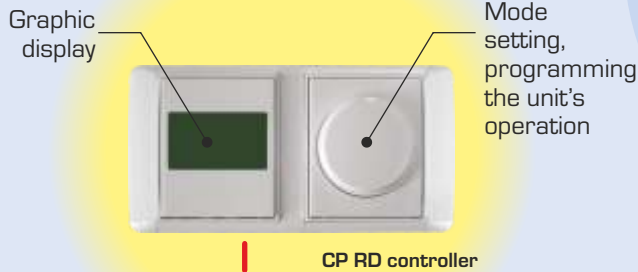


DUPLEX R4

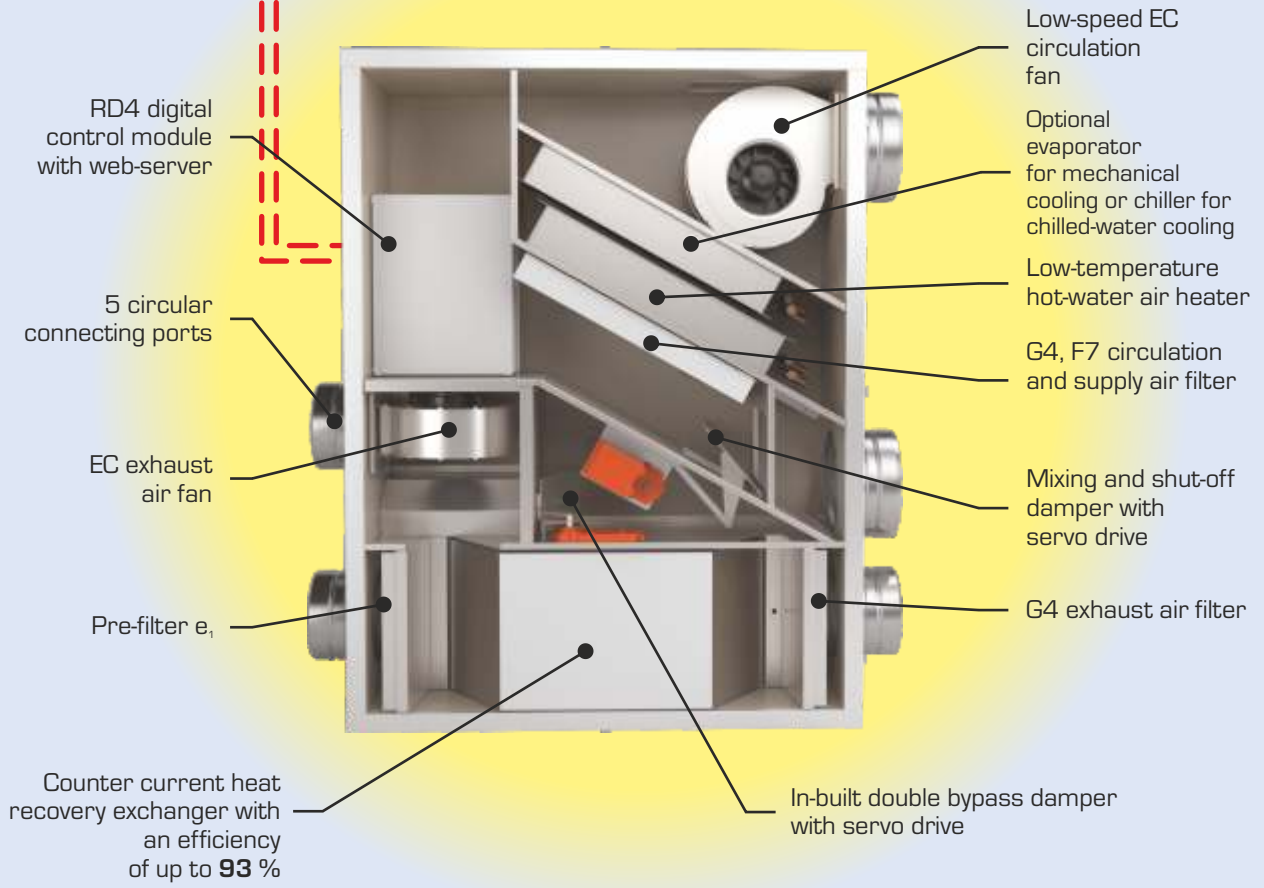
Compact ventilation units with an air circulation option for ventilation, cooling and hot-air heating



CP RD CONTROLLER



DUPLEX RB4



RESIDENTIAL VENTILATION & HEATING

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ATREA VENTILATION AND HEATING SYSTEM

ATREA VENTILATION SYSTEM

System description

All versions of installation of the HVAC system with a DUPLEX R4 series unit provide equal-pressure ventilation with heat recovery. Properly designed, this ventilation system ensures the supply of fresh filtered air into each residential room and the kitchen and at the same time extracts exhaust air from sanitary facilities, toilets, bathrooms and kitchens. The unique internal air circulation system within a building allows re-heating after heat recovery, the distribution of internal heat gains within the premises, cooling or hot-air heating without the need to have an additional heating system.

ATREA offers this system as a complete kit consisting of the following main components:

- DUPLEX R4 series hot-air heating and ventilation units with heat recovery
- Heat pumps and accumulation tanks
- A comprehensive measurement and control system allowing to run other parts of the system as well (e.g. zone dampers, ground coupled heat exchangers and heat pumps etc.) including connection through the Internet
- A complete ATREA system of air ducts and fittings suitable for every required version

For use not only in low-energy and passive houses

Owing to the circulation circuit features a wide range of applications is possible, with the DUPLEX R4 unit providing equal-pressure ventilation with heat recovery.

- Equal-pressure ventilation and cooling – heating is provided by an independent heating system; the DUPLEX R4 unit connects the circulation circuit if the distribution of gains from the fireplace or cooling are required
- Hot-air heating, ventilation and cooling – a system with a DUPLEX R4 unit replaces a heating system for rooms, becoming the only HVAC system to cover heating demands using solely air heating.

Designing a DUPLEX R4 ventilation and heating system

ATREA has compiled detailed design documentation for designing ventilation systems; together with component catalogues and the specialized design software it provides designers with all data necessary to properly design and size ventilation and hot-air heating.

Based on long-term measurement and experience with the installation of ventilation systems in residential buildings ATREA recommends sizing the ventilation capacity according to CSN EN 15 251 – Class 2 – see the highlighted part of the table below.

Advantages of the ventilation system

- Ensures permanent air exchanges necessary for health reasons, with optional burst increases (e.g. via an external signal from the toilet, bathroom, kitchen or other inputs depending on the immediate specific requirements of the user)
- Saving up to 90 % of ventilation cost as a result of highly efficient heat recovery exchangers
- Elimination of mould formation
- Elimination of thermal discomfort by supplying air with minimum temperature differences (again thanks to the highly efficient heat recovery)
- Utilization of all internal and external heat gains from the flat for the heat recovery reheating of ventilation air
- The supply of perfectly filtered air (through G4 or F7 class filters) significantly reduces the possibility of allergies or respiratory diseases of occupants
- Setting the unit to the maximum capacity (via the bypass) allows cooling in summer; primarily by supplying night filtered air
- The comprehensive kit system makes even DIY installation easy

Standard – regulation		Ventilation intensity in no-occupancy room (h ⁻¹)	Ventilation intensity (h ⁻¹)	Volume per person (m ³ /h)	Kitchens (m ³ /h)	Bathrooms (m ³ /h)	Toilets (m ³ /h)
CSN EN 15655 – Z1	Minimum value	0,3	0,3	15	100	50	25
	Recommended value		0,5	25	150	90	50
CSN EN 15251	Class 1	0,1 – 0,2	0,7	36	100	72	50
	Class 2		0,6	25	72	54	36
	Class 3		0,5	15	50	36	25
CSN 73 0540 – 2		0,1	0,3 – 0,6	15 – 25	Reference to other regulations		

Other documents used for designing the ATREA ventilation system



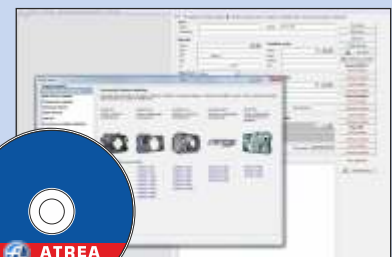
Marketing catalogue R4



Catalogue of components



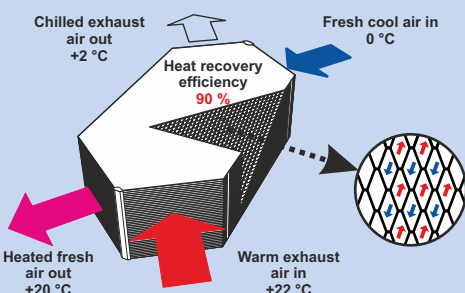
www.atrea.cz



CD

Selection software

HEAT RECOVERY – WHAT IS IT?



Principle of heat recovery

Heat transfer occurs through the separating walls of a heat exchanger – warmer exhaust air pre-heats colder supply air in winter. The identical principle is utilized during summer for cold recovery.

In winter humidity condensates in exhaust air; this condensate increases heat recovery efficiency by improving heat transfer; and is regularly drained into a sewage system.

Significance of heat recovery

A heat recovery exchanger with optimized energy performance provides a highly economical ratio between the power used (to run the fans), air performance and heat recovery. The energy efficiency value of the fan power input / recovery gain ratio during ventilation reaches between 17 and 25, i.e. up to 25 W of energy from waste air is recovered per 1 W used to run a DUPLEX R4 unit in ventilation mode to achieve an effective ration of 1:25.

DESCRIPTION OF DUPLEX R4 UNITS

Application

Already the 4th, new generation of DUPLEX heat recovery units is supplied in two basic versions – the **DUPLEX RB4** ceiling-suspended unit and the upright **DUPLEX RA4, RK4**. These units are intended for the comfort ventilation and hot-air heating of all kinds of residential and civil buildings, while they are particularly suitable for low-energy and passive houses and flats in apartment blocks.

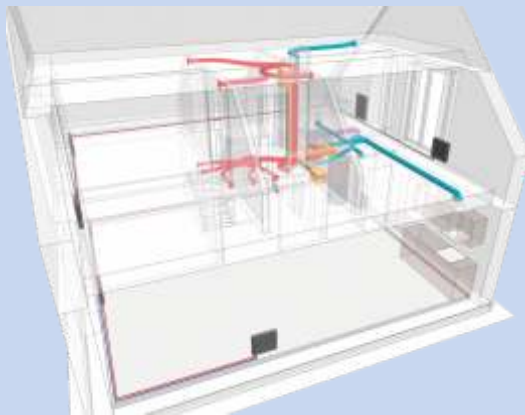
General description

The unit's housing has 30 mm thick polyurethane insulation to reduce thermal bridges ($U = 0,65 \text{ Wm}^{-2}\text{K}^{-1}$). Inside there is a counter-flow heat recovery exchanger made of plastic (an efficiency of up to 95 %), two free wheel fans with electronic EC control including the control of constant airflow, G4 supply and exhaust air filters upstream the heat recovery exchanger inlet, automatic bypass and circulation dampers, a control module and a connecting terminal block. Condensate drain outlets are prepared as standard for the cooling version as well. The connecting ports are circular to connect flexible or rigid ducts with thermal bridging reduction. Access to the unit is via a hinged door with securing latches.

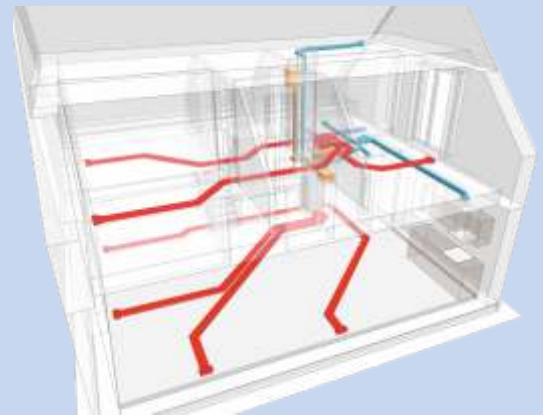
Advantages of the units

- EC type, free wheel fans installed as standard have characteristically very low power consumption and outstanding speed control
- The high performance of the units allows burst intensive ventilation and summer airing
- A heat recovery efficiency of up to 93 % thanks to the new generation of counter current heat recovery exchangers
- The excellent thermal and insulation properties of the unit's housing with reduced thermal bridging
- The in-built bypass is a standard part of the unit and does not require any additional area; moreover, thanks to its design it provides 100 % bypassing in bypass mode without mutual thermal transfers
- The standard control system meets all requirements for control, allowing for a wide range of sensors and other inputs to be connected, the control of shut-off and zone dampers, the control of heaters or the heating system of the house etc. and additionally an in-built web server to allow **control through the Internet**
- Versatile use from equal-pressure ventilation to circulation ventilation, circulation with heating to heating and cooling

TYPICAL EXAMPLES OF APPLICATION OF DUPLEX R4 UNITS

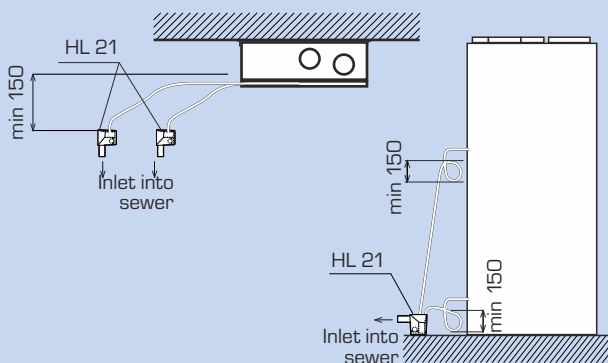


Equal-pressure ventilation and cooling, with heating provided by an independent heating system



Hot-air heating, equal-pressure ventilation and cooling

CONDENSATE DRAIN



During heat recovery – waste heat reclaim, humidity condensation occurs as exhaust air cools down. Water condenses on the walls of the heat recovery exchanger to further increase the efficiency of heat recovery. The condensate flows out of the heat recovery exchanger in the direction of flow of extracted air and runs from the DUPLEX unit into a sewer. For correct function and drainage it is necessary to separate the unit from the sewer using a sufficiently high trap; the recommended minimum height is 150 mm. Small condensate drain pumps can also be used.

COMPACT UNITS

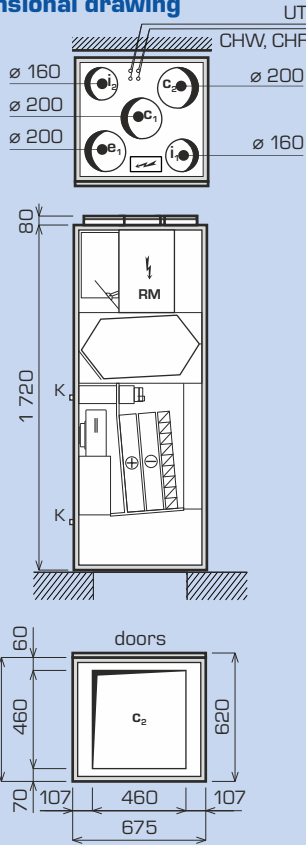


DUPLEX ALFA 4V or KAPPA 4V units make designing and installation significantly easier. These are compact appliances that integrate DUPLEX RA4 or RK4 AHU units with an air/water heat pump and mixing kits for heating. All this cannot be placed in such a small space in situ. The incorrect positioning of valves is also eliminated, with a resulting interior device that looks good not only in utility rooms.

DIMENSIONS AND CONFIGURATIONS

DUPLEX RA4

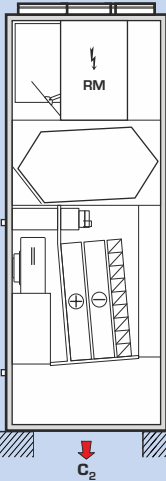
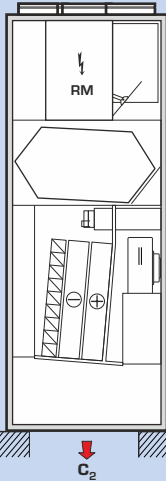
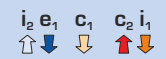
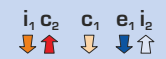
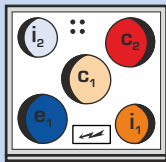
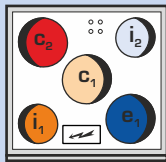
Dimensional drawing



Configuration

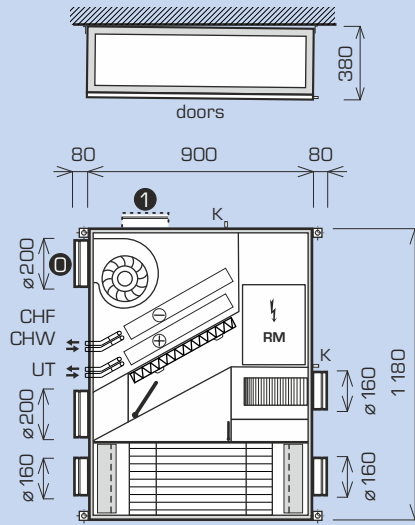
10/0

11/0



DUPLEX RB4

Dimensional drawing

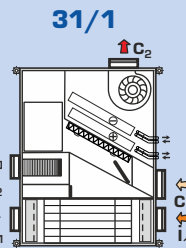
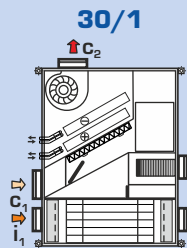
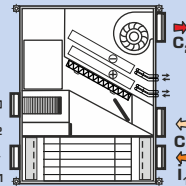
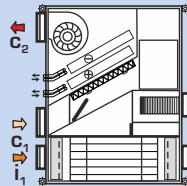


- ⊙ Port position in x/D configuration
- ⊙ Port position in x/1 configuration

Configuration

30/0

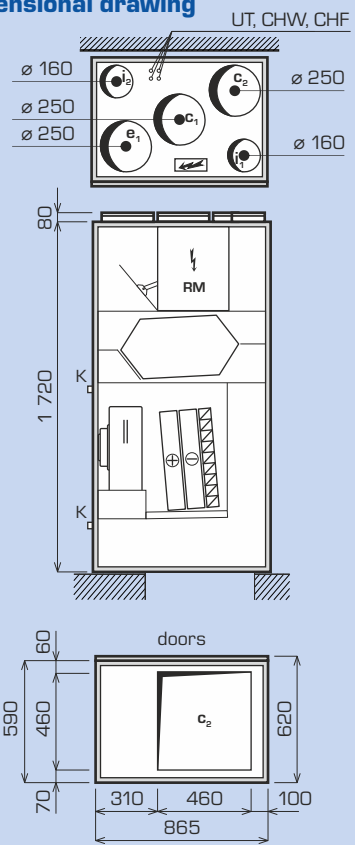
31/0



Note: View of DUPLEX RB4 from above – plan DUPLEX RB4 only in position x/D; change x/1 is done in situ by changing the position of the circulation fan.

DUPLEX RK4

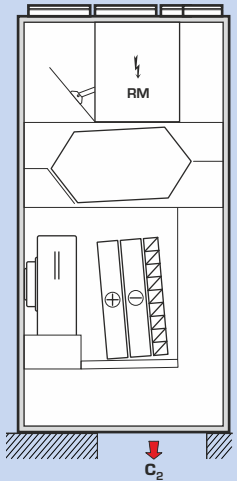
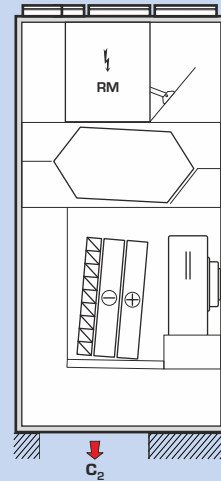
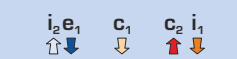
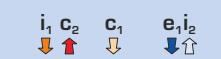
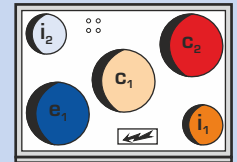
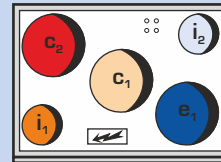
Dimensional drawing



Configuration

10/0

11/0



LEGEND

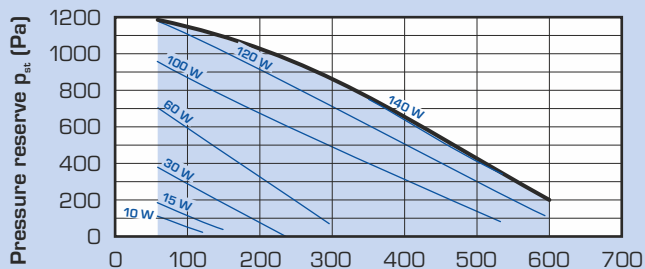
e ₁	Fresh air inlet	UT	Heating water connection
c ₁	Circulation air inlet	CHF	Mechanical cooling connection
c ₂	Fresh and circulation air outlet	CHW	Water-based cooling connection
i ₁	Exhaust air inlet	RM	RD4 digital control module
i ₂	Exhaust air outlet		
K	Condensate drain		

WEIGHT AND CONNECTIONS

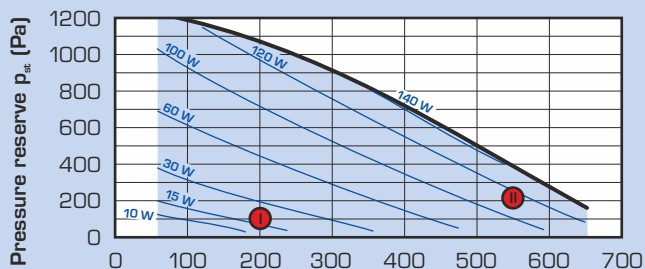
DUPLEX	RA4	RB4	RK4
Connecting port diameter	mm ø160 / ø200	ø160 / ø200	ø160 / ø250
Weight (depending on equipment)	kg 93-98	76-80	105-113
Condensate drain	mm	2x ø16	
UT, CHW connecting duct	mm	20 / 20	
CHF connecting duct	mm	12 / 6	

CIRCULATION AIR FAN

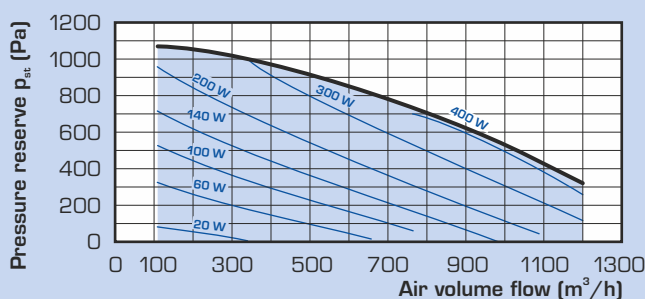
DUPLEX RA4



DUPLEX RB4



DUPLEX RK4

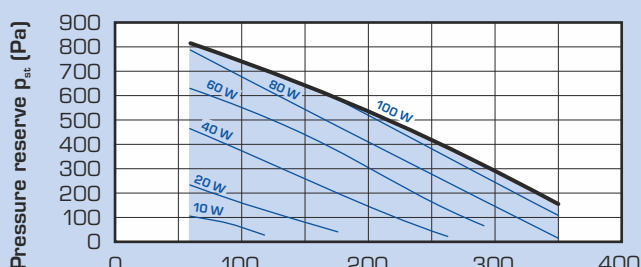
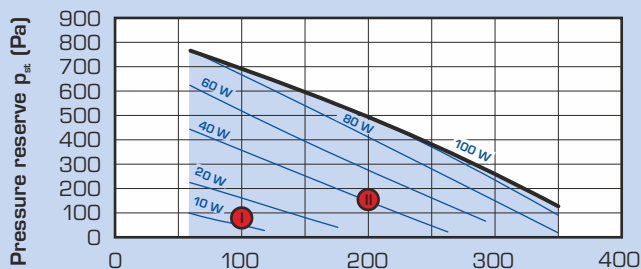
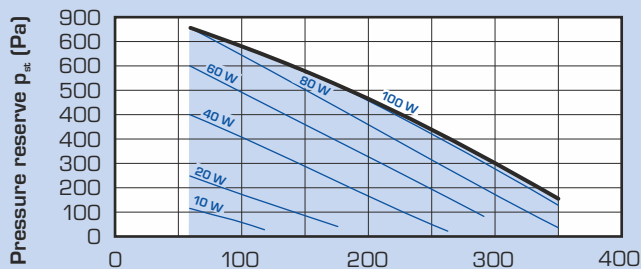


Legend:

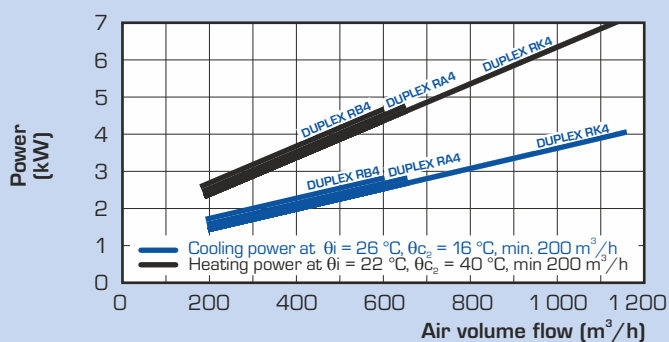
- Pressure reserve *
- Fan power input

* The maximum pressure reserve curve is shown; the units have constant flow control, i.e. each fan is automatically independently operated to ensure the required flow rate

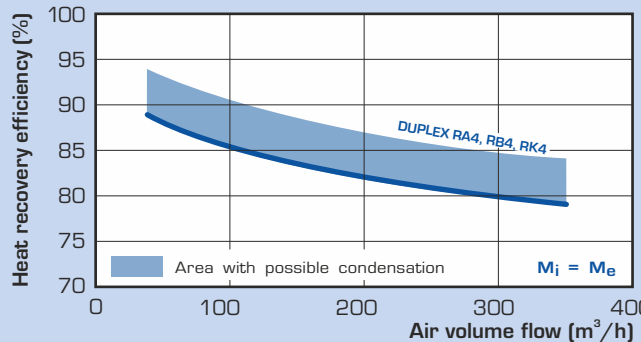
EXTRACTION AIR FAN



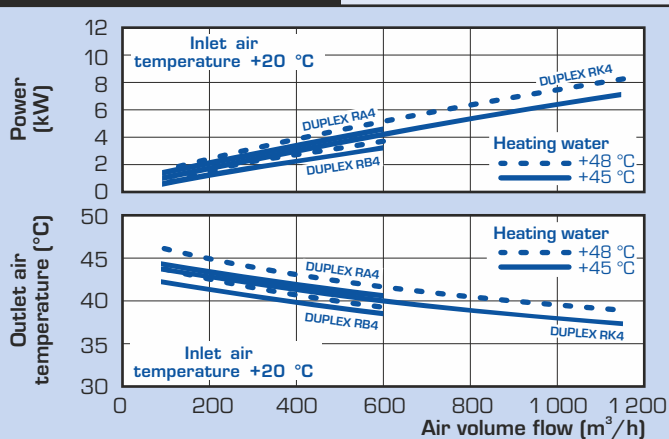
DIRECT EVAPORATOR



R4 HEAT RECOVERY EFFICIENCY



HOT WATER HEATER



SOUND POWER LEVEL L_w (dB)

			dB(A)	125 Hz	250 Hz	500 Hz	1 kHz	2kHz
DUPLEX RB4								
Circulation part	Suction	I.	43	55	47	32	28	24
	Discharge	I.	49	58	52	37	31	26
Extraction part	Suction	I.	41	56	47	34	20	24
	Discharge	I.	40	55	53	35	24	20
	Suction	II.	56	55	53	40	30	24
	Discharge	II.	42	53	46	31	25	23
	Suction	I.	55	64	54	48	50	41
	Discharge	II.	76	80	72	59	61	56

Housing - Sound power level equals air sound pressure level L_p + 17,5 dB.

SOUND PRESSURE LEVEL L_p (dB)

			dB(A)	125 Hz	250 Hz	500 Hz	1 kHz	2kHz
RB4		I.	38	42	40	36	30	28
RB4		II.	41	45	43	39	32	33

The sound pressure level is stated for a distance of 3 m.
Note: The example above applies to the DUPLEX RB4. For the levels of sound power and pressure for a particular DUPLEX R4 and an operating point selected see the ATREA design software.

CONTROL SYSTEM

RD4 - DIGITAL CONTROL SYSTEM

General description

The RD4 digital control module represents the most modern method of controlling the unit. It provides all basic functions and at the same time contains a range of inputs and outputs to connect with optional sensors such as those of CO₂ and relative humidity, signals from rooms (toilets, bathrooms, kitchens), heating systems including shut-off valves or shut-off dampers in ducts.

Additionally it contains a **web-server** and the option of **Internet access**.

A unit with the digital module may be controlled:

- By the CP 18 RD or CP 19 RD series controller with graphic display
- Without a controller, only via 0–10 V voltage (e.g. from a CO₂ sensor or through a higher-ranking system). Control via external signals and other automatic ventilation functions remain.
- Via a built-in intelligent web-server that allows control and setting via a web application and can also be used for versions a) and b).
- By an external control system via a standard Modbus TCP interface.

Functions

The control module provides all basic functions of the unit:

- Programming various ventilation, heating and cooling performances for the day and week
- Continuous control of both fans, with a constant performance function (i.e. an automatic change of the performance level to reach the desired flow rate directly in m³/h)
- The control of various heating sources when the re-heating or heating of residential rooms is required, with separate temperature control in bathrooms
- The control of various cooling sources – ground-coupled heat exchangers and heat pumps when cooling is required, ensuring the inlet air temperature does not drop below the minimum level
- Anti-freeze protection of the heat recovery exchanger

- Switching to a required performance level when started via an external signal (e.g. from the toilet, bathroom, kitchen) with programmable start-up and run-down times
- Supply and extraction shut-off damper control, and the control of two zone ventilation dampers and a kitchen extraction damper (the dampers are not included) – 24 V DC
- An automatic operation option according to sensors – CO₂ concentration, relative humidity or VOC (optional extras) – a 0–10 V input or switch contacts
- Depending on settings the unit enables a periodic venting mode – the unit is idle and switches ventilation on at set intervals
- Automatic ventilation time settings depending on occupancy and the air-tightness of the building – during periodic ventilation or when burst ventilation is started

CP RD series controllers

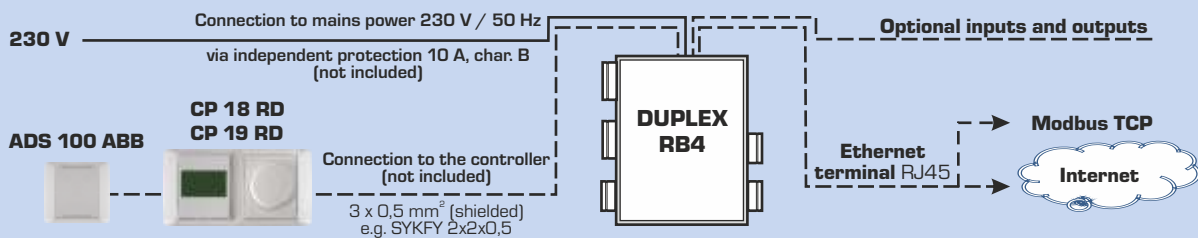
They are intended for setting basic ventilation, heating and cooling modes and status indication including failure conditions. It enables the user to access standard functions or program operating modes that can be run manually or automatically according to weekly program settings. The controller also enables to set a temporary party / holiday mode and includes an integrated room thermostat with a weekly heating / cooling mode.

All data are shown on a well-arranged graphic display. Settings and control are done via a rotary knob.

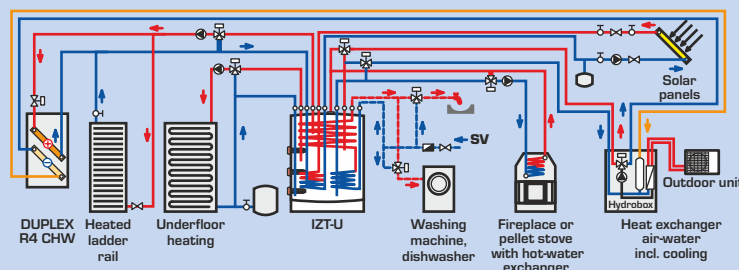
CP 18 RD



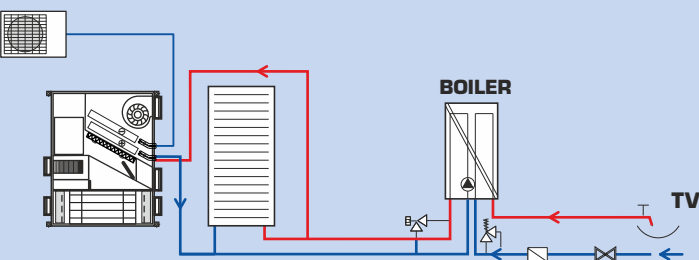
CP 19 RD



CONTROL AND ENERGY SYSTEMS FOR HEATING AND DHW HEATING



DUPLEX RB4-EC-CHW



DUPLEX RB4-EC-CHF

An IZT series integrated heat accumulator (e.g. IZT-U-TTS 650) for the combined preparation of HW and the heating of CH using electrical coils with solar support or connected to a heat pump.

The double heat exchanger is intended for the continuous flow heating of HW to eliminate the presence of Legionella pneumophila bacterium and the formation of aggressive sludge that typically appear in accumulation heaters.

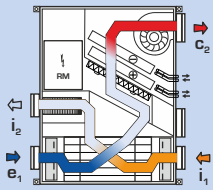
The bottom exchanger is connected to a solar system. The IZT accumulator can also be used with biomass boilers or heat pumps, in which case heating or cooling is provided by a condensation unit and the IZT acts as a bivalent source. Not all sources described above must be installed at the same time.

An electric or condensation gas boiler with in-built HW heating or a separate HW tank. Gas boilers with in-built power modulation according to water temperature to ensure a smooth change of the boiler's performance between 15 and 100 %.

A possible outdoor condensation unit with a reverse operation option with the basic and auxiliary DUPLEX RB4 control system allows interior cooling in summer and heating during the transition period (spring, autumn) – air/air HP systems.

OPERATING MODES

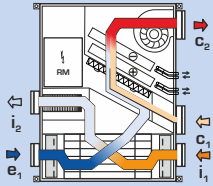
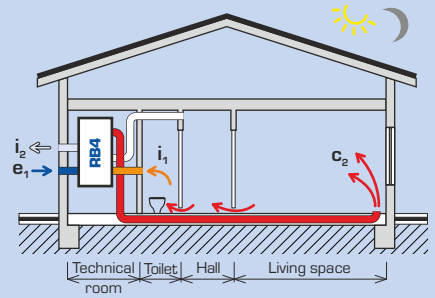
DUPLEX R4 OPERATING MODES



1

Equal-pressure ventilation mode

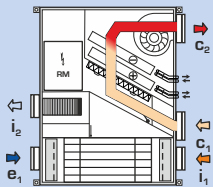
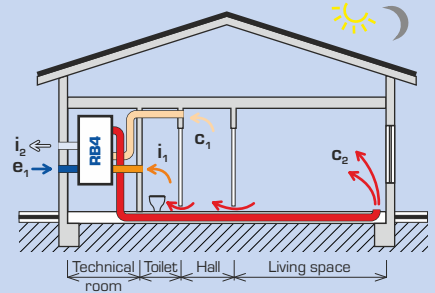
All year round
 $n_v = 0,15 - 0,5 / h^{-1}$ $n_c = 0 / h^{-1}$
 Equal-pressure ventilation with adjustable performance between 75 and 350 m³/h, with heat recovery or via a bypass. It is intended for ventilation and re-heating (without circulation) during the transitional period. Both fans on, the mixing damper is closed.



2

Circulation heating and ventilation mode

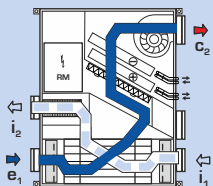
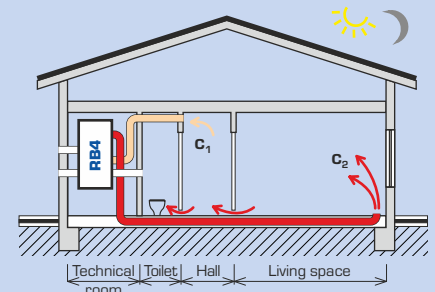
Heating season
 $n_v = 0,15 - 0,5 / h^{-1}$ $n_c = 0,5 - 1,5 / h^{-1}$
 Hot-air circulation heating and equal-pressure ventilation with waste heat recovery and circulation performance up to 600 (650, 1200 depending on the R4 type) m³/h (at 150 Pa) and ventilation performance up to 350 m³/h. Both fans on, the mixing damper is mixing outdoor and circulation air.



3

Circulation heating mode with burst ventilation

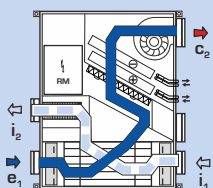
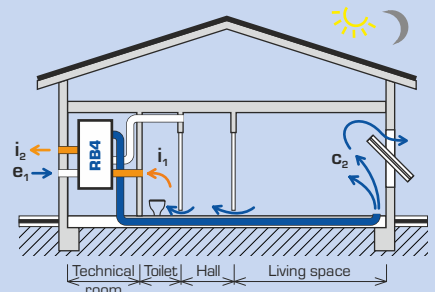
Heating season
 $n_v = 0$ $n_c = 0,5 - 1,5 / h^{-1}$
 During occupancy, an impulse from the toilet and bathroom switches intermittently the extraction fan with an adjustable run-down time on while an impulse from the kitchen starts mode 1 with no run-down time, all with heat recovery. When mechanical cooling is installed, this mode is also used for heating via an air-conditioning unit during the transitional period (spring, autumn).



4

Positive pressure ventilation mode

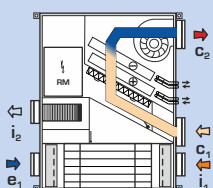
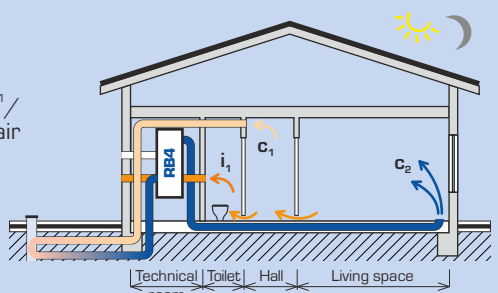
Summer
 $n_v = 0,5 - 2,0 / h^{-1}$ $n_c = 0 / h^{-1}$
 Intense summer positive pressure ventilation for living spaces via the full-throttle supply of outdoor air or from a ground-coupled heat exchanger; it can also be used for pre-cooling at night. Air is extracted via partially open windows. The exhaust air fan is started by an impulse; the mixing damper is in position 2 and the bypass damper is open.



5

Circulation cooling mode with a ground-coupled heat exchanger (ZVT-c; ZVT-s)

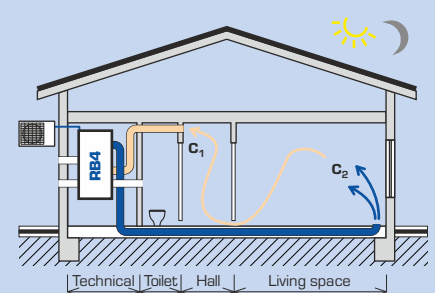
Summer
 $n_v = 0 / h^{-1}$ $n_c = 0,5 - 1,5 / h^{-1}$
 Intense summer ventilation of living spaces using indoor air circulating through a ground-coupled heat exchanger. The exhaust air fan is started by an impulse; the mixing damper is in position 2 and the bypass damper is open. This arrangement is possible only with a circulation ground-coupled air exchanger or with an antifreeze.



5a

Circulation mechanical cooling mode

Summer
 $n_v = 0 / h^{-1}$ $n_c = 0,5 - 1,5 / h^{-1}$
 Intense circulation cooling of living areas in conjunction with an outdoor condensation unit ("mechanical cooling"). During occupancy, an impulse from the toilet and bathroom switches intermittently the extraction fan with an adjustable run-down time on while an impulse from the kitchen starts mode 1 with no run-down time, in which case cooling is disabled. Ventilation can also be started periodically at set intervals.






c₁ Circulation air inlet from residential rooms into the unit
c₂ Heating, cooling and fresh air outlet from the unit into residential rooms

e₁ Fresh outdoor air inlet
i₁ Exhaust air inlet from sanitary facilities into the unit
i₂ Exhaust air outlet from the unit

ATREA'S MODULAR HVAC SYSTEM




DUPLIX R4 UNITS

	DUPLEX RA4-EC.D.CF 600 / 350	Ord. No. A170420
	DUPLEX RB4-EC.D.CF 650 / 350	Ord. No. A170430
	DUPLEX RK4-EC.D.CF 1200 / 350	Ord. No. A170440







FILTERS

	FT RB4 G4 - Circulation	Ord. No. A170922
	FT RB4 F7 - Circulation	Ord. No. A170923
	FTU RB4 - Circulation carbon	Ord. No. A170929
	FT RB4 G4 - Exhaust	Ord. No. A170926
	FT RA3 G4 - Circulation (RA3, RK3, RA4, RK4)	Ord. No. A170912
	FT RA3 F7 - Circulation (RA3, RK3, RA4, RK4)	Ord. No. A170913
	FTU RA3 - Circulation carbon (RA3, RK3, RA4, RK4)	Ord. No. A170928
	FT RA4 G4 - Exhaust (RA4, RK4)	Ord. No. A170920
	Spare filter cloth is supplied five pieces per package.	
	FK RB4 G4 - Circulation	Ord. No. A170924
	FK RB4 F7 - Circulation	Ord. No. A170925
	FK RB4 G4 - Exhaust	Ord. No. A170927
FK RA3 G4 - Circulation (RA3, RK3, RA4, RK4)	Ord. No. A170914	
FK RA3 F7 - Circulation (RA3, RK3, RA4, RK4)	Ord. No. A170915	
FK RA4 G4 - Exhaust (RA4, RK4)	Ord. No. A170921	
Spare filter cassettes are supplied in single-piece packages.		


CONTROLLERS

	CP 18 RD controller - White color	Ord. No. A170283
	CP 18 RD controller - Ivory color	Ord. No. A170284
	CP 19 RD controller - White color	Ord. No. A170282
	ADS 100 ABB	Ord. No. A170258


OPTIONAL ACCESSORIES - DIGITAL INPUT 0-10 V

	ADS RH 24 Relative humidity room sensor	Ord. No. A142318
	ADS SMOKE 24 Cigarette smoke and air quality room sensor	Ord. No. A142311
	ADS VOC 24 Air quality room sensor	Ord. No. A142331
	ADS CO₂ 24 CO ₂ room sensor	Ord. No. A142319
	ADS CO₂ D CO ₂ channel sensor	Ord. No. A142330
	ADS RH D Relative humidity channel sensor	Ord. No. A142332


OPTIONAL ACCESSORIES - CONTACT INPUT

	HYG 6001 Room hygrostat - relative humidity sensor	Ord. No. A142303
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OPTIONAL ACCESSORIES - WATER-BASED COOLING

	Modification CHW - water-based cooling RA4	Ord. No. A170249
	Modification CHW - water-based cooling RB4	Ord. No. A170435
	Modification CHW - water-based cooling RK4	Ord. No. A170361

OPTIONAL ACCESSORIES - DIRECT COOLING

	Modification CHF - direct cooling RA4	Ord. No. A170248
	Modification CHF - direct cooling RB4	Ord. No. A170436
	Modification CHF - direct cooling RK4	Ord. No. A170362

OPTIONAL ACCESSORIES - DIRECT COOLING

	ATREA FG09 (RB4) Outdoor condensation unit	Ord. No. A400010
	ATREA FG14 (RA4, RK4) Outdoor condensation unit	Ord. No. A400015
	ATREA FG18 (RK4) Outdoor condensation unit	Ord. No. A400019
	DMCH - ATW (FG09) Auxiliary control module	Ord. No. A170511
	DMCH - ATW (FG14) Auxiliary control module	Ord. No. A170512
	DMCH - ATW (FG18) Auxiliary control module	Ord. No. A170513

ATREA'S SYSTEM TECHNICAL AND DESIGN DOCUMENTATION

				
Electric wiring	Catalogue of components	CH connection diagram	CD	Selection software

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