

# DUPLEX

## 1500 to 15000 Roto

### All-purpose ventilation units with rotary heat exchangers

DUPLEX 1500-15000 Roto is a new generation of all-purpose ventilation units with rotary heat recovery exchangers.

The indoor version of compact DUPLEX 1500-15000 Roto units are used for comfort ventilation, hot-air heating and cooling in facilities, shop floors, stores, schools, restaurants, shops, sports and industrial halls. They are suitable wherever efficient ventilation and possibly hot-air circulation ventilation and cooling must be provided at minimum running cost, i.e. the highest efficiency of heat recovery, low power input of fans and as little noise as possible.

DUPLEX Roto units are produced in compact (1500 to 5000 Roto) and semi-compact (8000 to 15000 Roto) version and contain two independently controlled EC fans with backward curved blades, a heat recovery exchanger with large heat-transfer surface and high efficiency, slide-out supply and exhaust air class G4, M5 or F7 filters, drain pans and possibly also a circulation damper with a servo drive or integrated air heaters and coolers.

Unit casing is divided into two versions:

DUPLEX 1500-5000 Roto are frameless construction, casing is made of painted metal sheet (colour RAL 9006) with 30 mm PIR insulation with heat transfer coefficient  $\lambda = 0,024 \text{ W/mK}$ .

DUPLEX 8000-15000 Roto are frame construction, casing is made of painted metal sheet (colour RAL 9006) with 45 mm mineral wool insulation with heat transfer coefficient  $\lambda = 0,037 \text{ W/mK}$ .

#### DUPLEX Roto ventilation units meet the requirements of the most stringent European standards:

- Casing properties according to EN 1886
- EC motors according to ErP 2015
- SFP < 0,45 W/(m<sup>3</sup>/h) according to PassivHaus\*
- Hygienic requests according to VDI 6022
- Commission regulation (EU) requirements No. 1253/2014 (Ecodesign)\*



1500 to 15000 Roto

#### Advantages of DUPLEX Roto units:

- New design of ventilation units with excellent parameters
- Great thermal insulation of the casing (class T2)
- Reduced thermal bridging (class TB1/TB2 \*\*)
- Compact dimensions
- Ease of installation
- Variable configuration of discharge ports
- Unified dimensions of ports
- Optional versions with circulation damper, purge chamber or different types of a heat exchanger
- Optional versions with built-in T, CHF, CHW coils
- High efficiency fans – SFP < 0,45 W/(m<sup>3</sup>/h)\*
- High heat recovery efficiency of the rotary heat exchanger – up to 85 %
- Integrated control system including temperature sensors
- Integrated web server (aMotion regulation)
- Comprehensive design software
- The heat exchangers are certified by the renowned Eurovent Certification Company

\* in the defined working area

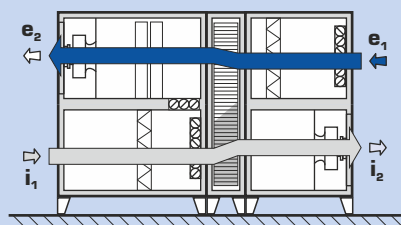
\*\* TB1 for 1500-5000 Roto  
TB2 for 8000-15000 Roto



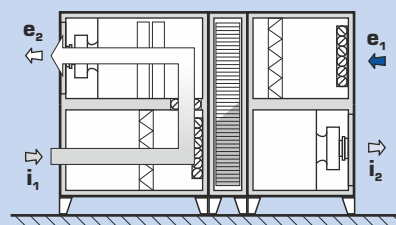
#### AVAILABLE MODIFICATIONS (CAN BE COMBINED)

- |     |                                  |       |                                   |
|-----|----------------------------------|-------|-----------------------------------|
| - C | with in-built circulation damper | - CHF | with in-built direct chiller      |
| - E | with in-built electrical heater  | - CHW | with in-built water-based chiller |
| - T | with in-built hot-water heater   |       |                                   |

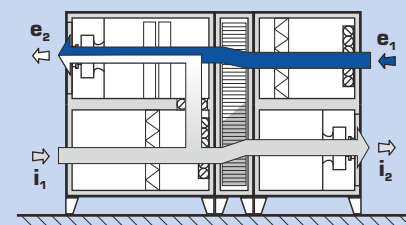
#### OPERATING MODES OF DUPLEX ROTO UNITS



Ventilation with heat recovery with re-heating (with cooling)



Circulation heating or cooling



Combined mode (ventilation with circulation)

- ➔ e<sub>1</sub> ... Fresh outdoor air suction  
⇄ e<sub>2</sub> ... Fresh filtered air outlet

- ⇄ i<sub>1</sub> ... Exhaust air suction  
⇄ i<sub>2</sub> ... Exhaust air outlet

- T/E... Central heating / electrical heater connection  
CH ... Cooling connection

#### SELECTION SOFTWARE



For the detailed design of DUPLEX series units, accessories and control systems we recommend using our dedicated design software. You can find it on our website at [www.atrea.eu](http://www.atrea.eu) or request a CD at our office.



UNIT VENTILATORS & HEAT RECOVERY

ATREA s.r.o., Čs. armády 32  
466 05 Jablonec n. Nisou  
Czech Republic



[www.atrea.eu](http://www.atrea.eu)

Phone: +420 483 368 111  
Fax: +420 483 368 112  
E-mail: [atrea@atrea.eu](mailto:atrea@atrea.eu)

# PERFORMANCE GRAPHS

## BASIC PARAMETERS

| DUPLEX Roto  |                                | 1500                                   | 2500    | 4000    | 5000    | 8000      | 12000       | 15000       |
|--|--------------------------------|--|---------|---------|---------|-----------|-------------|-------------|
| Supply air - max. <sup>1)</sup>                          | m <sup>3</sup> h <sup>-1</sup> | 1 550                                  | 2 750   | 4 600   | 6 600   | 11 200    | 14 100      | 16 700      |
| Extraction air - max. <sup>1)</sup>                      | m <sup>3</sup> h <sup>-1</sup> | 1 500                                  | 2 700   | 4 650   | 6 650   | 11 100    | 14 000      | 16 600      |
| Max. nominal airflow according to ErP 2018 <sup>5)</sup> | m <sup>3</sup> h <sup>-1</sup> | 1 400                                  | 2 400   | 4 200   | 5 050   | 7 600     | 9 600       | 11 600      |
| Heat recovery efficiency <sup>2)</sup>                   | %                              | up to 85 %                             |         |         |         |           |             |             |
| Number of versions and positions                         | -                              | see table „Mounting positions“, page 4 |         |         |         |           |             |             |
| Weight <sup>3)</sup>                                     | kg                             | 345-390                                | 350-395 | 560-630 | 565-635 | 840-1 050 | 1 130-1 350 | 1 330-1 600 |
| Max. power input   | kW                             | 0,8                                    | 1,7     | 2,9     | 5,1     | 9,9       | 10,2        | 11,3        |
| Voltage  | V                              | 230                                    | 230     | 400     | 400     | 400       | 400         | 400         |
| Frequency  | Hz                             | 50                                     |         |         |         |           |             |             |
| Revolutions - max.                                       | min <sup>-1</sup>              | 3 350                                  | 2 960   | 3 000   | 2 980   | 2 570     | 2 130       | 1 860       |
| Heating output E low - max. <sup>5)</sup>                | kW                             | 4,2                                    | 4,2     | 7,2     | 7,2     | -         | -           | -           |
| Heating output E high - max. <sup>5)</sup>               | kW                             | 8,4                                    | 8,4     | 12,6    | 12,6    | -         | -           | -           |
| Heating output T - max. <sup>4)</sup>                    | kW                             | 17                                     | 22      | 42      | 50      | 70        | 100         | 120         |
| Cooling output CHW - max. <sup>4)</sup>                  | kW                             | 10                                     | 18      | 35      | 39      | 50        | 61          | 80          |
| Cooling output CHF - max. <sup>4)</sup>                  | kW                             | 17                                     | 24      | 36      | 40      | 47        | 60          | 85          |

<sup>1)</sup> Maximum flow rate through units at zero external pressure

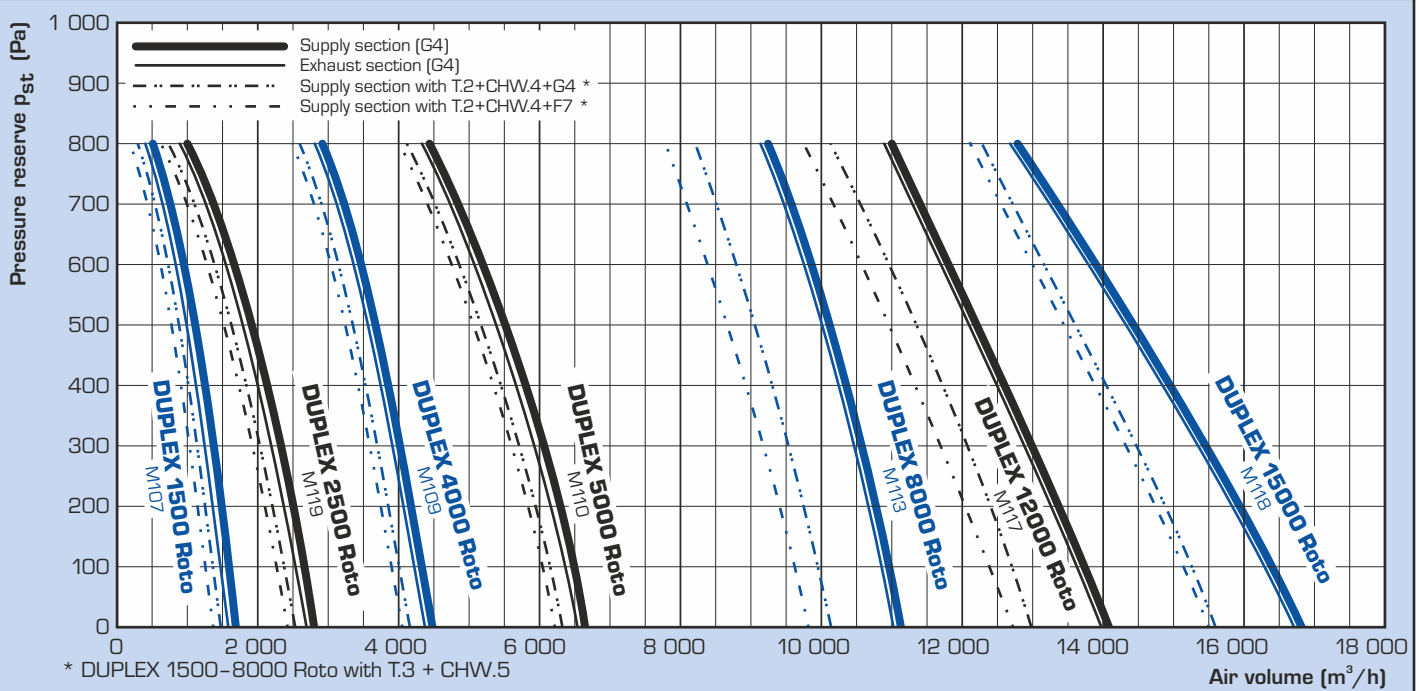
<sup>2)</sup> According to air volume

<sup>3)</sup> Depending on equipment

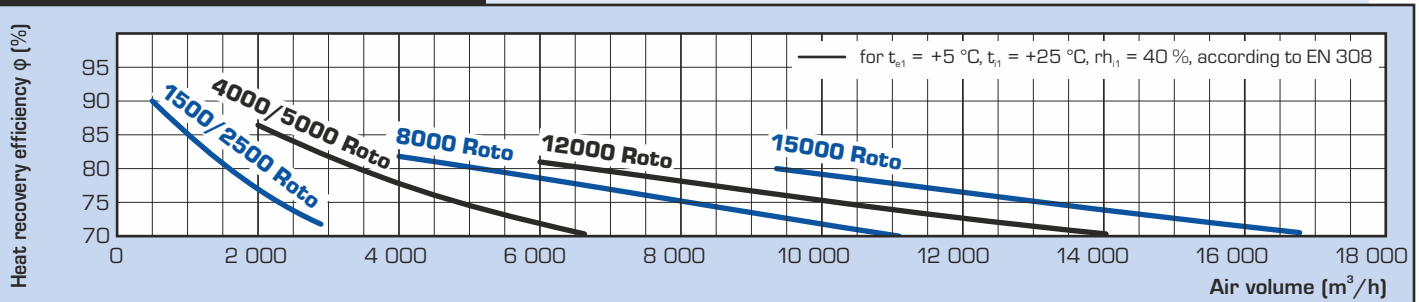
<sup>4)</sup> Depending on register type, liquid and flow rates

<sup>5)</sup> For detailed information please use our DUPLEX selection software.

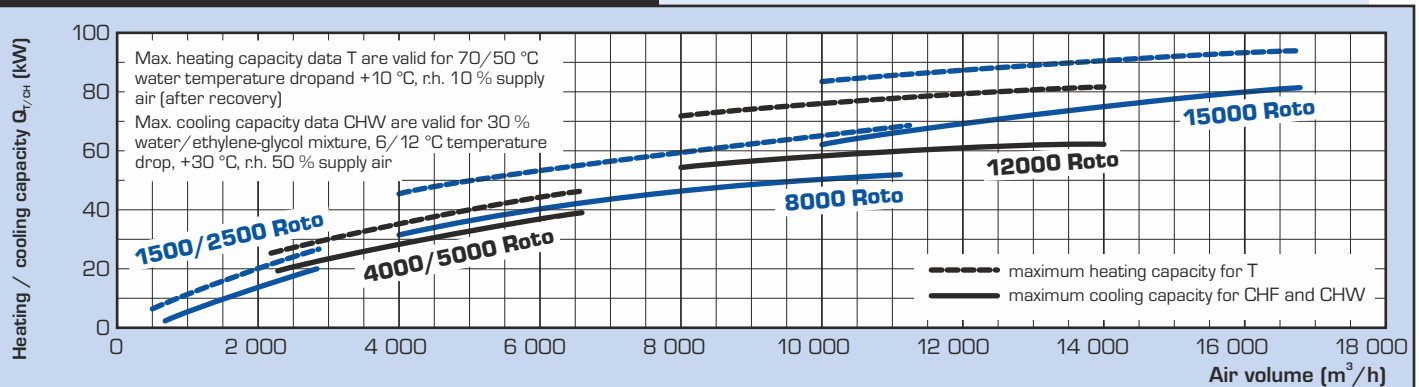
## PERFORMANCE SUMMARY



## HEAT RECOVERY EFFICIENCY

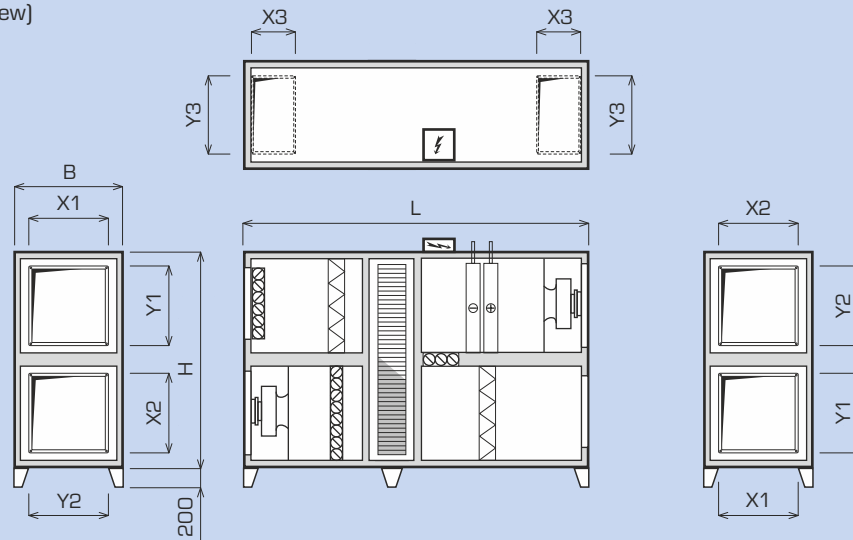


## HEATING AND COOLING PERFORMANCES

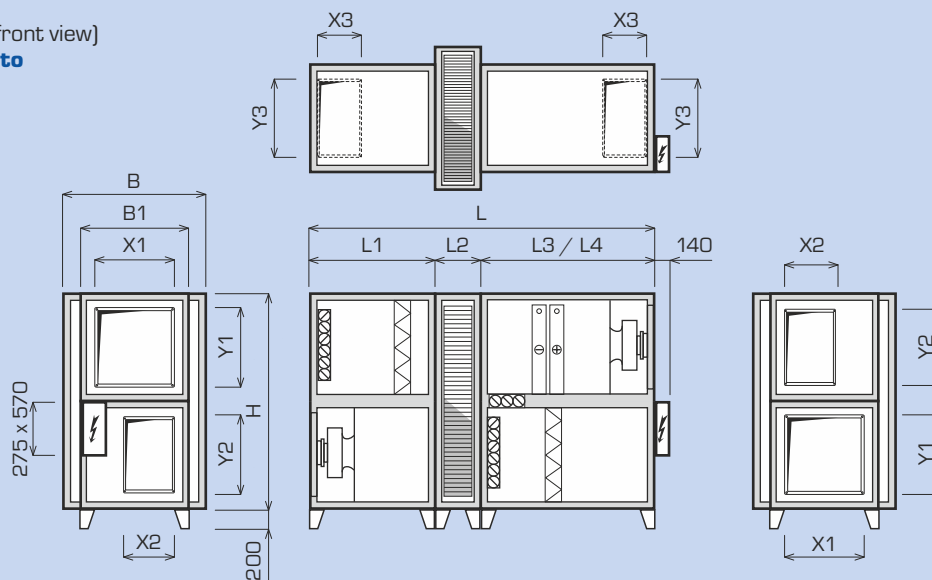


## BASIC DIMENSIONS

### FLOOR-STANDING (front view) 1 500 to 5 000 Roto



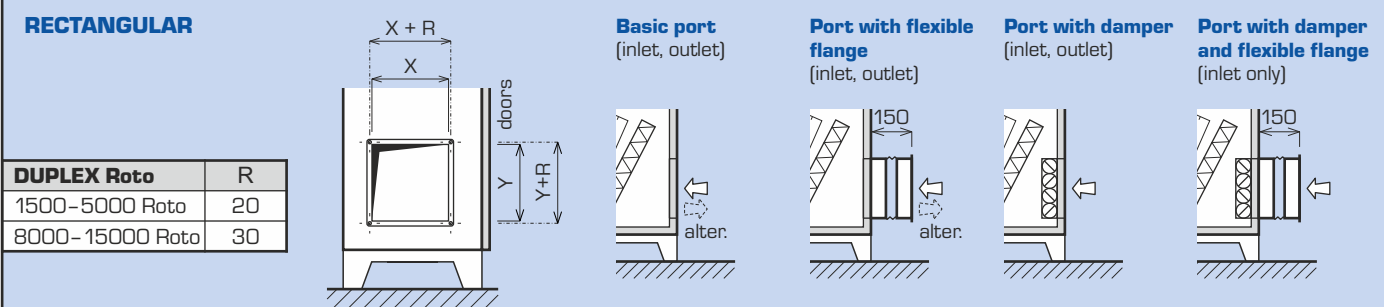
### FLOOR-STANDING (front view) 8 000 to 15 000 Roto



| <b>DUPLEX Roto</b>   |    | <b>1500</b>                      | <b>2500</b>   | <b>4000</b>   | <b>5000</b>   | <b>8000</b>   | <b>12000</b>  | <b>15000</b>  |
|--|----|----------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Dimension <b>B</b>   | mm | 880                              | 880           | 1 200         | 1 200         | 1 600         | 1 780         | 1 930         |
| Dimension <b>B1</b>  | mm | -                                | -             | -             | -             | 1 160         | 1 430         | 1 705         |
| Dimension <b>H</b>   | mm | 1 150                            | 1 150         | 1 760         | 1 760         | 1 820         | 2 100         | 2 250         |
| Length <b>L</b> (without / with mixing)                            | mm | 2 030 / 2 030                    | 2 030 / 2 030 | 2 250 / 2 250 | 2 250 / 2 250 | 2 665 / 2 965 | 2 830 / 3 130 | 2 970 / 3 270 |
| Length <b>L1</b>   | mm | -                                | -             | -             | -             | 1 000         | 1 055         | 1 125         |
| Length <b>L2</b>   | mm | -                                | -             | -             | -             | 530           | 530           | 530           |
| Length <b>L3</b> (without mixing)                                  | mm | -                                | -             | -             | -             | 1 135         | 1 245         | 1 315         |
| Length <b>L4</b> (with mixing)                                     | mm | -                                | -             | -             | -             | 1 435         | 1 545         | 1 615         |
| Condensate drain   | mm | ø 32 (only with CHW, CHF or CHP) |               |               |               |               |               |               |
| <b>Connecting ports</b>  |    |                                  |               |               |               |               |               |               |
| Dimension <b>X1</b> x <b>Y1</b> (e <sub>2</sub> , i <sub>2</sub> ) | mm | 400 x 400                        | 400 x 400     | 710 x 710     | 710 x 710     | 900 x 710     | 1 000 x 900   | 1 200 x 900   |
| Dimension <b>X2</b> x <b>Y2</b> (e <sub>1</sub> , i <sub>1</sub> ) | mm | 400 x 400                        | 400 x 400     | 710 x 710     | 710 x 710     | 500 x 700     | 710 x 710     | 900 x 900     |
| Dimension <b>X3</b> x <b>Y3</b> (e <sub>1</sub> , e <sub>2</sub> ) | mm | 400 x 400                        | 400 x 400     | 355 x 710     | 355 x 710     | 300 x 900     | 400 x 1 000   | 400 x 1 200   |

## TYPES AND DIMENSIONS OF CONNECTING PORTS

### RECTANGULAR



Note: For detailed design and technical data we recommend using our dedicated selection software.

# INSTALLATION AND VERSIONS

## INSTALLATION VERSIONS AND CONNECTING PORTS

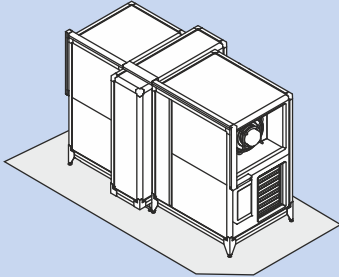
DUPLEX 1500 to 15000 Roto units are available in a range of versions to facilitate their installation in the machine room. This significantly increases options to install DUPLEX Roto units in cramped spaces.

Detailed drawings are shown in the summary table "Mounting positions". DUPLEX Roto units are characterised by a wide range of accessories – the ports may be optionally fitted with flexible flanges and inlet ports may have shut-off dampers if required.

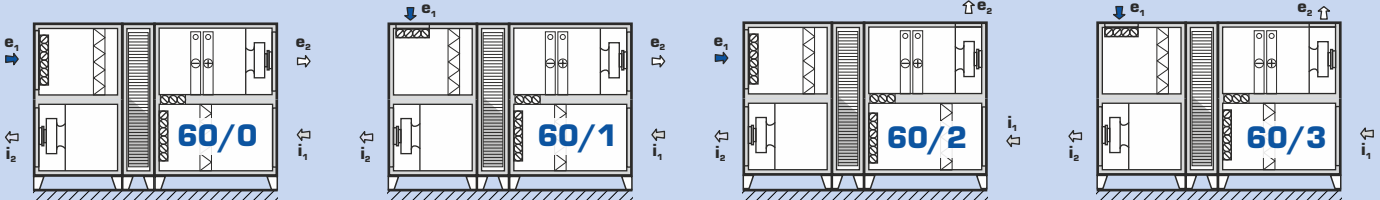
## MOUNTING POSITIONS

### FLOOR-STANDING

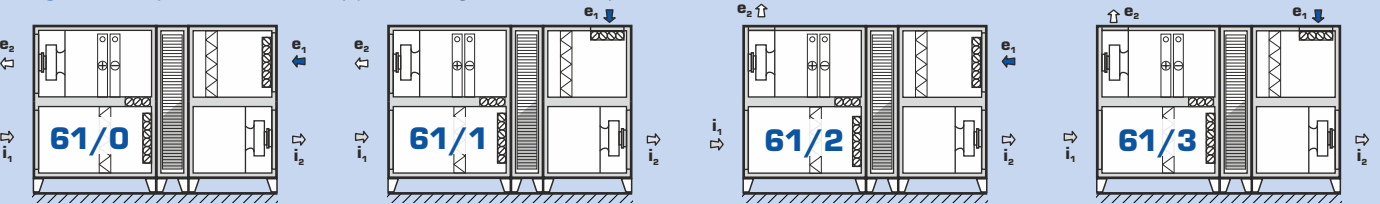
1500 to 15000 Roto



**configuration 60/x** – door-side view (up to 4 configurations in total)



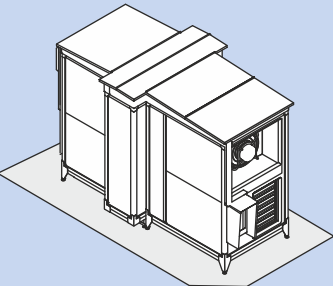
**configuration 61/x** – door-side view (up to 4 configurations in total)



## OTHER CONFIGURATIONS OF DUPLEX ROTO

### ROOFTOP UNITS

DUPLEX 1500 to 15000 Roto-N



For detailed information please see separate technical catalogues.

## HANDLING SPACE

DUPLEX units must be installed with the prescribed handling space around the unit in mind.

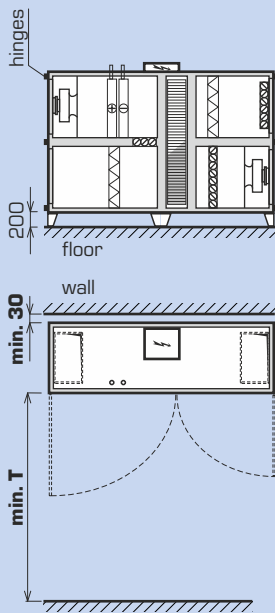
Below the unit at least 200 mm must be left to install the DN 32 condensate drain line. This line must run through a U-bend at least 150 mm high into a sewer. This space is easily provided when the steel supporting feet supplied as standard are used. Handling space in front of the unit must be maintained for opening the front door, replacing filters and providing servicing and installation access to each unit part. Each drawing shows the minimum handling space.

In addition, each unit must have the minimum handling space of 600 mm from the side of the control system electric switchboard according to CSN. Units with a heating or cooling control manifold must have free space from the side of the manifold, too.

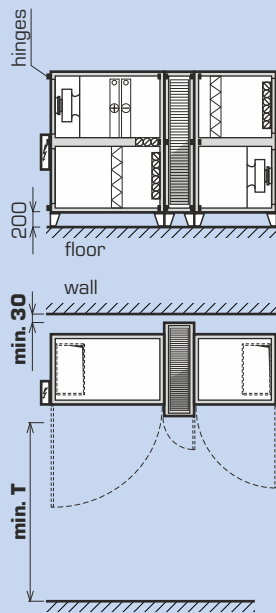
### Handling space in front of the door

#### Floor-standing horizontal

##### 1500-5000 Roto



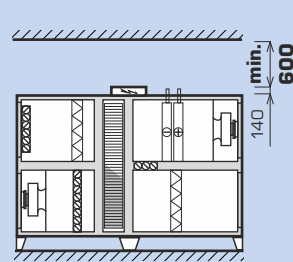
##### 8000-15000 Roto



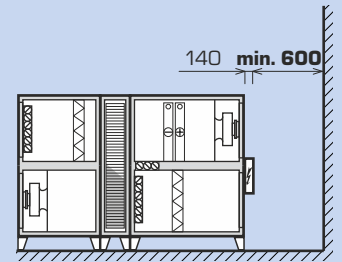
### Handling space for accessories

#### Control modules

##### 1500-5000 Roto

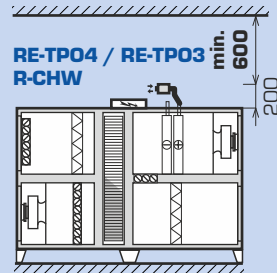


##### 8000-15000 Roto



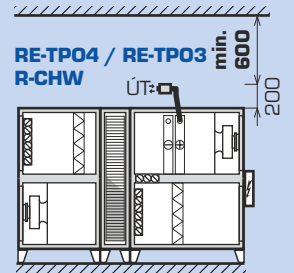
#### Control manifolds for coils

##### RE-TP04 / RE-TP03 R-CHW



#### Control manifolds for coils

##### RE-TP04 / RE-TP03 R-CHW



| Type              | standard doors T (mm) |
|-------------------|-----------------------|
| DUPLEX 1500 Roto  | 1 030                 |
| DUPLEX 2500 Roto  | 1 030                 |
| DUPLEX 4000 Roto  | 1 200                 |
| DUPLEX 5000 Roto  | 1 200                 |
| DUPLEX 8000 Roto  | 1 600                 |
| DUPLEX 12000 Roto | 1 800                 |
| DUPLEX 15000 Roto | 2 000                 |

## ACOUSTIC POWER $L_w$ AND ACOUSTIC PRESSURE $L_{D_3}$

| Type              | Working point                    | Acoustic power $L_w$ [dB(A)] |             |              |              |      | Acoustic pressure $L_{D_3}$ [dB(A)]<br>at distance of 3 m |
|-------------------|----------------------------------|------------------------------|-------------|--------------|--------------|------|---|
|                   |                                  | inlet $e_1$                  | inlet $i_1$ | outlet $e_2$ | outlet $i_2$ | unit |   |
| DUPLEX 1500 Roto  | 1300 m <sup>3</sup> /h (200 Pa)  | 63                           | 62          | 81           | 81           | 54   | 34  |
| DUPLEX 2500 Roto  | 2300 m <sup>3</sup> /h (200 Pa)  | 68                           | 68          | 83           | 83           | 61   | 40  |
| DUPLEX 4000 Roto  | 3500 m <sup>3</sup> /h (200 Pa)  | 69                           | 69          | 87           | 87           | 68   | 48  |
| DUPLEX 5000 Roto  | 5000 m <sup>3</sup> /h (200 Pa)  | 67                           | 66          | 91           | 91           | 65   | 45  |
| DUPLEX 8000 Roto  | 8000 m <sup>3</sup> /h (200 Pa)  | 81                           | 81          | 97           | 96           | 76   | 56  |
| DUPLEX 12000 Roto | 10000 m <sup>3</sup> /h (200 Pa) | 80                           | 80          | 99           | 99           | 69   | 49  |
| DUPLEX 15000 Roto | 15000 m <sup>3</sup> /h (200 Pa) | 81                           | 81          | 97           | 97           | 72   | 52  |

Note: for detailed acoustic parameters we recommend using our specialized selection software.

# MODIFICATIONS

## DUPLEX ROTO - BASIC UNIT



### Basic configuration

#### DUPLEX 1500-5000 Roto

The compact unit consists of supply and exhaust fans with free-running impellers, removable rotary heat recovery exchanger, removable supply and exhaust air class G4 (alter: M5 or F7) filters. A front door enables easy access to all built-in components and filters.

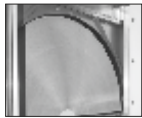
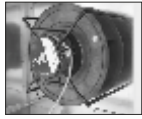
#### DUPLEX 8000-15000 Roto

The unit consists of 3 separate sections:

- 1 - supply centrifugal fans with electric motors in anti-vibration mounting, removable supply filter G4, M5 or F7
- 2 - rotary heat exchanger with an electric motor, a belt pulley and a belt
- 3 - exhaust centrifugal fans with electric motors in anti-vibration mounting, removable exhaust filter G4, M5 or F7

A front door enables easy access to all built-in components and filters.

The units meet requirement in accordance with Commission regulation (EU) No. 1253/2014 (Ecodesign) in the defined working area.



### Fans

All units are equipped with high-efficiency EC fans (Ziehl Abegg) with free-running impellers and backward curved blades. Whole range of DUPLEX 1500 to 15000 Roto units fans meets the requirements of the European directive ErP 2015.

### Heat exchanger

DUPLEX Roto are equipped with a thermal rotor made of aluminum with high efficiency - up to 85 %. The heat exchangers are certified by the Eurovent certification company.

There are two types of exchanger drive:

- 1) AC motor - option only for 8000-15000 Roto units with „basic“ control system (constant rotor revolutions mode).
- 2) Stepper motor - option for „basic“ and „aMotion“ control (rotor revolutions are controlled by 0-10 V signal input).

DUPLEX xxxx ROTO

Me.xxx; Mi.xxx

R.x

## DUPLEX ROTO - MODIFICATION DESCRIPTION



### Rotary heat exchanger

Optionally it is possible to select from following features:

### Hygroscopic rotor

The hygroscopic rotor is wound from aluminium foil with a special hygroscopic layer allowing the transfer of heat (up to 85 %) together with humidity with an efficiency of up to 90 %.



### Purge chamber

The purpose of the purge chamber is to allow some of the supply air to get through the rotor into the exhaust air stream. In this way the rotor channels are purged, which considerably reduces the risk of contaminating the supply air.

### Labyrinth sealing

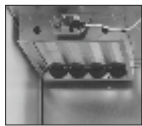
This special type of sealing minimizes the leakage values. Available only for 8000-15000 Roto units.

R.x

R.E

R.xP

R.xL



### Mixing damper ("C")

The mixing damper is used to mix exhaust and supply air. Circulation valve consists of an opposed-blade damper and actuator. It is fitted next to the recovery core inside the unit. It increases the size of the unit (see chapter Dimensions).

#### Important:

For DUPLEX 8000-15000 Roto units increases the mixing damper dimensions of the unit (see chapter „Dimensions“).

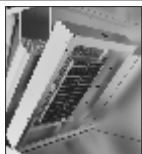
C.x



### Hot water heating coil ("T")

Built-in water-to-air two-, three- or five-row heating coil; made of copper pipes and aluminum fins. Designed for systems up to 110 °C and 1,0 MPa. The coil is standardly equipped with flexible connection and a steam-gas capillary thermostat for freeze protection. Units in modification T (with heating coil) must be equipped with e, supply air shutoff damper; an actuator with spring-return function is recommended. A coil hydraulic kit for heating capacity control of RE-TPO4 or RE-TPO3 type can be supplied with the coil upon request.

T.x



### Electric heating coil ("E")

Integrated electric heating coils consist of PTC (Positive Temperature Coefficient) cells; they are generally used to heat up supply air. By default, electric heating coils always include protective thermostats (operational as well as emergency with manual reset) and regulation module KM featuring power switching elements with so called "zero" switching function (SSR). Built-in electric heating coils are offered in the 1500-5000 Roto units in two power options (basic and powerful). For more information please refer to the selection software DUPLEX.

E.x



### Direct expansion (DX) coil ("CHF")

A built-in coil made of copper pipes and aluminum fins, including a condensate drain with individual condensate drainage and a pressure switch for freeze alarm. Three- or four-row coils with various evaporate temperature are chosen depending on capacity required, refrigerant type and air parameters. Optionally it is possible to deliver double-circuit evaporator in division 1:1 or 1:2, or completely atypical with needed capacity.

CHF.x



### Chilled water cooling coil ("CHW")

A built-in coil made of copper pipes and aluminum fins, including a condensate pan with individual condensate drainage. Three- or five-row coils are chosen depending on capacity required, cooling medium type and air parameters. The cooling coil can be equipped with the R-CHW2 or R-CHW3 hydraulic kit on request.

CHW.x



## OTHER OPTIONAL ACCESSORIES (BASIC OVERVIEW)

Ke.xxx; Ki.xxx

### Shutoff damper e<sub>1</sub>; i<sub>1</sub>

Shutoff dampers standardly fitted with BELIMO actuators are located in the air inlet port. The following damper types are available:

- fresh air dampers e<sub>1</sub>, i<sub>1</sub> - mandatory for C modification (with mixing damper)
- fresh air damper e<sub>1</sub> - mandatory for T modification (with heating coil)
- exhaust air damper i<sub>1</sub>



Fe.xxx; Fi.xxx

### Air filtration

All DUPLEX Roto units can be equipped with supply or exhaust air filtration of M5 or F7 class instead of standard G4 class. External static pressure then drops by 50 to 150 Pa (clean filter) depending on air flow rate, unit type and dirt accumulated.



RE-TPO.x

### Heating coil hydraulic kit

Its function is to control heating capacity of a heating coil. It consists of a three-speed pump, two globe shutoff valves and connection pipes. Further equipment depends on the type:

- RE-TPO4 - four-way mixing valve with an actuator for digital control system
- RE-TPO3 - three-way mixing valve with an actuator for digital control system



R-CHW.x

### Cooling coil hydraulic kit

Its function is to control cooling capacity of a chilled-water cooling coil. It always consists of two globe shutoff valves and connection pipes. Further equipment depends on the type:

- R-CHW3 - three-way mixing valve with an actuator
- R-CHW2 - throttling valve with an actuator for digital control system



MFF

### Tube manometers

Accessory for filters for simple view of current pressure drop.



FK.x

### Spare filters

Replacement filter cartridges in different sizes based on the unit type. Available in G4, M5 and F7 filtration class. Filter F7 can be selected as a cassette or bag filter (only for 8000-15000 Roto units).



### Delivery of disassembled unit

All units can be delivered dismantled on request. The unit is to be assembled by rivets and bolts directly on site, therefore the unit can be installed in inaccessible location.

H.P

### Flexible connections

Round and rectangular ports can be equipped with flexible connections upon request.



TPO

### Hot water heating coil (TPO)

Separately supplied coil for installation into round duct. It is suitable for cramped locations, where it is impossible to put the coil inside the unit, as well as for rooftop units. The coil is standardly equipped with the steam-gas capillary thermostat. Capacities and diameters can be found in respective catalogue sheets.



EPO-V

### Electric heating coil (EPO-V)

Separately supplied heating coil to be fitted into the duct. Capacities and diameters can be found in respective catalogue sheets.



CF.XXX

### Constant air flow and pressure

Manometers reading fan pressure together with controls, enables intelligent fan control of preselected airflow. This accessory assumes the unit is equipped with aMotion digital control. Using a second manometer (optional accessory) in the supply air duct enables the user to control constant pressure in the supply duct.



EPO-V

### Electric preheaters (EPO-V)

EPO-V electric heating coils to provide the antifreeze protection of the heat recovery exchanger when equal-pressure ventilation is continuously required. It is installed inside a duct on the outdoor supply air side of the unit (e.). Control is provided through the DUPLEX aMotion unit control system.



### Hingeless doors

When needed it is possible to deliver door without standard hinges - than necessary manipulation space is reduced.

# CONTROLS




DUPLEX Roto units are delivered with basic control components or with complete control systems.

There are two types of control systems available according to customer needs and an application. The systems also include variety of sensors (temperature, humidity, air quality, CO<sub>2</sub>) for effective operation control.

## Features of the control systems

- selection of the most suitable and efficient control system at the lowest cost, depending on the particular application
- control system is integrated with the unit, most components are already wired and checked in factory, thus reducing the risk of incorrect wiring
- no control system project documentation is necessary for standard cases, standardized solutions can be used
- simple wiring, system simplicity, error indication
- qualified technical support and consulting

## SUMMARY OF DUPLEX ROTO CONTROL SYSTEMS

| Type                      | Use   | Controller   |
|---------------------------|---|--|
| <b>“Basic” controls</b>   | <ul style="list-style-type: none"> <li>- all electrical components are wired to a junction box terminal strip inside or outside the unit</li> <li>- standard components are fans, damper actuators, capillary freeze protection thermostat of hot water heating coil</li> <li>- more components are included upon customer's request (exact actuator type, sensors, thermostats, pressure switches etc.)</li> <li>- suitable for applications with separate delivery of control system; e.g. large buildings with central control system etc.</li> </ul>  | <div style="text-align: center;"> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <b>basic version</b><br/>                     (fans, actuators, thermostats, pressure switches and others on request)                 </div> <div style="text-align: center; margin: 5px 0;">                     ↑<br/>                     ↓                 </div> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">                     Supervisory control system                 </div> </div> |
| <b>“aMotion” controls</b> | <p><b>Standard aMotion control functions</b></p> <p><b>Elementary aM-CE basic module</b></p> <ul style="list-style-type: none"> <li>- EC fans speed control (according to selected mode)</li> <li>- Automatic heat and cool recovery control (by-pass control)</li> <li>- Evaluates and prevents all emergency conditions according to the measured values</li> <li>- Possibility of setting basic and user scenes and weekly calendars to select modes, power, temperatures and other functions</li> <li>- Ethernet connection for communication over the Internet</li> <li>- Inputs for external signals - control e.g. from kitchens, toilets and similar</li> <li>- Possibility of connecting air quality sensors (e.g. CO<sub>2</sub> concentration or relative humidity) either by contact, 0-10V voltage, or via the bus.</li> <li>- Outputs for continuous control of electric preheater and heater (pulse switched 10 V)</li> <li>- Possibility of connecting up to two controllers of different types</li> <li>- Connection to supervisory control system via Modbus TCP protocol</li> </ul> <p><b>Legendary aM-CL advanced module (with all functions from Elementary aM-CE module and additional options below)</b></p> <ul style="list-style-type: none"> <li>- Control of systems with VAV boxes</li> <li>- Control of systems with heat sources (heat pumps, heat accumulators etc.)</li> <li>- Communication by BACnet protocol over the bus</li> <li>- Possibility of connecting more than two controllers</li> <li>- More than 4 external bus elements (controllers, CO<sub>2</sub> sensors, outdoor temperature sensors,...)</li> <li>- Multiple adjustable scenes (more than 10)</li> <li>- More than 2 user calendars</li> <li>- More than 4 users (excluding service access)</li> </ul> <p><b>Additional module aM-IO18</b></p> <ul style="list-style-type: none"> <li>- Inputs for 4 external signals - control from kitchens, toilets and similar</li> <li>- Hot water heater control (0-10 V)</li> <li>- Control of circulation modes</li> </ul> <p><b>Additional module aM-IO12</b></p> <ul style="list-style-type: none"> <li>- Control of cooling (direct and water) and heat pumps</li> <li>- Rotary regenerator</li> </ul> <p><b>Additional aM-XCF</b></p> <ul style="list-style-type: none"> <li>- Unit control based on flow measurement</li> </ul> <p><b>Additional RD-K module</b></p> <ul style="list-style-type: none"> <li>- Additional inputs and outputs significantly expanding the control system functionality</li> </ul> <p><b>BACnet / KNX converter</b></p> <ul style="list-style-type: none"> <li>- Connection to the superior system via BACnet or KNX protocol</li> </ul> | <p><b>aTouch (touchscreen)</b></p>  <p><b>aDot (touchscreen)</b></p>  <p><b>aSpace (internet interface)</b></p>    |