

PROVENT

Ceiling Type High Efficient Heat Recovery Units



Index

PROVENT

PROVENT (650/1000/2000/2500/3500/4000) Ceiling Type Energy Recovery Unit

- Unit Components	2
- Performance Data	3
- Technical Specifications	5
- Unit Dimensions	6
- Installation	6
Control System	9
Accessories	
- Filter Box	9
- Electric Heaters	10
- Changeover Coil Box	11
- Heating Coil	12
- Sliding Rail	13
- Ventilaton on Demand (VOD)	14
- Sound Attenuator	15
General Terms and Conditions of Sale	16



The technical specifications and the performance data declared with this logo have been developed by the tests performed in Eneko Energy Laboratory which is established with the development Project support of Tübitak by regarding relevant standards.

Control System

Regin control unit is developed for controlling of heat recovery units' equipments, meeting the demands coming from the customers and is user-friendly designed. Regin is capable of commanding the equipments in standard unit and optional accessories. Regin Control unit can be performed the basic functions without any control panel, with Standard Panel can be also used more functional. Besides, the control unit can control the all functions via ModBus and switch on/off via BMS as optional.

Casing & Insulation

The unit's casing is made up of double skinned high corrosion resistive 200 gr/m² galvanize coated steel. 50 mm thickness and 70kg/m³ density of Rockwool insulation between the walls is used for thermal and sound insulation. Circular inlet and outlet flanges with seals in models PROVENT 650 to PROVENT 1000, and rectangular flanges in models PROVENT 2000 to PROVENT 4000.

Supply and Exhaust Air Fans

The fans in heat recovery units are equipped with innovative Electronically Commutated EC motor technology. EC motors have higher efficiency and simple speed control. Fan blades have high aerodynamic efficient backward curved design. Using the EC motors reduce the energy consumption and increase the energy efficiency of the unit. With EC Fans, maintenance costs are reduced as the fans are directly connected to the motors; the belt and pulley problems are eliminated.

Heat Recovery Exchanger (Aluminum)

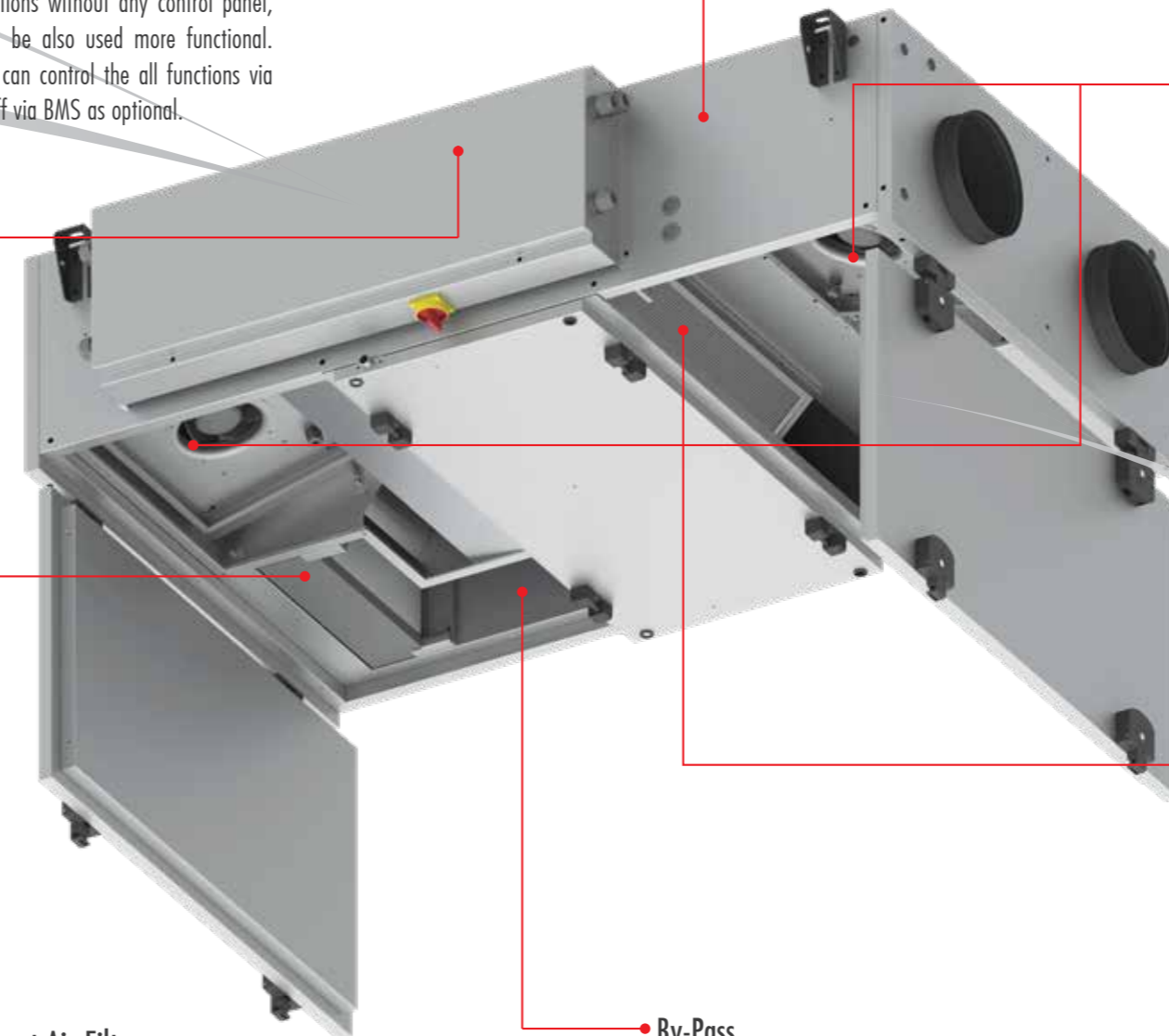
PROVENT heat recovery ventilation units have aluminum counterflow, high efficient plate heat recovery exchangers. Plate heat recovery exchangers have plates that are produced improved surface areas to provide high efficient and leakage free design. With the optimization of exchanger heat transfer is increased and pressure drop is decreased. Heat recovery exchanger has Eurovent certification.

By-Pass

PROVENT units have by-pass ventilation as standard. During by-pass ventilation, no heat transfer occurs between exhaust and fresh air stream. In transition periods and at nights in summer, by-pass module helps to cool down (free-cooling) and heat up (free-heating) the building without any energy expense.

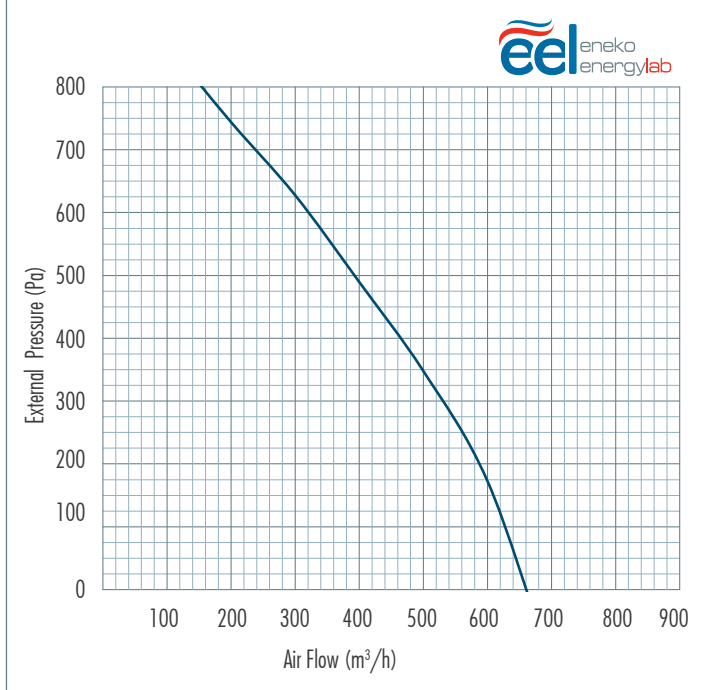
Supply and Exhaust Air Filters

To increase indoor air quality and to protect the equipments used in unit, ISO ePM 1 >50-65%, & ISO ePM 10 >50% class filters (according to ISO 16890 standard) are used for supply and exhaust air streams, respectively. F9 class filters can be also used optionally outside the unit. ISO ePM 1 >80% class filters reduce the available static pressure of the unit for the nominal air flow rate.



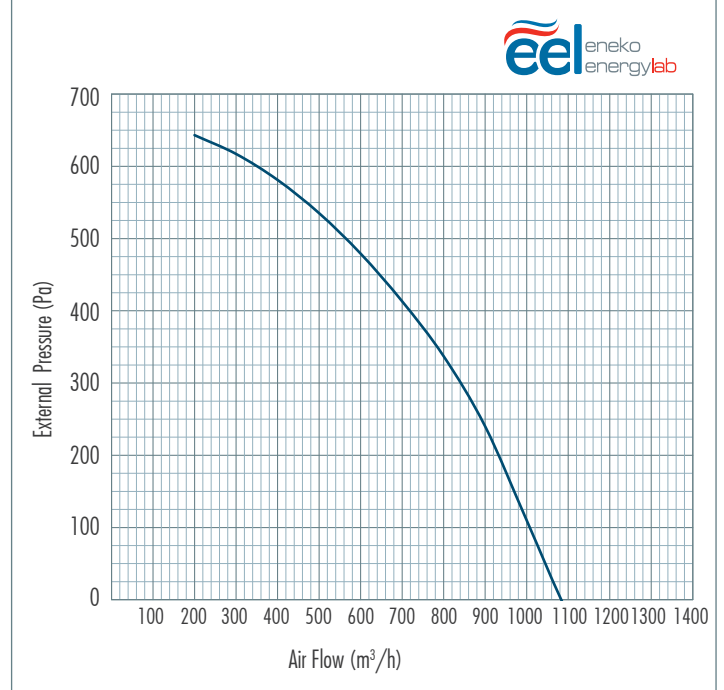
PROVENT 650LC / 650RC

Performance Curve



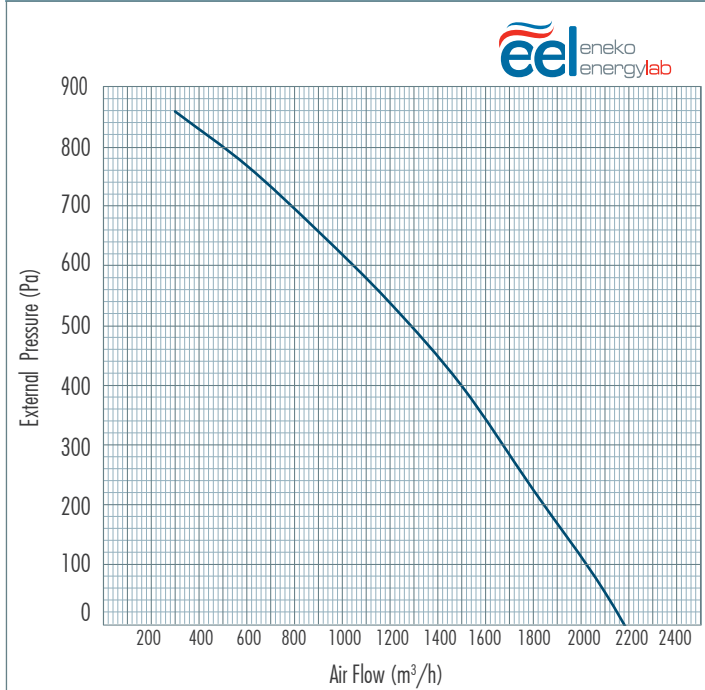
PROVENT 1000LC / 1000RC

Performance Curve



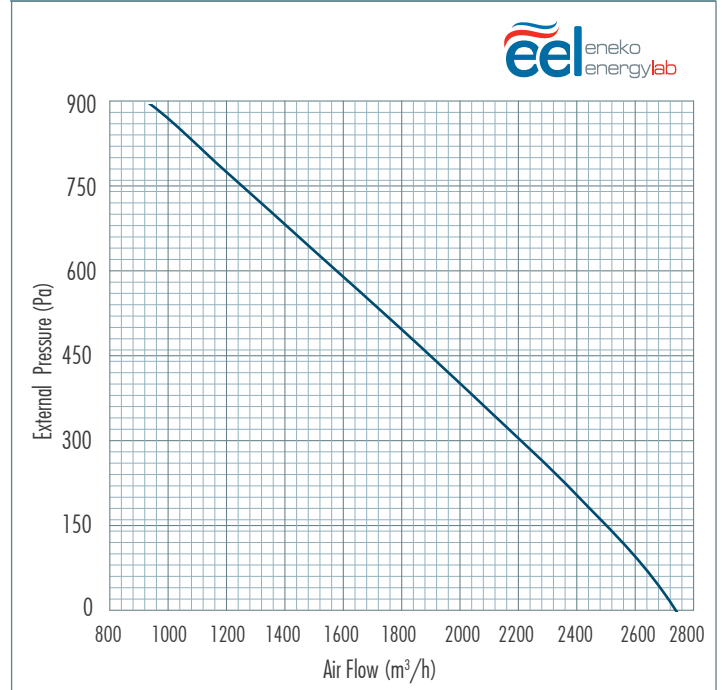
PROVENT 2000LC / 2000RC

Performance Curve

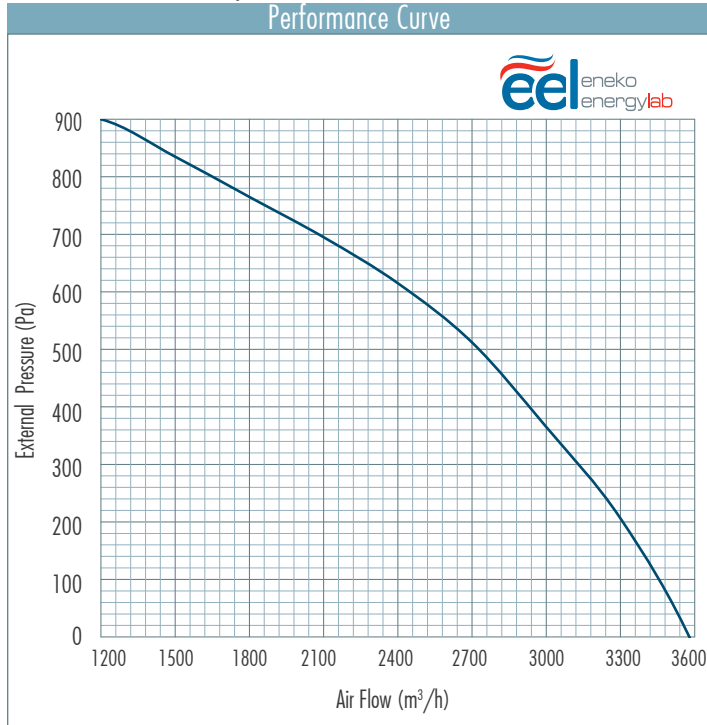


PROVENT 2500LC / 2500RC

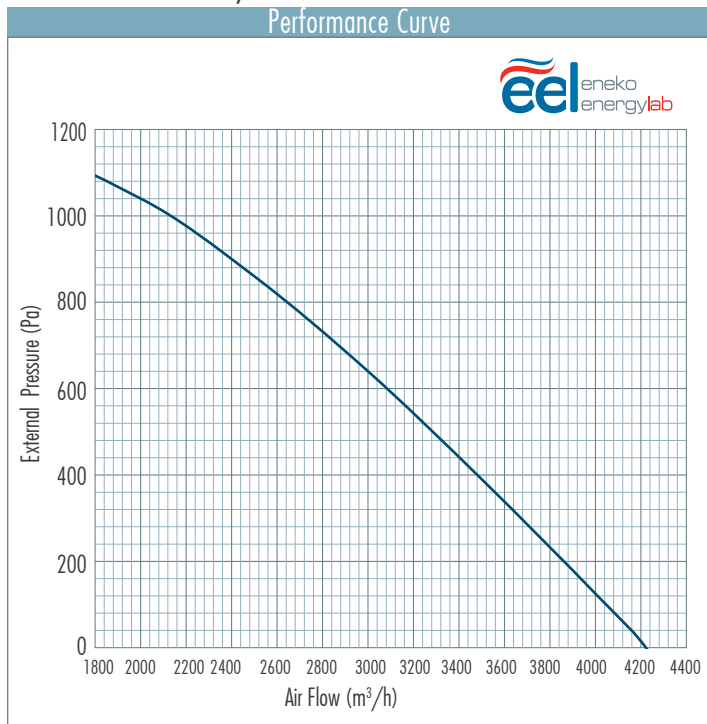
Performance Curve



PROVENT 3500LC / 3500RC



PROVENT 4000LC / 4000RC

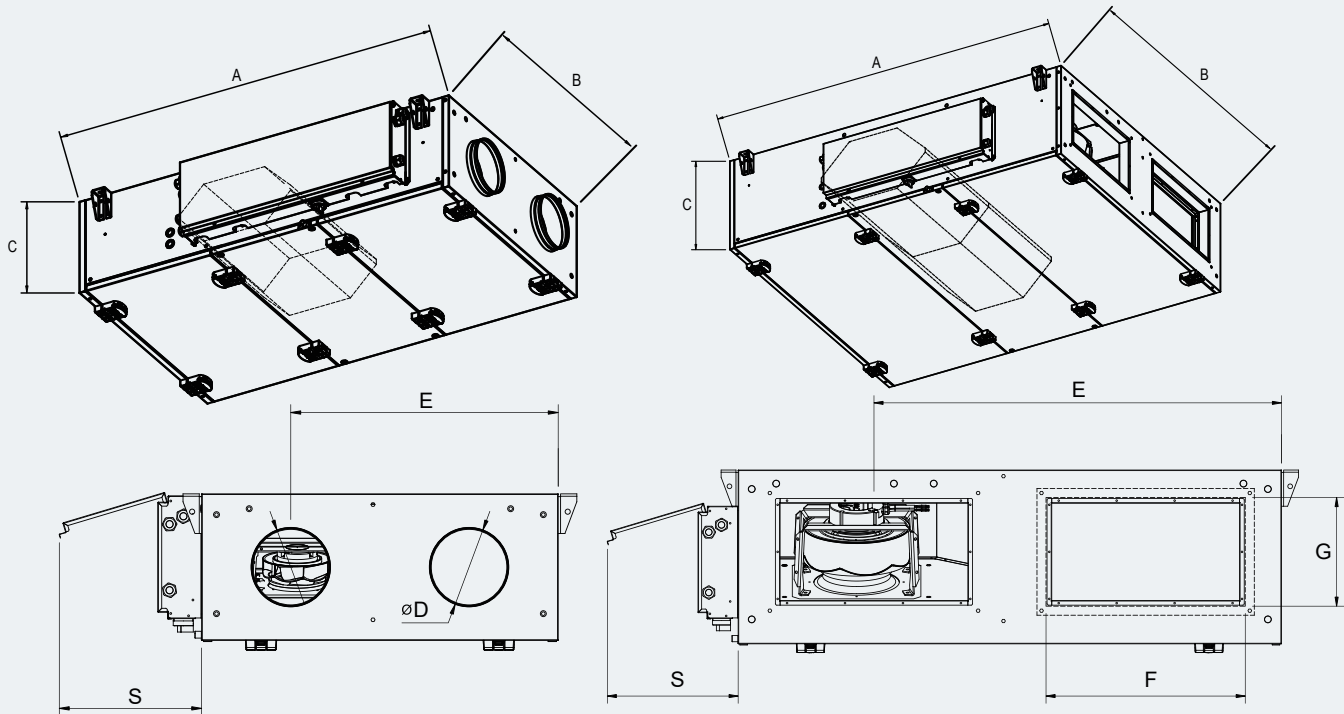


Technical Specifications

Product Model Identifier		PROVENT650LC PROVENT650RC	PROVENT1000LC PROVENT1000RC	PROVENT2000LC PROVENT2000RC	PROVENT2500LC PROVENT2500RC	PROVENT3500LC PROVENT3500RC	PROVENT4000LC PROVENT4000RC
Manufacturer		ENEKO					
Erp		Erp 2018					
Declared typology		NRVU/BVU					
Type of drive		Variable speed drive (VSD)					
Type of HRS	%	Other					
Thermal efficiency of HRS ¹	%	80.2	82.5	81.8	80.5	79.1	80.1
Nominal flow rate	m ³ /s	0.139	0.250	0.389	0.556	0.694	0.917
Effective electric power input	kW	0.228	0.436	0.645	1.097	1.454	1.892
SFP _{int}	W(m ³ /s)	707.6	808.1	714.4	716	920.7	861
Face velocity at design flow rate	m/s	1.49	1.78	1.60	1.70	1.86	1.90
Nominal external pressure drop ($\Delta P_{s,ext}$)	Pa	100	150	200	300	300	300
Internal pressure drop of ventilation components($\Delta P_{s,int}$) (SUP/EXH)	Pa	174/166	214/203	212/202	216/205	286/283	273/266
Internal pressure drop of non-ventilation components($\Delta P_{s,int}$)	Pa	N/A					
Static efficiency of fans used in accordance with Regulation (EU) No. 327/2001(SUP/EXH)		47,5/47,2	51,7/51,7	58,8/58,8	59/59	62,4/62,4	61,4/61,2
Declared maximum external leakage rate	%	< 3					
Declared maximum internal leakage rate	%	< 3					
Energy classification of the filters (Energy performance) (SUP/EXH)		ePM1 >50% / ePM10 >50%					
Description of visual filter warning for NRVUs intended for use with filters		Pressure					
Casing sound power level (L _{WA})		46.5	48.0	50.6	47.5	54.0	56.6
Internet adress for pre-/dis-assembly instructions		www.eneko.com.tr					

¹ @Balanced flow, EN 308 conditions (OA = 5°C & 72%, RA = 25°C & 28%).

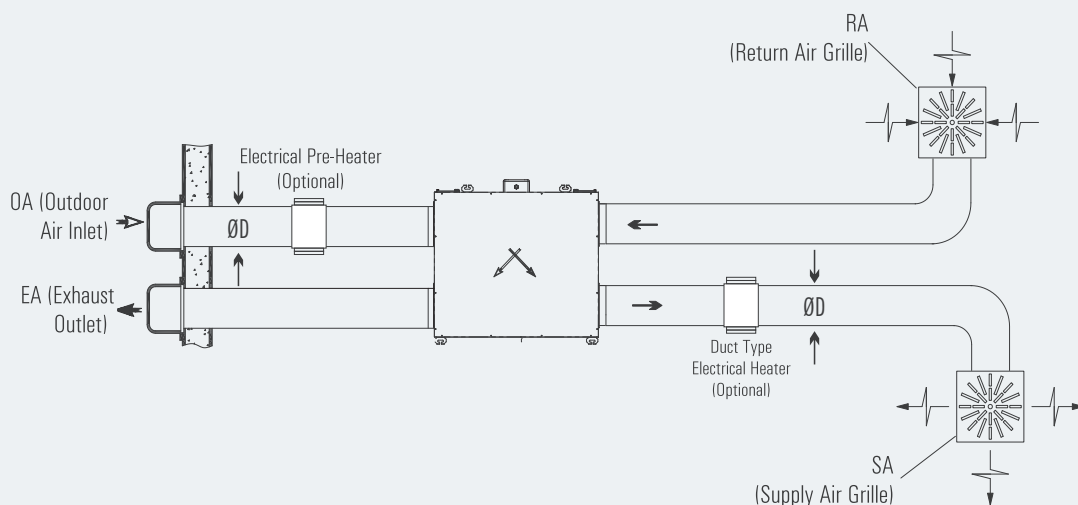
Prevent Unit Dimensions



	PROVENT 650LC PROVENT 650RC	PROVENT 1000LC PROVENT 1000RC	PROVENT 2000LC PROVENT 2000RC	PROVENT 2500LC PROVENT 2500RC	PROVENT 3500LC PROVENT 3500RC	PROVENT 4000LC PROVENT 4000RC
A	900	1150	1500	1650	1650	1970
B	1500	1600	1800	2000	2100	2250
C	370	400	480	565	580	580
ØD	200	250	-	-	-	-
E	675	863	1125	1238	1238	1478
F	-	-	517	567	567	717
G	-	-	267	367	367	367
S	370	370	300	400	400	400
Unit Weight	125	164	230	286	320	370

*All measurement values are mm. **Unit weight is kg.

Installation



*Drain pipe must be installed



NOTE: View from TOP

Control System

Automation Options		Control Cards
Standard	Optional	Standard
OA Temperature Sensor		☑
RA Temperature Sensor		☑
SA Fan Control		☑
RA Fan Control		☑
Proportional ByPass Damper		☑
Filter Contamination Info (DPS)		☑
Modbus RTU		☑
Weekly Timer		☑
Airflow Control (2000/2500/3500/4000)		☑
SA Temperature Sensor		☑
BacNET		☑
Web Browser (TCP/IP)		☑
	Humidity Control	
	CO2 Control	⊖
	On/Off Damper Control	☑
	On/Off Heating Coil	☑
	Proportional Changeover (water)	☑
	Proportional Cooling Coil	☑
	Electrical Pre-Heater	☑
	Electrical After-Heater	☑

⊖ Only one of them the defined functions is selectable for this control card.

⚠ The optional features in the table vary according to the product.

Control Panel		Control Cards	
Panel Type	Panel Descriptions	Standard	Optional
	Standard Wall-mounted type hand panel, IP 30 protection class, Max:100 m communication ability	☑	⊗
	Standard Wall-mounted type hand panel, IP 30 protection class, Max:100 m communication ability	⊗	☑

■ Selection of Electrical Cable Cross-Section

Unit Model PROVENT	Unit Voltage (V)	Unit Power Input (kW)	Current (A)	Fuse (A)	Cable Cross-Section (mm ²) for 50M and PF=0.8
PROVENT650LC / RC	230	0,37	2,98	2x4	1
PROVENT1000LC / RC	230	0,59	2,98	2x4	1
PROVENT2000LC / RC	230	0,59	3,78	2x6	1
PROVENT2500LC / RC	230	0,94	4,58	2x6	2,5
PROVENT3500LC / RC	230	1,54	6,58	2x10	4
PROVENT4000LC / RC	400	2,66	3,58	3x4	2,5

The data in the table shows the maximum power/current values. Please check unit label for updated values.

■ Cable Cross-Section Formulas

$$1$$

$$I_{\text{current}} = \frac{P}{U \cdot \cos Q}$$

$$I_{\text{cable}} > I_{\text{current}}$$

$$2$$

$$\%e = \frac{100 \cdot P \cdot L}{k \cdot S \cdot U^2}, \quad S = \frac{100 \cdot P \cdot L}{k \cdot \%e \cdot U^2}$$

$$\%e = \%3$$

$$3$$

$$I_{\text{cable}} > I_{\text{fuse}} \geq I_{\text{current}}$$

$$\text{Cable Cross-Section } S = \text{Max } (S1, S2, S3, 1.5\text{mm}^2)$$

- P** : Power
I : Current
U : Voltage
S : Conductor cross section
k : Conductor coefficient
L : Conductor length
%e : The voltage drop

■ Example of Cable Cross-Section Calculation

$$\begin{aligned}
 P &: 1 \text{ kW} & L &: 50\text{m} \\
 U &: 230\text{V} & \%e &: \%3 \\
 PF: \cos Q &: 0.8 & k &: 56\text{m} / \Omega
 \end{aligned}$$

$$1$$

$$I_{\text{current}} = \frac{1000 \text{ W}}{230 \cdot 0,8} = 5.43 \text{ A}$$

The cable will be used, is selected from the cable cross-section table so that the equivalent ampere value in the table should be higher than calculated "I_{current}" value.

$$S1 = 1.5 \text{ mm}^2$$

$$2$$

$$\%e = \%3$$

$$S = \frac{100 \cdot 1000 \cdot 50}{56 \cdot 3 \cdot 230^2} = 0.56 \text{ mm}^2$$

$$S2 \geq 0.56 \text{ mm}^2 \geq 0.75 \text{ mm}^2$$

$$S2 = 0.75 \text{ mm}^2$$

$$3$$

$$I_{\text{cable}} > I_{\text{fuse}} \geq I_{\text{current}}$$

$$I_{\text{cable}} > 10\text{A} \geq 5.43\text{A}$$

"I_{fuse}" which will be higher than "I_{current}", is selected.

The cable will be used, is selected from the cable cross-section table so that the equivalent ampere value in the table should be higher than selected "I_{fuse}" value.

$$I_{\text{cable}} = 24\text{A}$$

$$S3 = 1.5 \text{ mm}^2$$

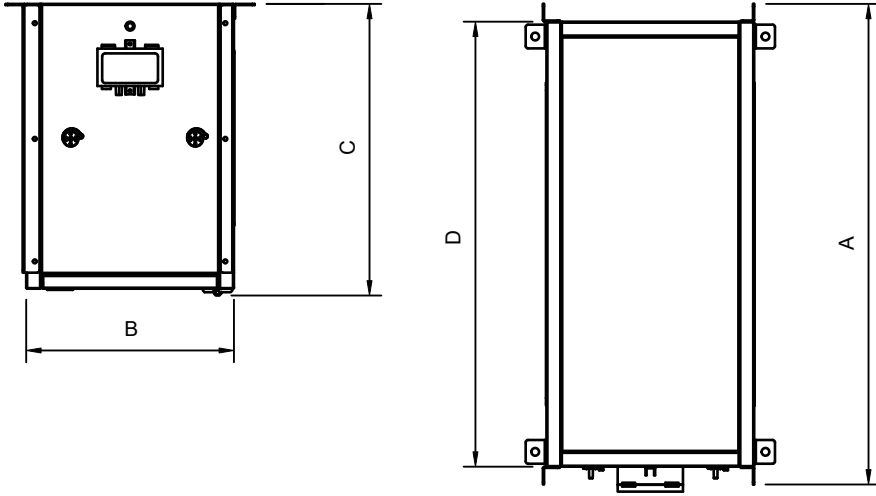
$$\text{Cable cross-section } S = \text{Max } (S1, S2, S3, 1.5 \text{ mm}^2)$$

$$S = \text{Max } (1.5, 0.75, 1.5, 1.5)$$

$$S = 1.5 \text{ mm}^2$$

■ Filter Box

Channel type ePM1 class filters are available in Provent units. In order to reduce initial and operational pressure drop, innovative pleated type filters are used to increase the filtering surface. The maximum airflow of the units decreases due to filter pressure reduction



Filter Box						
Unit Model		A (mm)	B (mm)	C (mm)	D (mm)	Total Weight
PROVENT	650LC 650RC	510	350	382	450	21
	1000LC 1000RC	635	350	412	575	23
	2000LC 2000RC	810	350	492	750	33
	2500LC 2500RC	885	350	572	825	36
	3500LC 3500RC	885	350	592	825	39
	4000LC 4000RC	1045	350	592	985	42

■ Electric Heaters



Electric heaters are optionally supplied in cold climates for supply air and in extreme climates for both supply and outdoor air sides against freezing. Electric heaters are manufactured according to circular or rectangular duct systems.

Standard types are produced of stainless steel heating elements and galvanized metal casing. Stainless steel casing is also available. Electric heaters are equipped with two circuit cutting thermostats. Factory setting for the automatically operating one is 70 °C and for the manual operating 110 °C.

Electric heaters capacity can be controlled up to 3 steps with control panel according to the set temperature from the room control panel and room (or supply air) temperature. Speed controls shall not be used with Electric heater installations. Eneko electric heaters are connected in Delta connection in standard models.

Heating Capacity Calculation

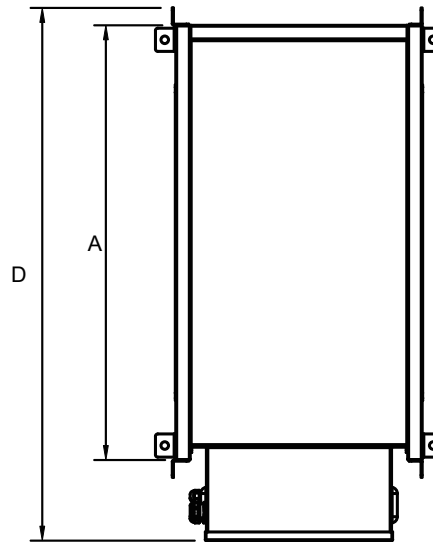
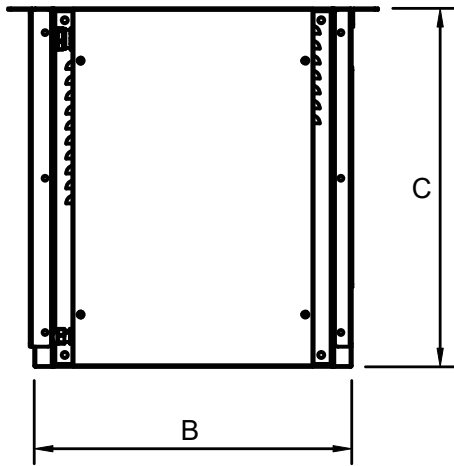
$$Q = 0,33 \times V \times (T_2 - T_1)$$

Q : Heating Capacity (W)

V : Air Flow through electric heater (m³/h)

T₁ : Air temperature before the heater (°C)

T₂ : Air temperature after the heater (°C)

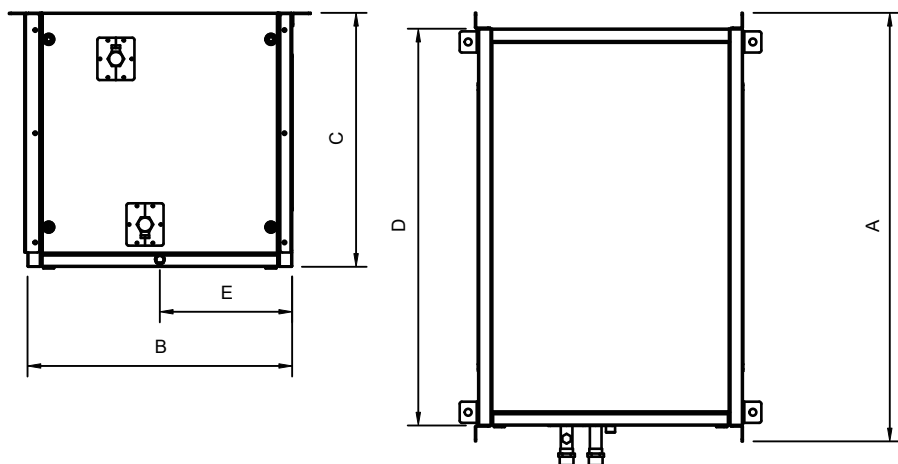


Electrical Heater Box

Unit Model		A (mm)	B (mm)	C (mm)	D (mm)	Capacity (Pre-Heater) (kW)	Low Capacity (Post-Heater) (kW)	High Capacity (Post-Heater) (kW)
PROVENT	650LC 650RC	450	425	370	617	3,0	-	3
	1000LC 1000RC	575	425	400	742	5,0	-	5
	2000LC 2000RC	750	425	480	919	8,0	4,0	8
	2500LC 2500RC	825	425	565	994	11,0	5,5	11
	3500LC 3500RC	825	425	580	994	14,0	7,0	14
	4000LC 4000RC	985	425	580	1154	18,0	9,0	18

Changeover Coil Box

Duct type changeover coil are assembled in cabin as suitable to mount inside duct and have standard capacity. Coils consist of copper tubes and aluminum fins. Inlets and outlets of cabin are suitable for circular duct connections as in heat recovery ventilation units. Additionally, cooling coils have drain pan and extra insulation to prevent condensation of cabin. Both changeover coil can be controlled separately as on/off via unit automation system.

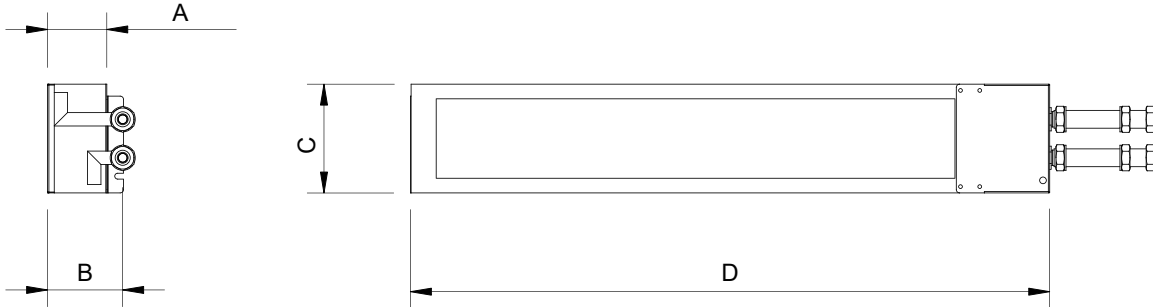


Changeover Coil Box							
Unit Model		A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	Total Weight
PROVENT	650LC 650RC	510	500	370	450	250	30
	1000LC 1000RC	635	500	400	575	250	36
	2000LC 2000RC	810	500	480	750,0	250	48,0
	2500LC 2500RC	885	500	565	825	250	57
	3500LC 3500RC	885	500	580	825	250	60
	4000LC 4000RC	1045	500	580	985	250	64

Changeover Coil Box				Heating Operation	
Unit Model		Nominal Volume Flow Rate (m ³ /h)	Cooling Capacity (kW)	Nominal Volume Flow Rate (m ³ /h)	Heating Capacity (kW)
PROVENT	650LC 650RC	500	1,5	500	4,1
	1000LC 1000RC	900	2,3	900	6,8
	2000LC 2000RC	1400	3,9	1400	11,0
	2500LC 2500RC	2000	5,2	2000	15,9
	3500LC 3500RC	2500	7,2	2500	19,4
	4000LC 4000RC	3300	10,0	3300	26,0

*For coil heating capacities, water coil inlet temperature & outlet temperature are taken as 60 °C & 40 °C, respectively. For coil cooling capacities, water coil inlet temperature & outlet temperature are taken as 7 °C & 12 °C, respectively.

■ Heating Coil

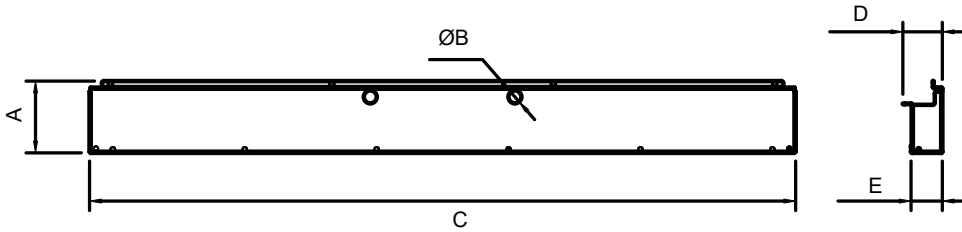


Heating Coil								
Unit Model	Nominal Volume Flow Rate (m ³ /h)	Heating Capacity (kW)	A (mm)	B (mm)	C (mm)	D (mm)	Total Weight	
PROVENT	650LC 650RC	500	2,9	70	89	130	764	5
	1000LC 1000RC	900	5,4	70	89	151	1014	6
	2000LC 2000RC	1400	8,4	70	89	187	1364	8
	2500LC 2500RC	2000	12,8	70	89	228	1514	11
	2500LC 3500RC	2500	14,7	70	89	228	1514	11
	4000LC 4000RC	3300	19,1	70	89	227	1834	13

*For coil heating capacities, water coil inlet temperature & outlet temperature are taken as 60 °C & 40 °C, respectively

■ Sliding Rail

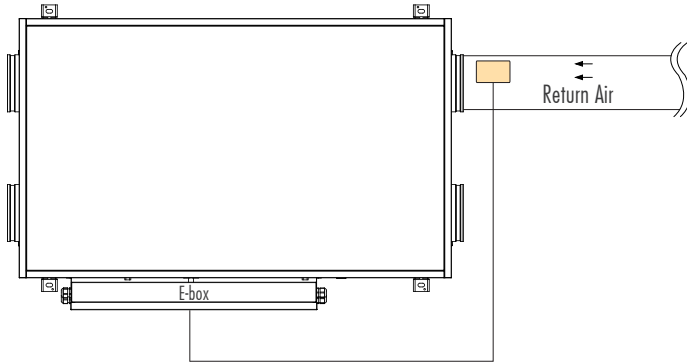
Designed to provide easy access to components in areas that cannot be fully opened or serviced.



Sliding Rail							
Unit Model	A (mm)	ØB	C (mm)	D (mm)	E (mm)	Total Weight	
PROVENT	650LC 650RC	152	27,5	1499	84	66	10
	1000LC 1000RC	152	27,5	1599	84	66	11
	2000LC 2000RC	152	27,5	1799	84	66	12
	2500LC 2500RC	152	27,5	1999	84	66	13
	3500LC 3500RC	152	27,5	2099	84	66	16
	4000LC 4000RC	152	27,5	2249	84	66	20

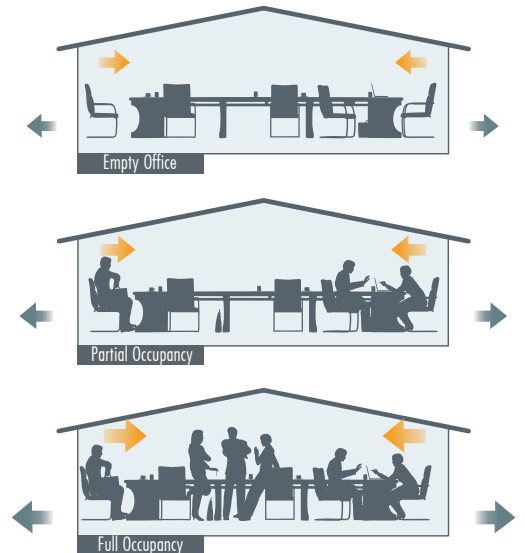
■ Ventilation on Demand

Air Quality Sensor (CO_2 / Humidity) is mounted to the return air duct and is connected to control system of unit. The set point for the desired indoor air quality is set during the installation. According to the demand indoors, PROVENT units are modulated automatically by the sensor. Annual energy consumption of the unit is reduced as a result of the modulation, ending in reduction in energy costs.



Fresh air demand in a space is calculated according to human occupancy and/or physical properties of the conditioned space. The calculation is based on the maximum indoor occupancy. In practice maximum occupancy is observed for only a small period of time annually where lower air flow rates will be sufficient for most of the year. By reducing the air flow rate according to the fresh air demand; it is possible to reduce units electrical consumption and reduce also energy consumption used to condition the space. It should be noted that by increasing fresh air rate, indoors heating/cooling demand will also be increased.

With the help of control panel, it is possible to regulate fresh air rate according to the demand indoors. Eneko Indoor air quality sensor (CO_2 /Humidity) sensor is mounted to the return duct or the conditioned space and the demanded condition is set. A 0-10 V signal will be created and PROVENT unit's air flow will be regulated according to the signal.

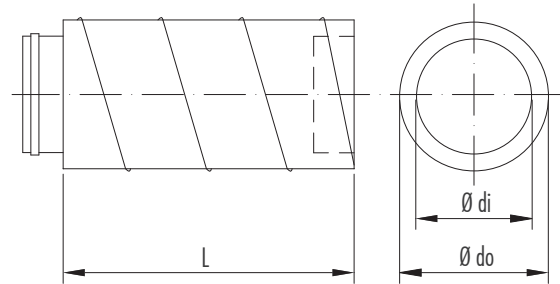
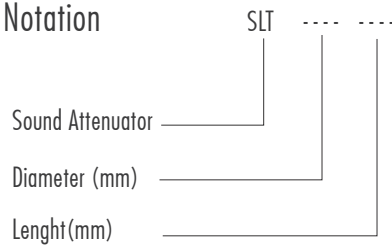


■ Sound Attenuator For Circular Ducts



Sound attenuators are designed for standard duct dimensions. Various lengths are available according to attenuation demand. Sound attenuation capacities are given in the table. For better performance sound attenuators can be used in series. For the best result the sound attenuators shall be installed just after the unit.

Notation



Sound Attenuator Capacity [dB]

SLT	63	125	250	500	1k	2k	4k	8k
200-300	1	2	3	6	10	14	12	14
200-600	2	3	6	7	13	17	18	20
200-900	3	4	7	10	16	18	21	22
250-300	1	2	6	6	13	16	14	15
250-600	2	3	7	7	18	21	20	22
250-900	3	4	9	8	21	24	21	23
300-300	1	2	4	4	10	12	12	15
300-600	1	3	6	7	13	15	17	19
300-900	2	4	7	8	15	17	18	21
355-600	1	3	8	8	9	6	5	7
355-900	4	4	13	13	11	7	6	8

Sound Attenuator Dimensions [mm]

SLT	length (L)	Ø di	Ø do
200-300	300	200	260
200-600	600	200	260
200-900	900	200	260
250-300	300	250	310
250-600	600	250	310
250-900	900	250	310
300-300	300	300	360
300-600	600	300	360
300-900	900	300	360
355-600	600	355	415
355-900	900	355	415



GENERAL

The sale of all Products of ENEKO shall exclusively be made on the basis of these General Terms and Conditions of Sales. Any other conditions and General Conditions of Purchase of the Buyer are not accepted.



OFFERS

Our offers are non-binding and without obligation. Contracts for delivery and all other agreements (including subsidiary agreements) as well as declarations of our representatives shall only become legally binding for us after written confirmation. We do not render planning service.

Proposals made and information provided by our representatives shall be non-binding. Illustrations, drawings, dimensions and weights or other performance data shall only be binding if this is expressly agreed in writing.



TERMS OF ORDER

Purchase orders shall be sent to ENEKO in written form and shall be non-binding unless they are accepted by written confirmation (order confirmation) from ENEKO. Each order shall include properly identified Products ordered and relevant shipping dates.



PRICE OF THE GOODS

Prices are net Ex Works according to current Incoterms unless stated otherwise and do not include any kind of taxes. Prices are valid at the date of delivery will be applied. We reserve the right to adjust prices for confirmed orders as well to reflect any increase in our costs for any reason beyond our control like force majeure, shortage of primary material or labor strikes, official orders, transportation or similar problems. In this case, a new price agreement shall be required for higher rates. If such an agreement is not made, we shall be entitled to withdraw from the contract by written notice within 15 days.



TERMS OF PAYMENT

Payments shall be carried out according to the contractual terms as defined and set forth in the order confirmation. If the payment conditions have not been agreed upon conclusion of the contract, the payment terms and payment dates specified in our invoices shall be binding. Deadlines for discounts and periods allowed for payment shall begin to run upon receipt of the invoice. Payments by draft, bills of Exchange or anyway extended payments shall mean neither credit novation, nor prejudice to the Retention of Title agreement, nor to territorial competence. If buyer fails to make payment by due date, we are entitled to charge the buyer with a relevant interest on the unpaid amount.



TERMS OF DELIVERY

Delivery time information is only approximate. We shall only be in default if the performance is due and a written demand for payment was issued. Delivery day is the day of dispatch Ex Works. We shall also not be liable with regard to bindingly agreed periods and dates in the event of delays an delivery and of performance due to force majeure and events which considerably complicate or make delivery impossible not only temporarily-strike lockout, breakdown, delay in supply with important raw and auxiliary materials even if the delay occurs at our supplier, in particular. These delays entitle us to postpone delivery for the period of the impediment plus a reasonable start-up period or to withdraw from the contract as a whole or in part. If delivery time is extended or we are released from our delivery commitment, the buyer may not derive a claim for damages from it. However, we may only rely on the circumstances mentioned if we notify the buyer immediately. We shall be entitled to make part deliveries. Any part delivery shall be considered as independent transaction. In case of default, our liability is limited to contract-typical foreseeable damage.



SHIPMENT

Shipment is made for the buyer's account. Mode of shipment and shipping route, transport and packaging and other securities respectively shall be at our choice. We shall be entitled, however, not obliged to insure deliveries in the name and for account of the buyer. Risk passes to the buyer when shipment is handed over to the person performing the transport or left our Works for shipment. If shipment is delayed upon buyer's request, risk passes to the buyer with the ready for shipment note. If ordered goods are rejected after the ready for shipment note, we shall be entitled to request payment and store the goods at buyer's expense. Discharge of the goods is made at buyer's expense.



RETENTION OF TITLE

In any event ENEKO shall retain full ownership of all materials supplied whilst the payment conditions of the entire amount have not been complied with, said materials may be removed from the customer at our request. Should the customer be declared bankrupt or insolvent and has not made paid the entire amount of payments. ENEKO shall be entitled to recover the goods. ENEKO may interrupt the supply without incurring any liability whatsoever if he had notice of or became aware of a decrease in the creditworthiness of the purchaser or if any of the existing negotiable instruments or debts were not properly complied with, shall result as being unpaid and protested.



WARRANTY

ENEKO Products are under warranty (defect in material or workmanship) for 2 years from the date of sale reflected on the invoice. Under this warranty, ENEKO is under the obligation to replace the part requested under warranty.

The followings are excluded from ENEKO warranty:

- Normal wear and tear
- Defective assembly or handling
- Third party compensation

Parts the subject of a claim shall be sent to our warehouse as carriage paid with relevant report completely filled in, wherein the parts shall be subjected to analysis.



LIABILITY

ENEKO, for any losses/damages, shall only be responsible within the limits of the law. Owing to basic obligations undertaken by simple negligence, if the contract is violated, ENEKO's liability shall be limited to compensate for losses which are emerged specific and predictable. ENEKO shall not carry any responsibility in case of a single negligence in breach of non-essential contractual obligations.



PROPERTY RIGHTS

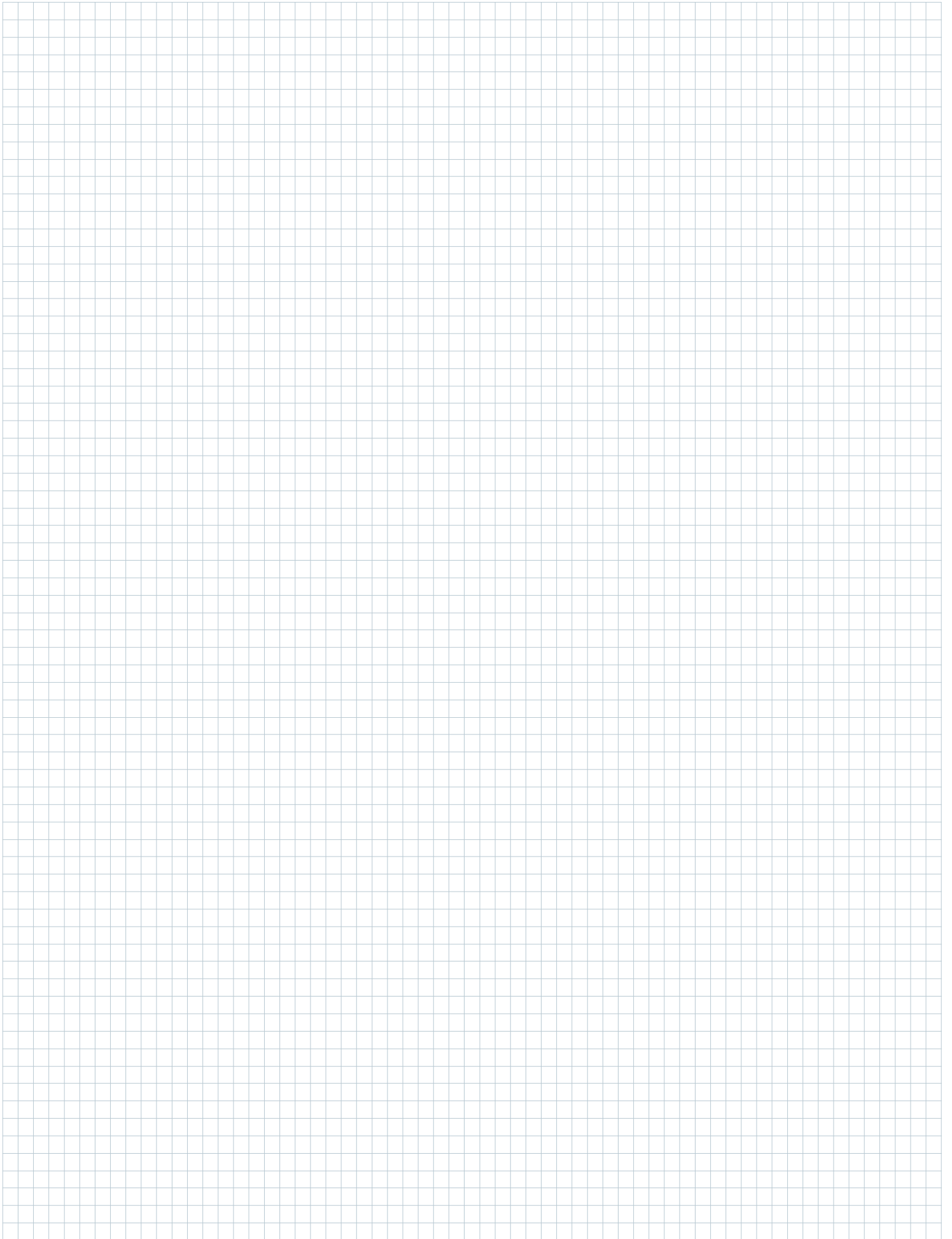
The purchaser in no event and under no circumstances whatsoever shall publish or use the trademark, trade name or logo of ENEKO without a prior written permission.

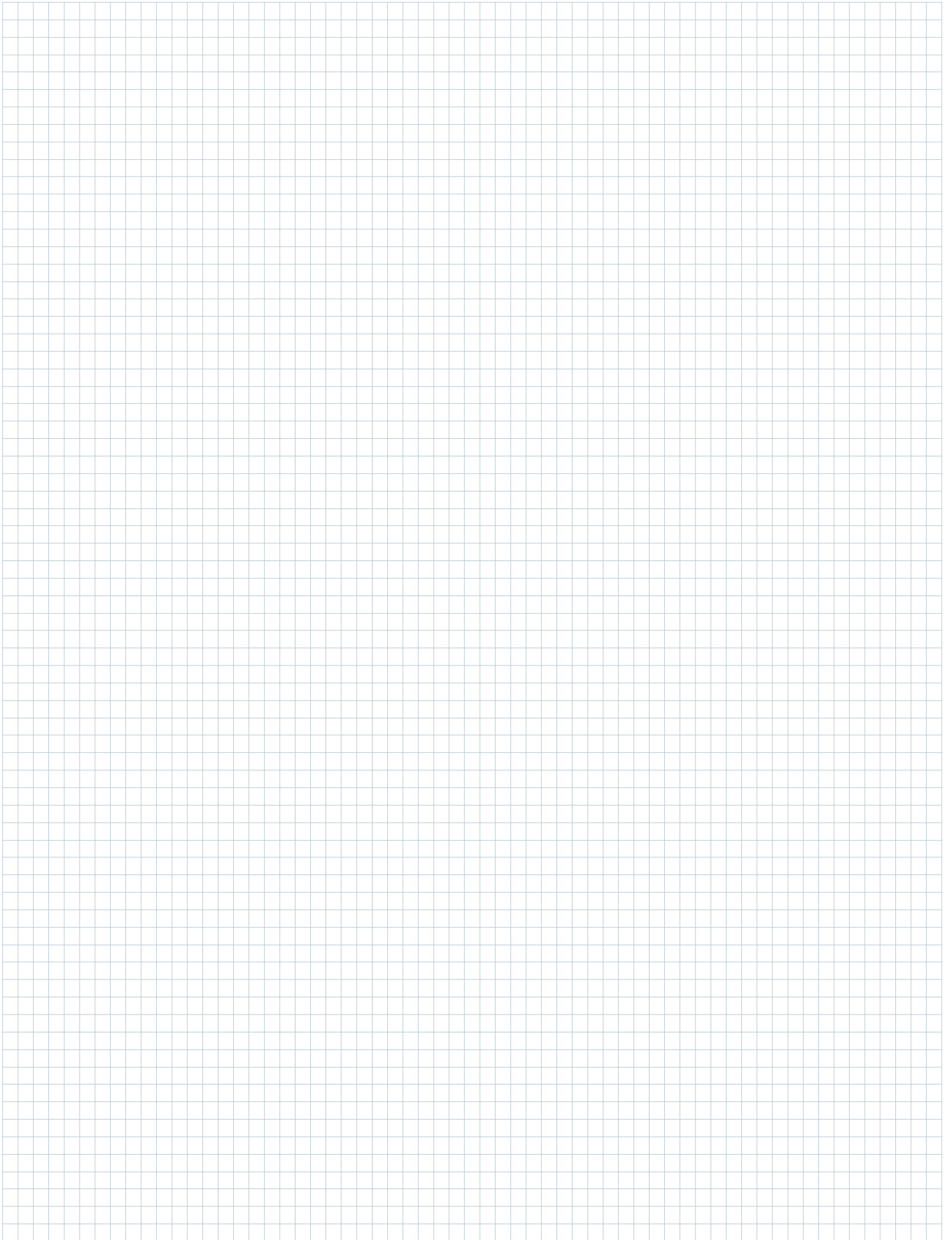


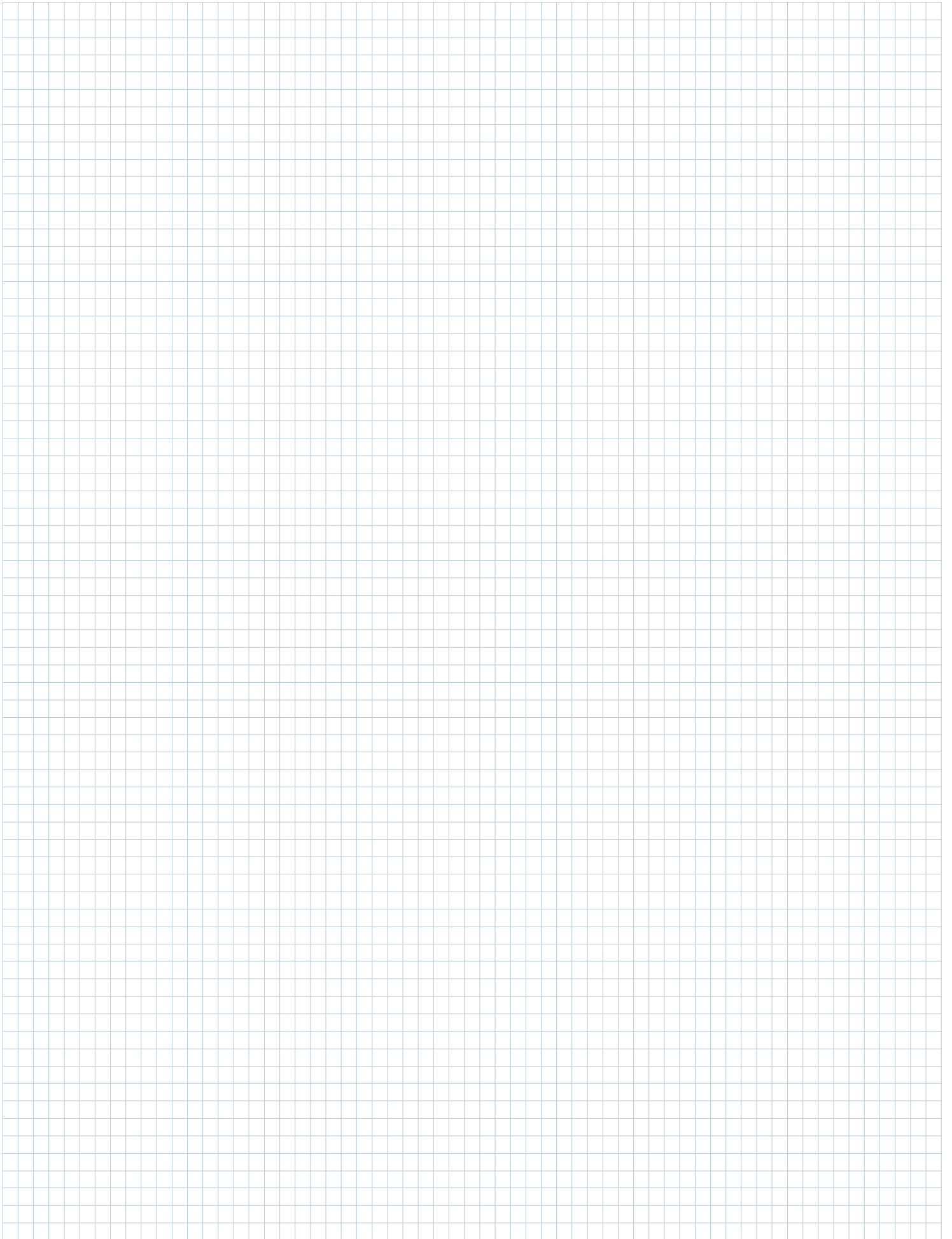
GOVERNING LAW AND JURISDICTION

This agreement shall be governed with all aspects of the Turkish Law. The courts of Izmir/Turkey shall have an exclusive jurisdiction to adjudicate any dispute arising under or in connection with this agreement.











ISTANBUL

Address : Cevizli District, Zuhal Avenue, Fusun Street, Ritim Istanbul A5
Block Floor: 25 No: 137, 34846 Maltepe/Istanbul - TURKEY
Tel. : +90 216 455 29 60 / +90 216 455 29 61
Fax. : +90 216 455 29 62
E-mail : satis@eneko.com.tr

IZMIR

Address : 10049 Street No: 4 I.A.O.S.B. Cigli/Izmir - TURKEY
Tel. : +90 232 328 20 80
Fax. : +90 232 328 20 22
E-mail : info@eneko.com.tr
Web : www.eneko.com.tr

In parallel with our ongoing product development in R&D department, all rights of changing all technical specifications are reserved by ENEKO without any declaration and notice.

