

Overview

In many homes, ERVs or HRVs must be ducted to deliver fresh air to rooms and exhaust air from certain rooms throughout the home. This guide provides a step-by-step process on designing a Rheia duct system for this application.

Step 1: Determine the required airflows

Follow the Passive House guide or any other accepted means of determining the total CFM needed for ventilation and room-by-room CFM needed.

Step 2: Select an ERV/HRV

Select the ventilation equipment of choice meeting the necessary efficiencies and minimum airflow requirements determined in Step 1.

Step 3: Select a fan speed

Look at the fan speed options on the equipment specification sheet or the fan performance curve data. Example below. Find the lowest CFM setting that covers the total CFM determined in Step 1. Also make note of the maximum allowable external static pressure as this will be used in future steps. Be sure to convert airflow units to CFM and static pressure units to IWC if they are listed in other units.

Supply voltage [V/Hz]	230V/50Hz									
Dimensions (w x h x d) [mm]	750 x 650 x 560									
Duct diameter [mm]	ø160									
Ext. diameter condensate discharge [mm]	ø32									
Weight [kg]	37									
Filter class	ISO Coarse 60% (ISO ePM1.0 50% for the air supply optional)									
Fan setting (factory setting)	0		1		2		3		max	
Factory setting [m ³ /h]	50		100		150		250		325	
Permissible resistance of duct system [Pa]	2	6	9	24	21	53	59	148	100	250
Rated power (excl. preheater) [W]	6.1	6.6	7.9	10.3	15.1	21.0	46.6	69.1	87.5	144.5
Rated current (excl. preheater) [A]	0.08	0.08	0.09	0.11	0.15	0.21	0.41	0.59	0.73	1.07
Max. rated current (incl. preheater switched on) [A]	6									
Cos φ	0.341	0.343	0.389	0.394	0.430	0.439	0.492	0.507	0.521	0.542

Step 4: Determine final room-by-room airflows

In most cases your equipment fan setting will be a higher airflow than the total CFM determined in Step 1. Divide the equipment airflow selected in Step 3 by the total CFM determined in Step 1 to create a multiplication factor for each room. Then multiply each room's CFM by that factor to get the final room-by-room airflows. Example:

- Total CFM determined in Step 1: 132 CFM
- Equipment fan selection from Step 3: 147 CFM
- Multiplication factor = 147/132 = 1.11

- If bedroom 1 CFM requirement from Step 1 is 26 CFM: $26 \times 1.11 = 29$ CFM final airflow.
- Repeat for all rooms

Step 5: Lay out duct system

Locate registers in each room that require supply or exhaust air and draw ducts from the ERV location to each register. Pay attention to the home's structure to ensure ducts can travel as intended. Note that Rheia 3" ducts can fit within a 2x4 wall but 4" ducts cannot. 4" ducts can fit within a 2x6 wall. Rheia has four different boot types:



Ceiling Boot



High Sidewall Boot



Pass Through Boot



Floor Boot

Step 6: Determine the available static pressure

In Step 3 the maximum external static pressure of the equipment was determined. Some of this total external static will be consumed by the duct bringing air in from the outside and the duct exhausting air to the outside. Size those ducts using ACCA Manual D principles for friction loss to determine the pressure loss of the intake/outlet ducts and fittings. Size them to not incur excessive static pressure. Keeping the pressure loss of those ducts below 0.25" would be a good target. Subtract the pressure loss for the intake/outlet ducts from the maximum external static pressure of the equipment to determine your available static pressure.

Step 7: Size the Rheia ducts

Use the following table to size each Rheia duct. Be sure to account for vertical length going from one floor to the next when determining duct length.

	Available Static Pressure (IWC)															
	0.1-0.15				0.15-0.20				0.20-0.30				>0.30			
	Duct Length															
Room CFM	<10'	10'-20'	20'-40'	40'-75'	<10'	10'-20'	20'-40'	40'-75'	<10'	10'-20'	20'-40'	40'-75'	<10'	10'-20'	20'-40'	40'-75'
<15	3"	3"	3"	4"	3"	3"	3"	3"	3"	3"	3"	3"	3"	3"	3"	3"
15-25	3"	4"	4"	3"+3"	3"	4"	4"	4"	3"	3"	4"	4"	3"	3"	3"	4"
25-35	4"	3"+3"	4"+3"	4"+4"	4"	4"	3"+3"	3"+3"	4"	4"	4"	3"+3"	3"	3"	4"	4"
35-45	3"+3"	4"+3"	4"+4"	4"+4"	3"+3"	3"+3"	4"+3"	4"+4"	4"	3"+3"	4"+3"	4"+3"	4"	4"	3"+3"	4"+3"

Step 8: Create bill of materials (BOM)

The BOM will be an estimate only, actual installed quantities may vary. The table below describes how to account for each component within your duct layout. There are two fitting assemblies that will not appear on your drawing to account for, Coupler Fittings and Elbow Fittings.

Coupler Fittings -

These will be used to splice two shorter pieces of duct together to minimize waste from duct that is cut to length. Assume one coupler fitting for the greater between: 1) one for every three duct runs or 2) one for every 50' of total duct.

Elbow Fittings -

These will be used to bend the flex duct around any tight corner avoiding excessive pinching of the duct. Review your duct layout and assume an elbow fitting each time a duct bends around a tight corner. Elbow fittings will not be needed when turning to go up a wall.

Part Name	Part Number	How to calculate
3" Duct Uninsulated (S-TL) ft.	10-00-190	Add up the length of each 3" duct run
3" Ferrule	10-01-010	Two for each 3" duct run (one at the take-off and one at the boot) plus two for each coupler or elbow fitting.
Elbow Extension	10-01-020	One for each Ceiling Boot, one for each Floor boot, and two for each elbow fitting
Coupler	10-01-030	One for each coupler fitting and one for each elbow fitting
Duct Board Take Off Inside	10-01-041	One for each duct run
Duct Board Take Off Outside	10-01-051	One for each duct run
High Sidewall Boot Assembly	10-01-200	One for each High Sidewall Boot
Pass Through Boot Assembly	10-01-210	One for each Pass Through Boot
Ceiling Boot Assembly	10-01-220	One for each Ceiling Boot
Floor Boot 4x10 Assembly	10-01-280	One for each Floor Boot
Slotted Diffuser	10-04-091	One for each High Sidewall Boot and one for each Pass Through Boot
Ceiling Diffuser Assembly	10-04-230	One for each Ceiling Boot
4" Duct Uninsulated (S-TL) ft.	20-00-190	Add up the length of each 4" duct run
4" Ferrule	20-01-010	Two for each 4" duct run (one at the take-off and one at the boot) plus two for each coupler or elbow fitting
Hanger Bar Assembly	00-00-240	One for each Pass Through Boot, one for each High Sidewall Boot, and two for each Ceiling Boot
Metal Floor Diffuser 4x10	00-04-300	One for each Floor Boot