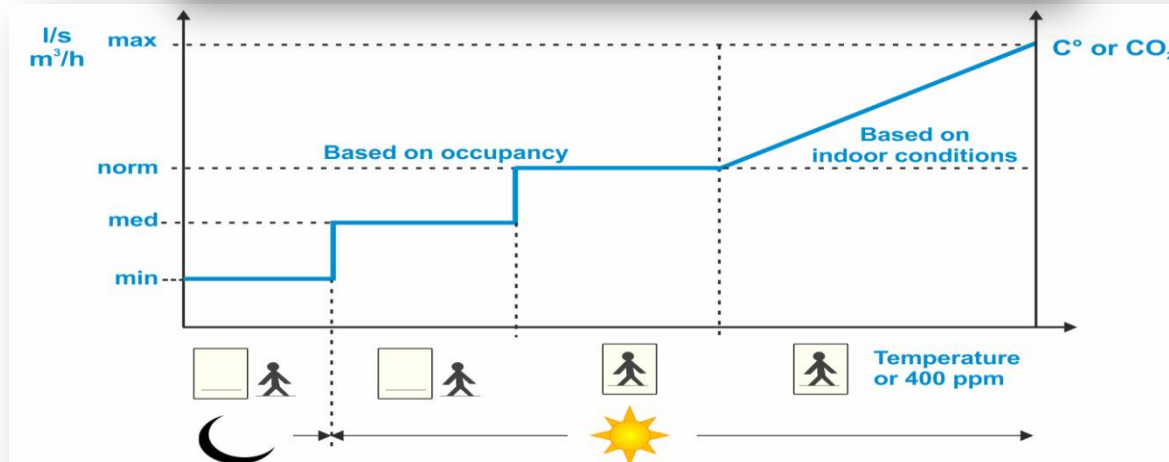
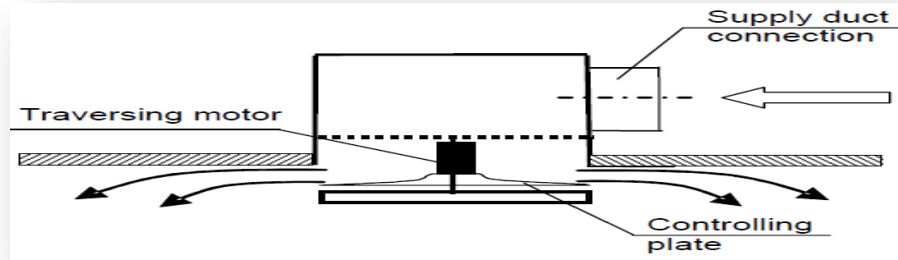
Room conditions are ensured on within the total airflow range in order to avoid draft risk

Active operations available for air supply and exhaust

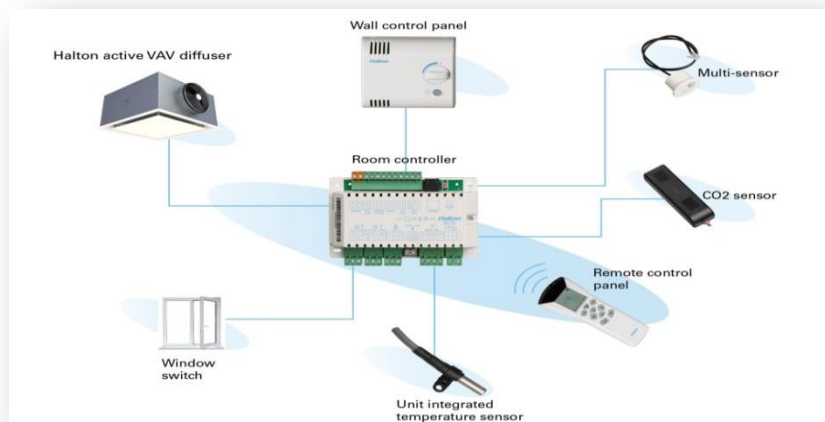
Operates in constant pressure ductwork



Halton Vario; Room air temperature control in cooling mode



Halton Vario; Rooms with all-air system



- Halton Jaz for Vario system integrated room controller
- Room air temperature measurement to control space temperature
- Occupancy sensor for demand based operation with airflow damper
- Air quality control with carbon dioxide sensor, CO2
- Cooling with all air system
- Several user interface options, either wall mounted or hand-held remote controller
- Energy saving window switch operation

Available for LonWorks, BACnet and Modbus

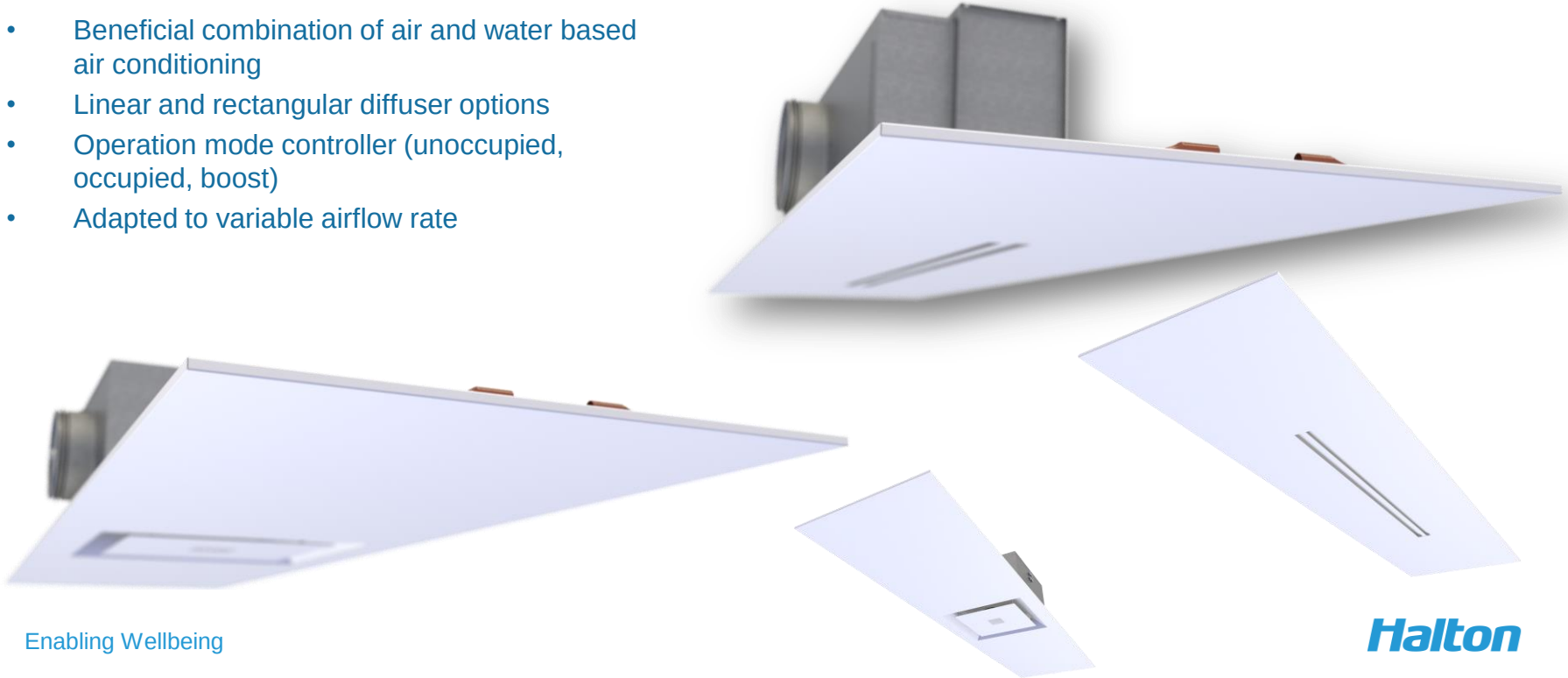
Halton Vario; Halton Jaz Active exhaust air diffuser JDE for VARIO

- Exhaust air diffuser with active operations – motorized damper
- Operating range from ~6 to 90 l/s with 50 Pa pressure $\leq$ 30 dB(A)
- **Operates on constant pressure exhaust duct**
- **Integrated airflow operation with Halton Rex and Halton Jaz**



Variable flow air diffusion & integrated radiant ceiling

- Beneficial combination of air and water based air conditioning
- Linear and rectangular diffuser options
- Operation mode controller (unoccupied, occupied, boost)
- Adapted to variable airflow rate

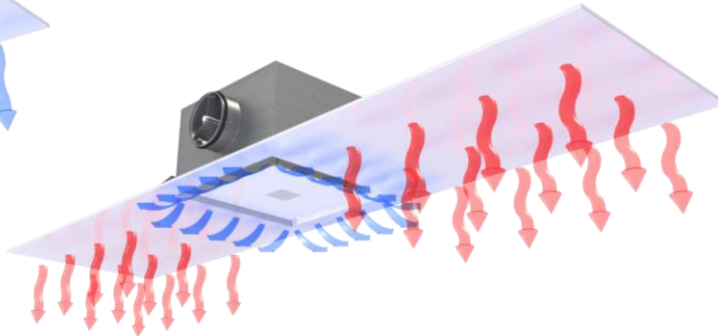
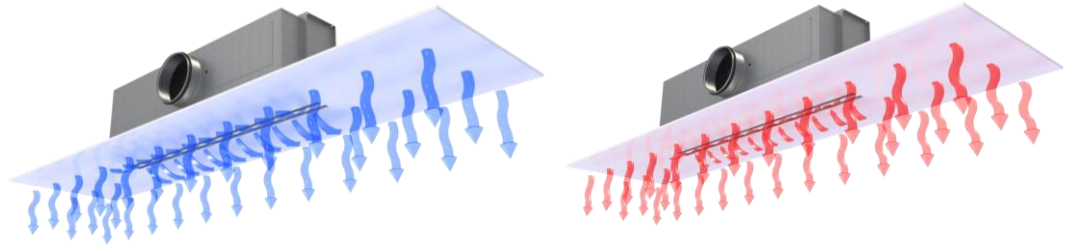


Enabling Wellbeing

Halton

Variable flow air diffusion & integrated radiant ceiling

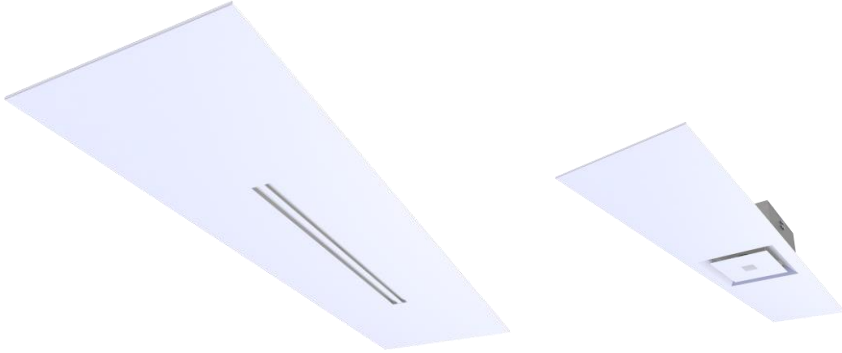
- Radiant ceiling integrated either
 - Supply air diffuser
 - Exhaust air unit
- Radiant ceiling operating for
 - cooling
 - heating



Enabling Wellbeing

Halton

Rex for Vario vs. Rex 600



2 plenum application for variable airflow
Halton Rex for Vario; (R60)

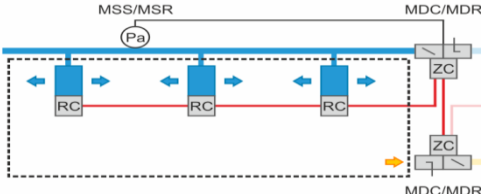
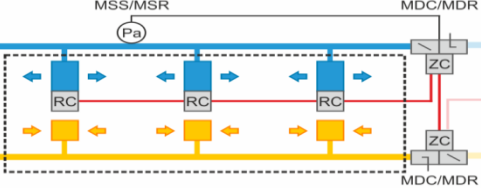
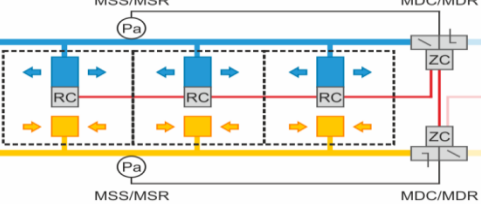
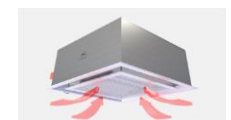
Enabling Wellbeing



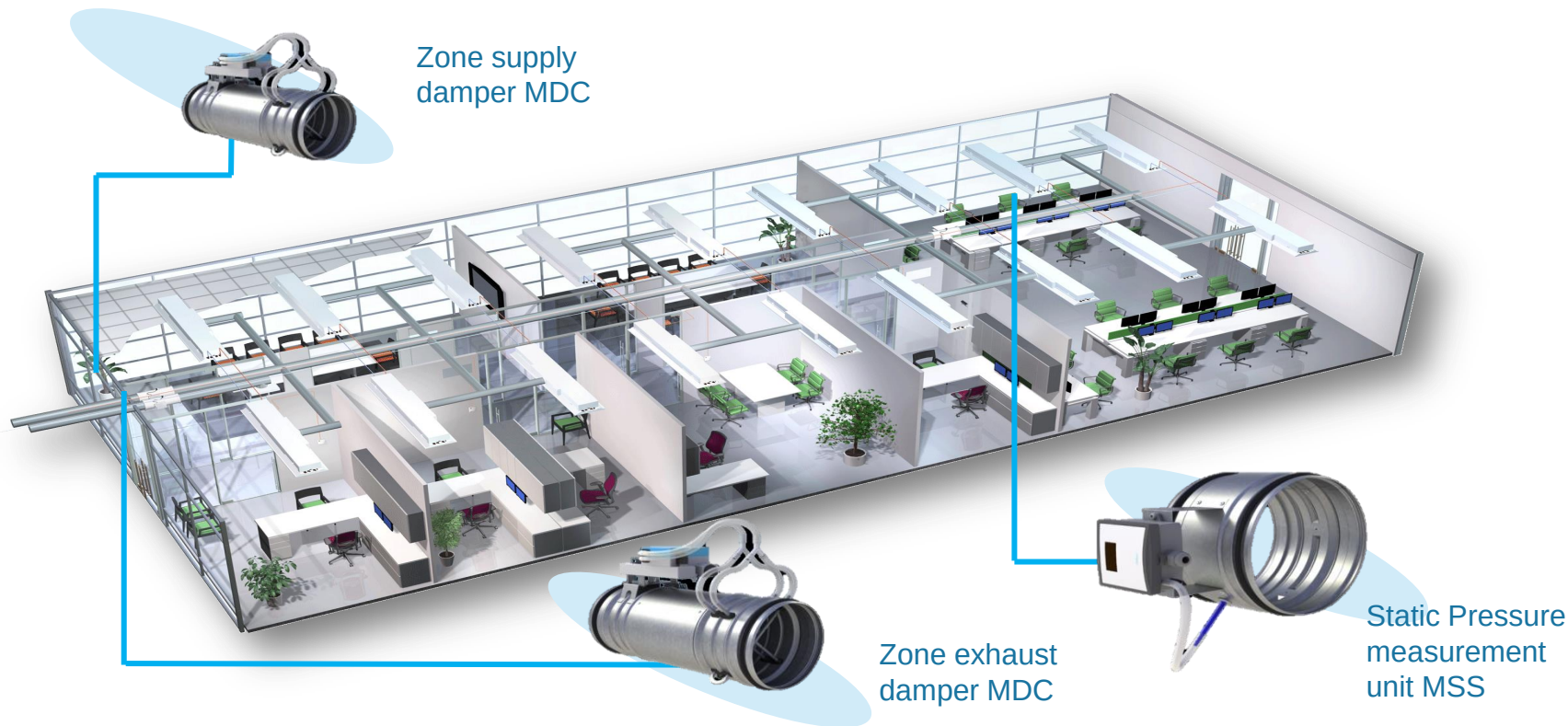
1 plenum with integrated bypass for variable airflow
Rex 600; (RE6)

Halton

Halton Vario; Application options

Zone Common exhaust 	Halton Rex   Halton Rex Grille	Halton Jaz   Halton Jaz Grille
Zonal exhaust 	Halton Rex   Halton Rex VHC/E	Halton Jaz   Halton Jaz VHC/E
Room exhaust 	Halton Rex   Halton Rex JDE	Halton Jaz   Halton Jaz JDE

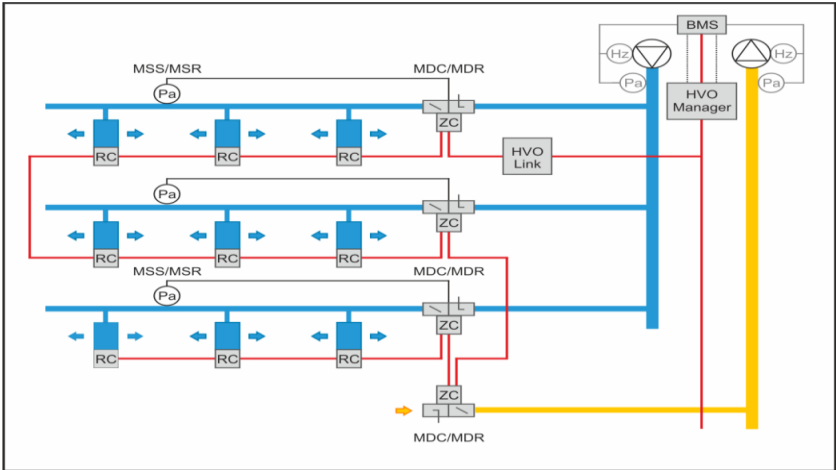
Halton Vario: Flexible ventilation with constant pressure zones



Enabling Wellbeing

Halton

Static pressure supply
and common exhaust



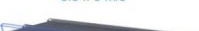
Zone dampers

0.6 .. 5 m/s



MDC
D200...500

0.6 .. 5 m/s



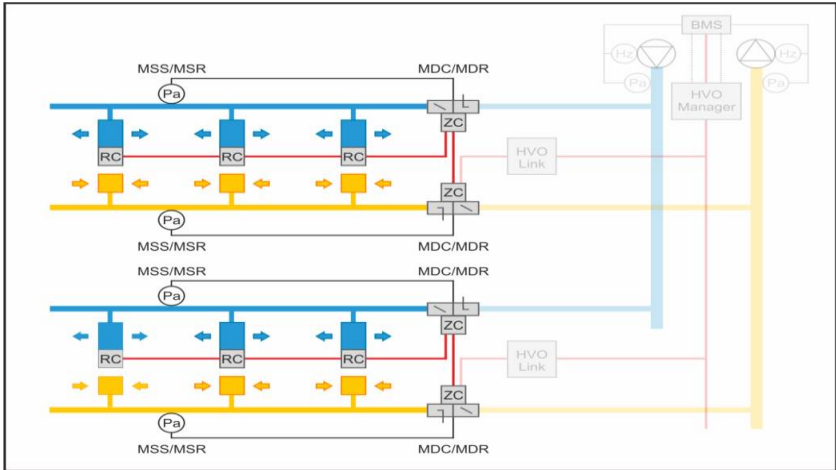
MDR
W = 200 ... 800
H = 200 ... 400

Unit total pressure loss at 5 m/s is ~45Pa



Unit total pressure loss at 5 m/s is ~45Pa

Static pressure supply and exhaust



Static pressure measurement

200 Pa



MSS
D200...500

200 Pa

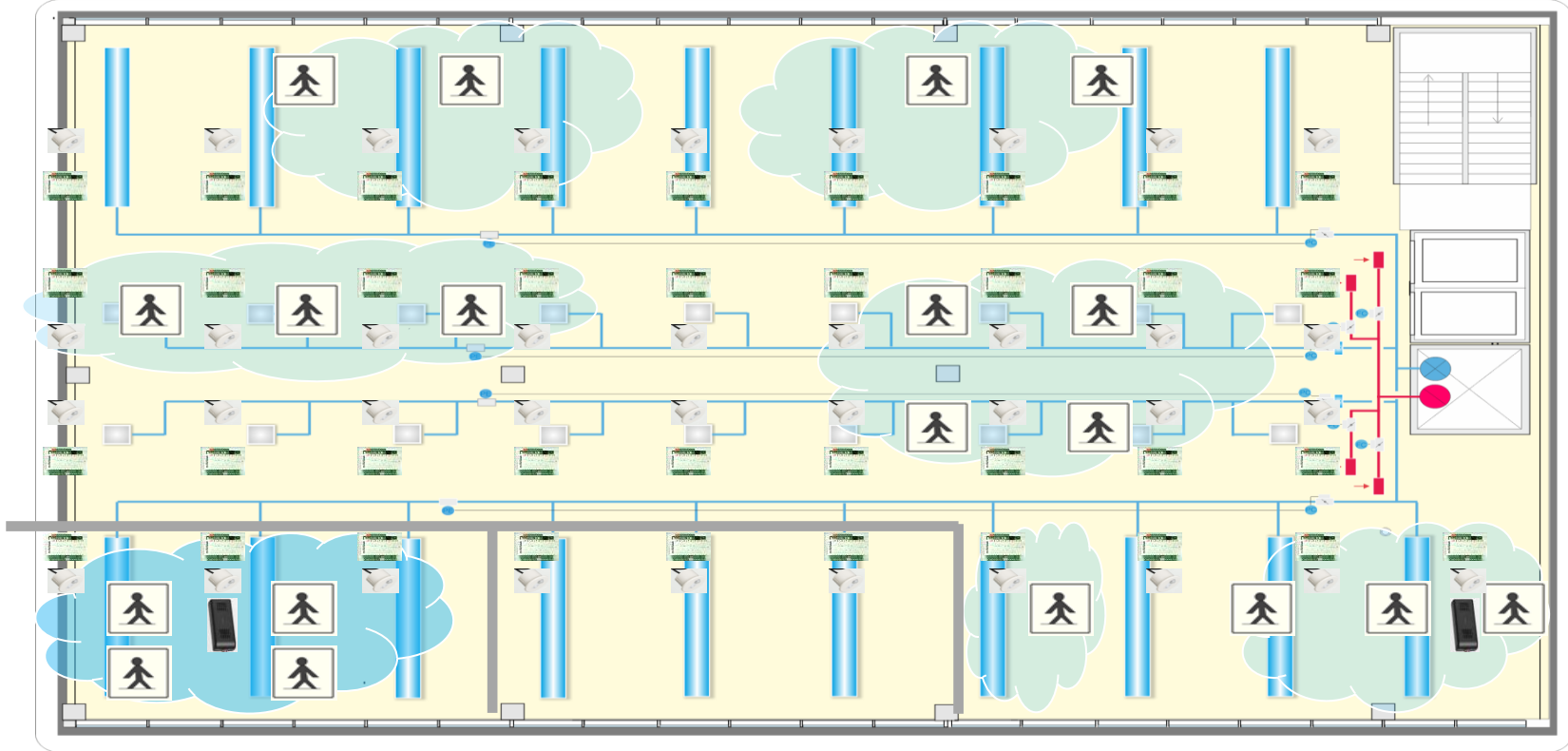


MSR
W = 200...800
H = 200...400

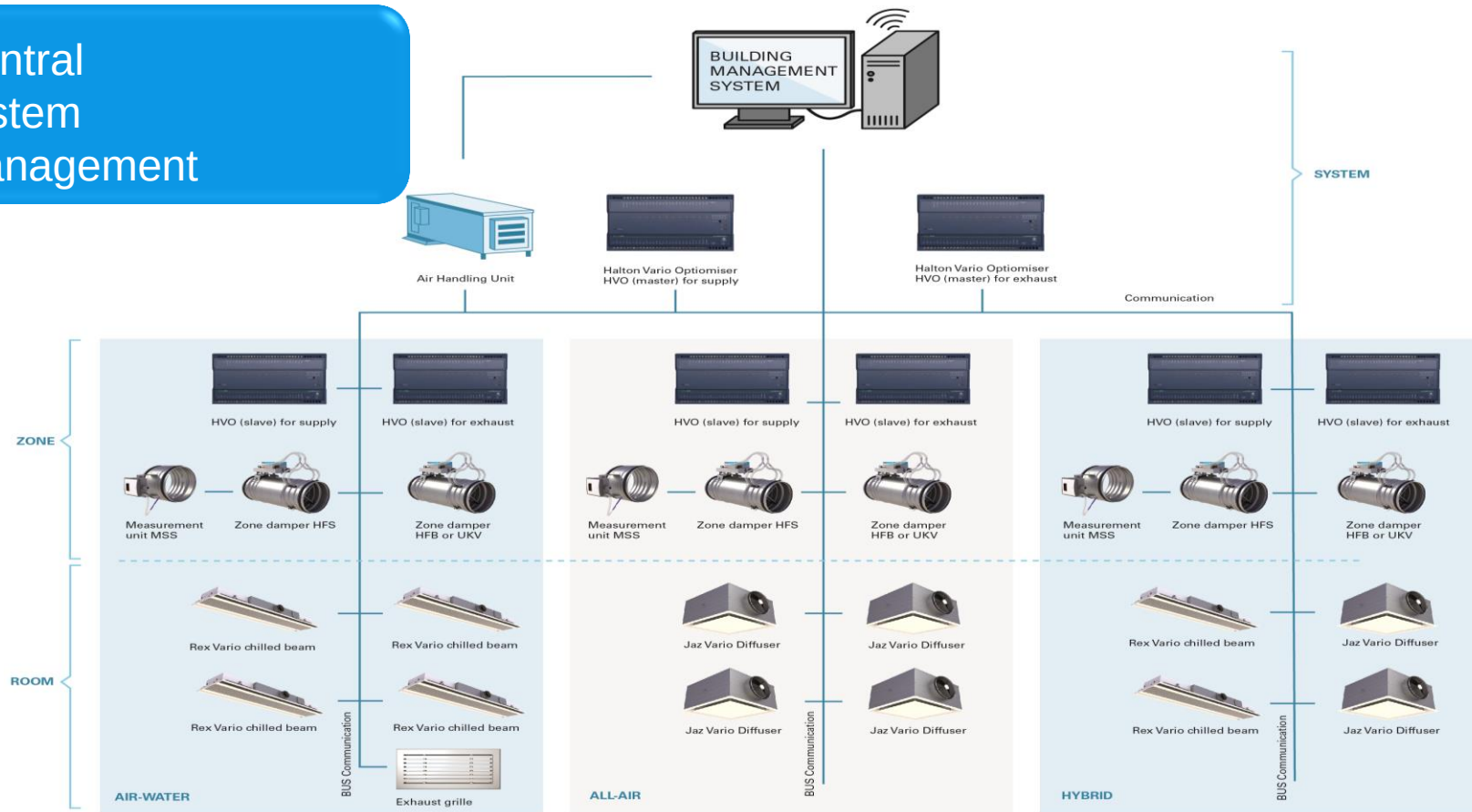


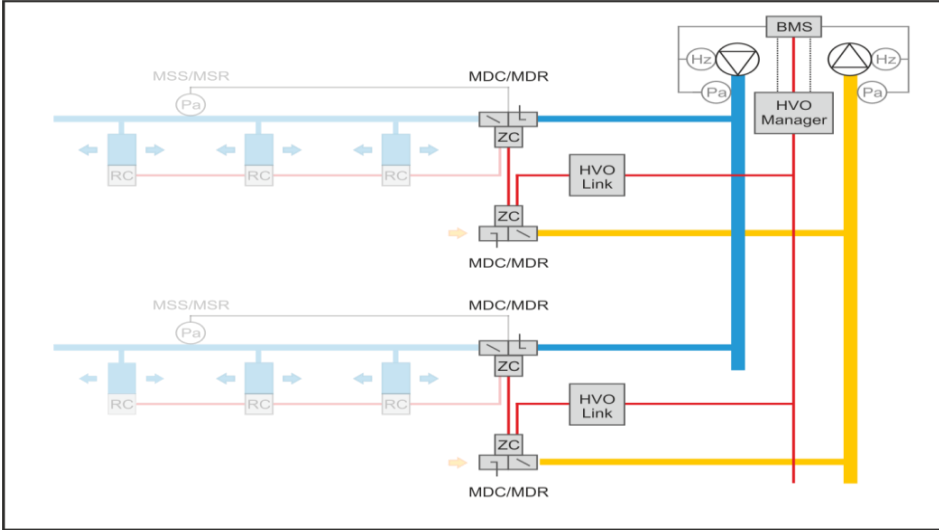
W = 200...800
H = 200...400

Demand based airflow control



Central system management





Halton Vario Optimizer, manager module:

- Communication with AHU
- Monitor HVO link modules
- AHU pressure optimization
- AHU minimum airflow limitation
- Network variables to BMS
- 0-10 VDC control signal to BMS as an option

Halton Vario Optimizer, link module

- Communication with HVO manager
- Zone damper monitoring
- Floor maximum airflow limitation
- Network variables

Zone dampers

- Communication with HVO link
- Damper blade position
- Zone airflow
- Network variables

Halton Vita Lab



Room airflow control VLR

The system controls the airflow rate of fume cupboards and different local exhaust units based on demand and manages the room air conditioning by controlling the ventilation and pressurisation by controlling the supply airflow rate.

The supply airflow control is realised by tracking the actual exhaust airflow and controlling the supply air airflow rate to maintain the desired airflow difference or actively based on differential pressure sensor.

Enabling Wellbeing

Halton

Halton Vita Lab Solo VLS



Airflow control of a fume cupboard or a local exhaust unit

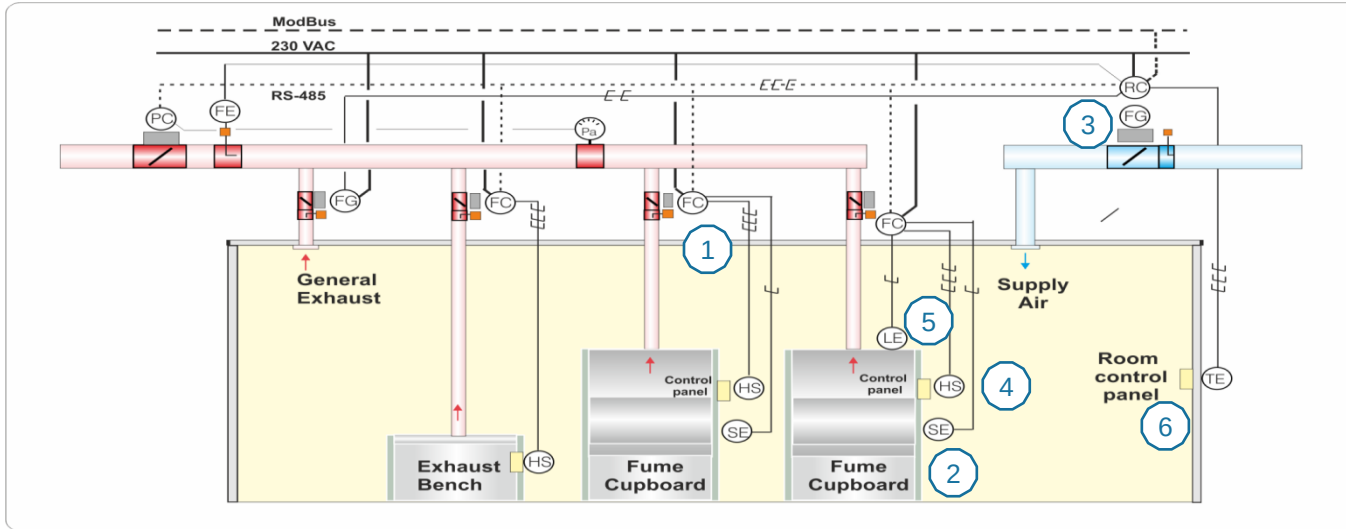
Airflow control can be realised in different ways:

- A The face velocity control using a velocity sensor; the face velocity is kept constant e.g. 0.5 m/s at all times
- B The exhaust airflow control based on the sash position indicated by a sash sensor
- C. 2-step (min/max) airflow control of a fume cupboard or a local exhaust unit using a limit switch or a 2-position switch

The setpoint of the face velocity or the airflow rate can be shifted to a defined value in order to save energy always there are no occupants in the vicinity of the fume cupboard.

Halton Vita Lab; Airflow control

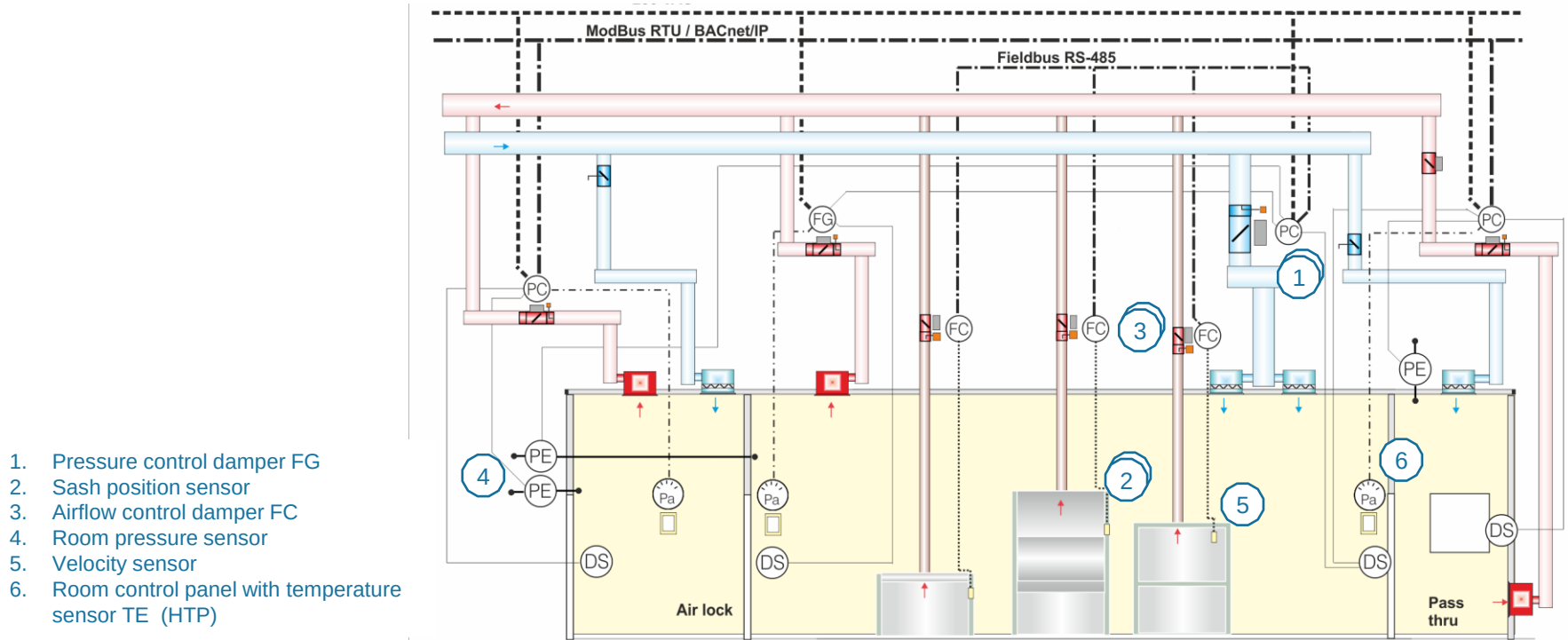
The exhaust and supply airflow control of a laboratory space



1. Airflow control damper
2. Sash position sensor SE (SGU)
3. Digital, communicative airflow control damper FC with airflow measurement
4. Control panel with touch screen HS (HTP)
5. Velocity sensor LE (AST)
6. Room control panel with temperature sensor TE (HTP)

Halton Vita Lab; Clean space laboratory

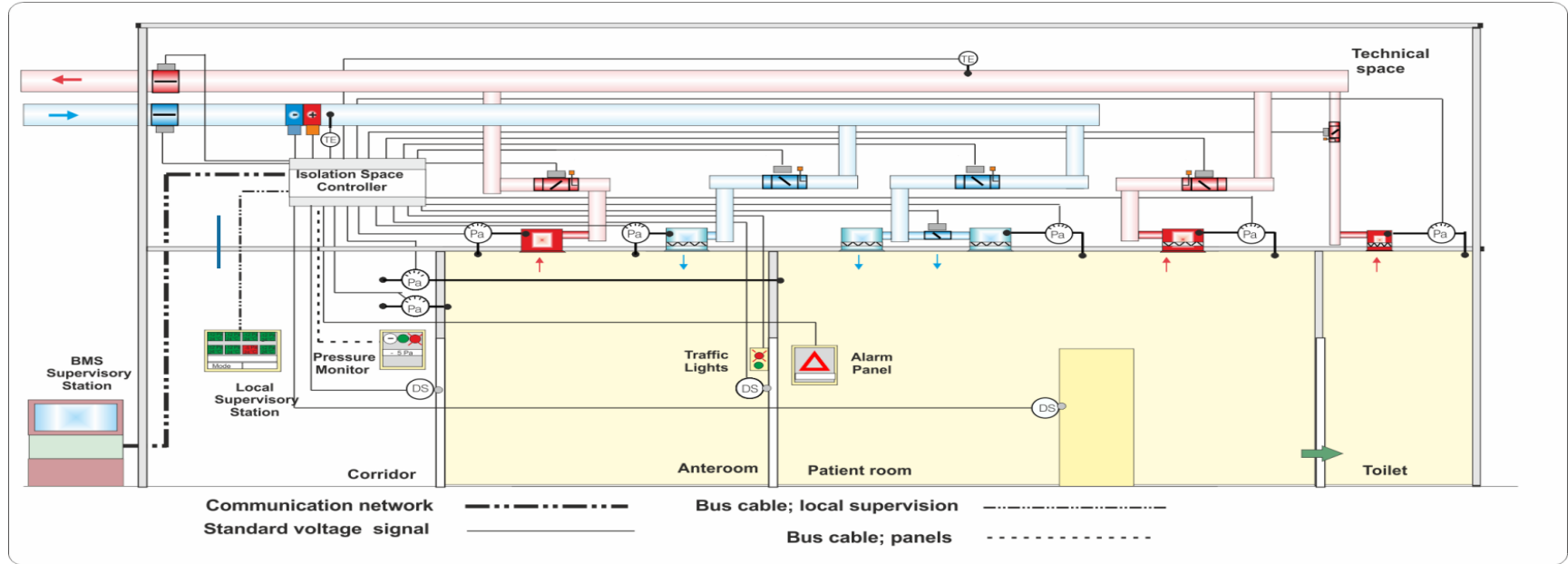
The exhaust airflow control and room pressure control of a laboratory space



Enabling Wellbeing

Halton Vita Isolation Room

Interchangeable infection and protective isolation (Negative & positive pressure)



Ventilation control : Ventilation rate according to the operation mode, negative, positive, neutral

Pressurisation : Pressurisation according to the operation mode; - isolation, + protection

Temperature control : Patient room air temperature is controlled using supply air temperature control

Enabling Wellbeing

Halton

Rooms with Halton Vario

Air – water system



- For offices and meeting rooms with medium to high cooling loads
- Based on Halton Rex 600 chilled beams with smart controls

Hybrid



- For offices and meeting rooms with low to medium cooling loads
- Based on Halton Jaz active diffusers with smart controls
- Can also be used with chilled beams in internal zones

Rooms with air-water system



Nantex office building, France,
equipped with Halton Vario system



Rooms with all-air system



Nantex office building,
France,
equipped with Halton Vario system

