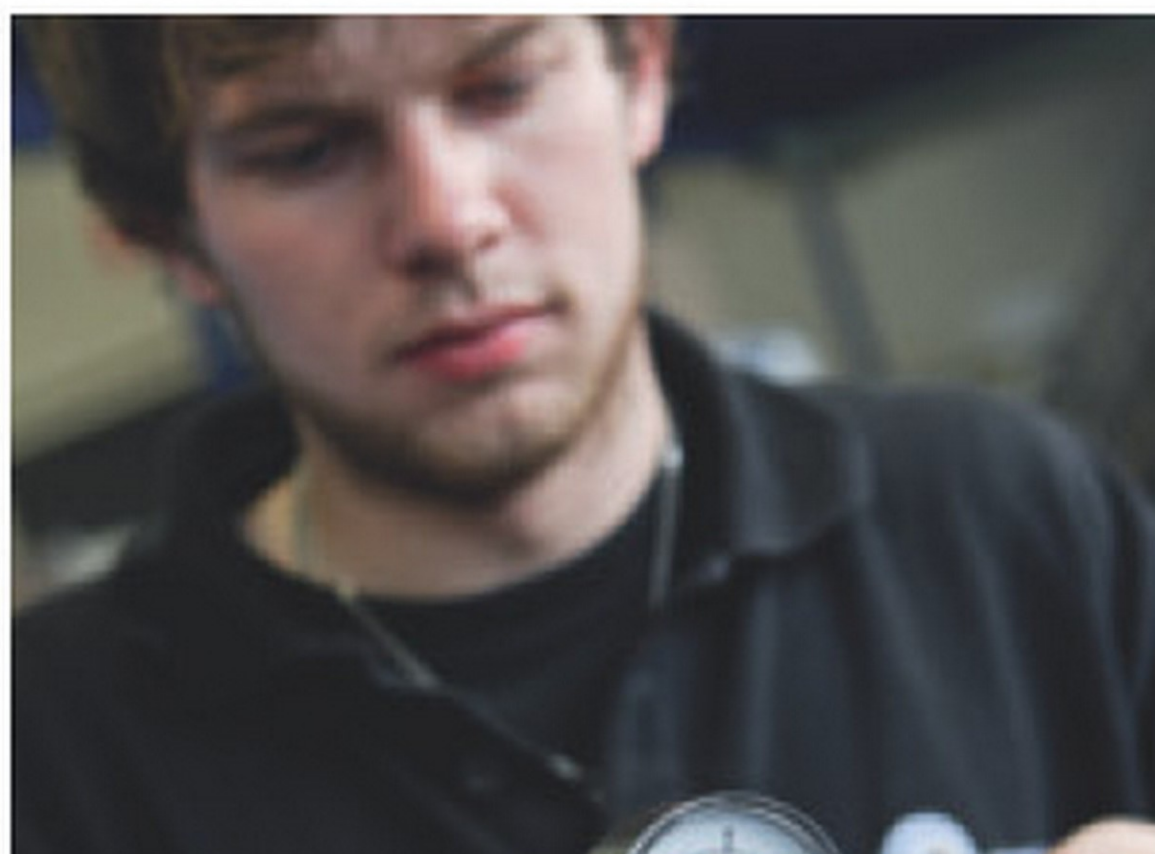
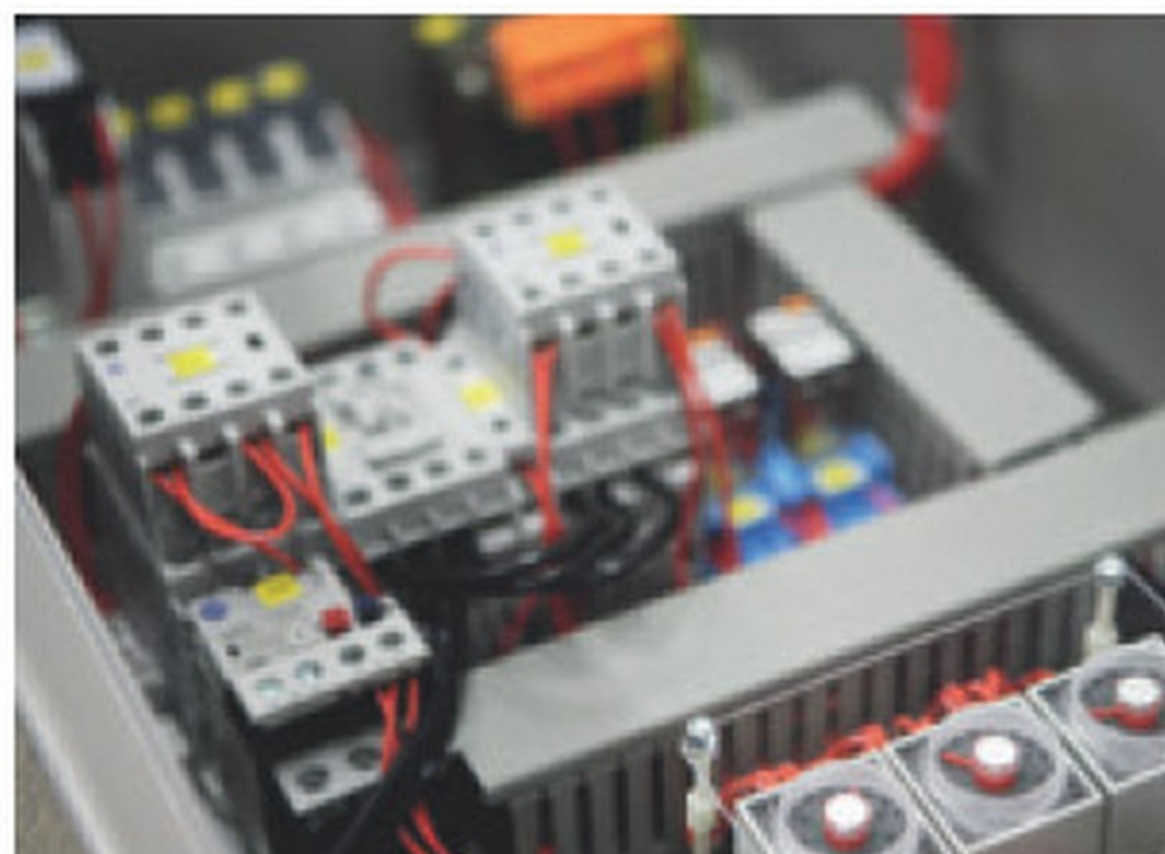


BESSELING GROUP

CONTROLLED ATMOSPHERE



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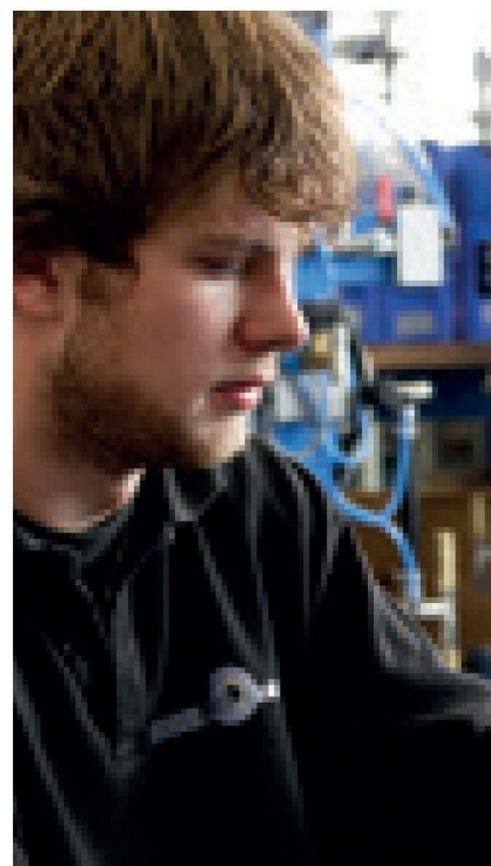
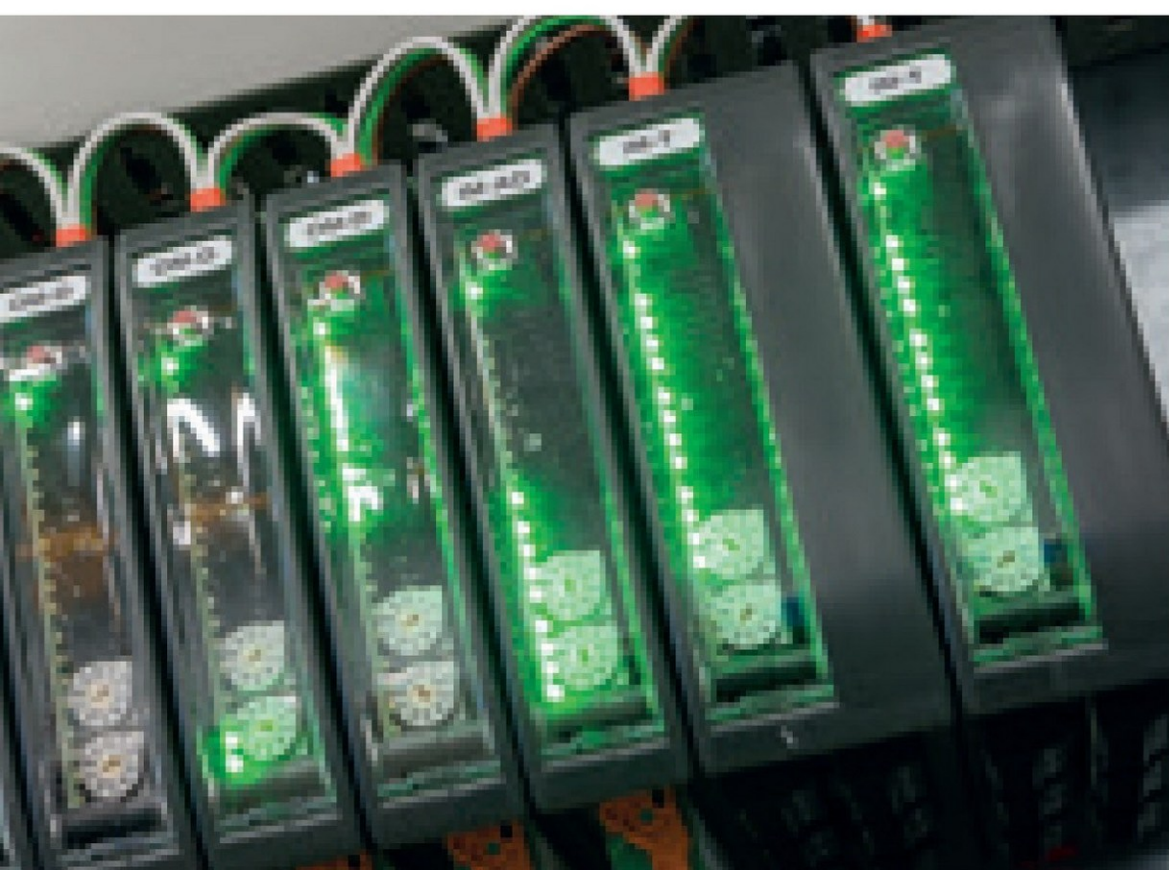
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THE ART OF STORAGE

BESSELING GROUP

CONTROLLED ATMOSPHERE



THE ART
OF STORAGE



COLD STORE PROTECTION / ACCESSORIES

MEASUREMENT & CONTROL TECHNOLOGY

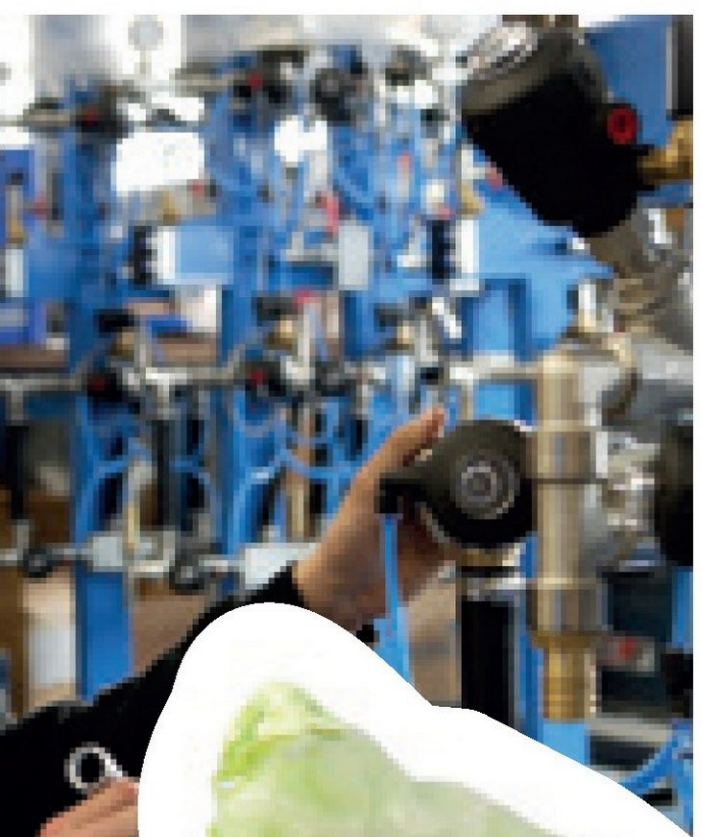
ETHYLENE CONVERTER

PSA NITROGEN GENERATOR

CO₂ ADSORBER

CONTROLLED ATMOSPHERE

BESSELLING GROUP



Besseling, the art of storage

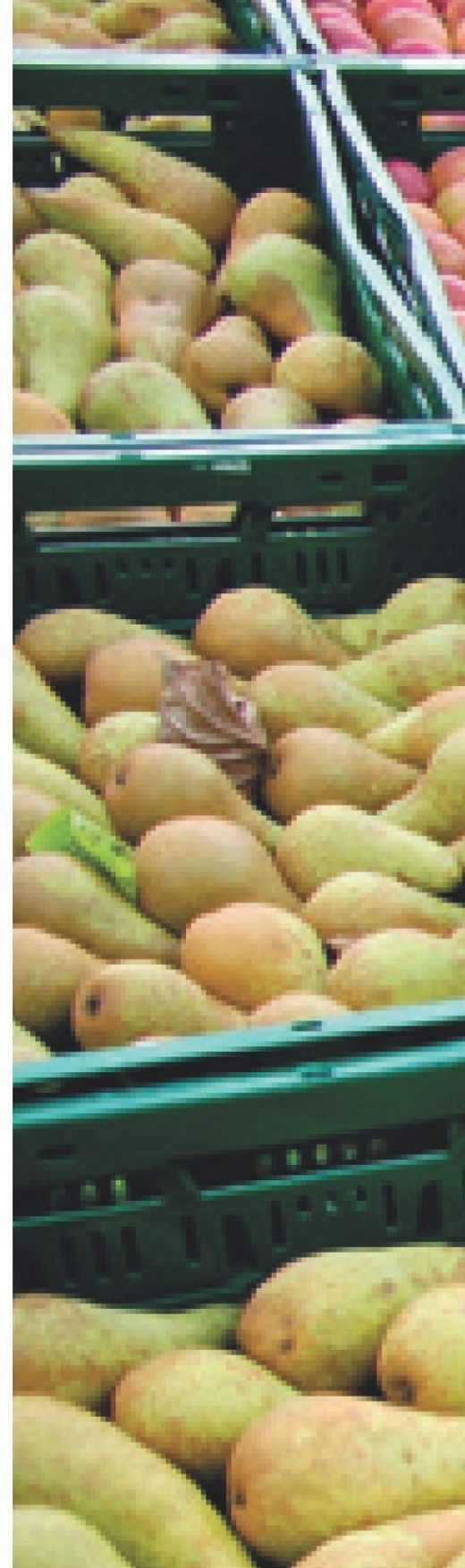
Storing and protecting, two words which are key to everything Besseling does: giving your products exactly the care and attention they need in order to achieve the highest possible returns.

As a specialist in CA/ULO/DCA and other storage technologies, we offer tailored solutions to create a protective atmosphere.

Why Besseling Group? The answer is simple: proven technology. Our products are tried and tested under the most difficult and most extreme conditions. We set the most stringent requirements for our products. Not surprisingly, because our founders have been active in the agrarian sector for generations and have always remained on the lookout for the best ways to store your precious products.

Thanks to our expertise, we are able to offer you integrated solutions for all your storage needs and, if desired, advice on the many facets of atmosphere, cold and moisture control. Our high-quality products have been specially developed to store your products - long-term, affordable, reliable and with a minimum of maintenance. In short: a complete program to preserve your products/income.

Besseling offers you peace of mind in your cold store and beyond. And that is exactly what we mean by "the art of storage".



Research

The strength
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h & Development

of our products lies in their
 e equipment we produce provides
 proof that high-quality technology
 omatically need to be complicated.
 smart constructions prevent failures
 only minimal maintenance in

order to keep the equipment in perfect condition. Our Research & Development department is engaged in ongoing research into new applications for our equipment. At our own testing and development centre, we are constantly devising and testing new ways to improve storage technologies. Extensive tests are also carried out in order to find the optimum storage conditions for numerous products.



Controlled Atmosphere storage

The market price for fruit and vegetables is primarily determined by quality, supply and demand. But how do you maintain the best quality in your products until the most suitable moment? Simple: by opting for storage under Controlled Atmosphere (CA) conditions.

By using CA, the physiological processes in the

stored product are slowed down, resulting in an extended storage life. The product is put into hibernation so to speak. The required conditions are achieved by creating and maintaining a special protective atmosphere.

Lowering the oxygen level slows respiration and reduces the metabolism of important nutrients. The aim is to keep the oxygen level as low as possible in order to preserve these nutrients - hence quality.

The remaining oxygen is converted into CO₂, which in turn ensures that the respiration of fruit and vegetables is further slowed down. However, excess CO₂ will damage your product and must therefore be removed.

Ethylene is produced by fruit and vegetables and stimulates the ripening process - hence the ageing process. In order to slow down these processes, it is necessary to remove this harmful ethylene gas from the air of the cold stores for some products.

Each product variety requires different conditions. Depending on factors such as climate, soil conditions, growing conditions, time of picking, the optimum conditions change year by year, but also from one product to another and even from one variety to another. In CA storage, we offer you tailored solutions. Every opportunity to keep a close watch on your valuable produce.

These days, many different storage systems are available: ULO, DCA, ILOS, DILOS. Besseling can supply both the product and the required equipment for these conditions.

Particularly for smaller quantities, the ULO System is the ideal solution. Various types of fruit and vegetables are stored in a product-specific atmosphere per pallet immediately after picking.

In order to supply the highest quality product in any quantity on demand. Flexibility is important. One or multiple pallets can be removed from the system without affecting the conditions of the other pallets.

Pallet Fresh System

Soft fruit, a great product but also a sensitive one. It is a product that must be marketed at the right moment in order to fetch the best price. Especially for these sensitive fruit varieties Besseling has developed the Pallet Fresh System. This storage system enables you to store your products under CA conditions per pallet/cover in order to maintain their quality for as long as possible.

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The Pallet Fresh System works both with individual pallets or groups of pallets, depending on the quantity and the variety of the product that needs to be stored. Each Pallet Fresh Unit consists of a cover and a special pallet on which the crates, boxes or even a pallet with products can be placed.

Also required are:

- A cold stor e
- Measurement and control system (ACS) for creating and managing the CA conditions
- Nitrogen from a Besseling PSA nitrogen generator
- CO₂ from gas cylinders
- Oxygen from an air compressor

Besseling also measures the composition of the air outside the pallets/covers.



CO₂ adsorber

Fruit and vegetables 'breathe', and release CO₂ (carbon dioxide). An increase in CO₂ levels in a cold store can harm fruit, but an excess will cause damage.



A CO₂ adsorber, also known as a carbon dioxide adsorber, is used to remove carbon dioxide from cold stores. It works by passing a portion of the harmful ethylene gas through the adsorber, which contains active carbon. The active carbon is characteristic of adsorbing CO₂ (it attracts and holds them to it). By efficiently transporting the gas through the cold store, passing it over the adsorber, and returning it to the cold store, the CO₂ is removed from the air in the store.

Besides a user-friendly control panel, the adsorber also offers a range of actions per cold store, the adsorber



natural process in which oxygen is converted
increased CO₂ level in a cold store 'calms' the
damage and must therefore be removed.



an 'adsorber lung'. This patented
system guarantees absolute low
oxygen operation which means that
virtually no oxygen can enter the cold
store (ideal for storage under ULO
and/or DCA conditions).

A frequency-controlled ventilator
reduces energy consumption to a
minimum - an important benefit

a scrubber, removes
, along with a small
present. The CO₂
, which has the
molecules (binding
porting the air from
the active carbon and
the CO₂ is effectively
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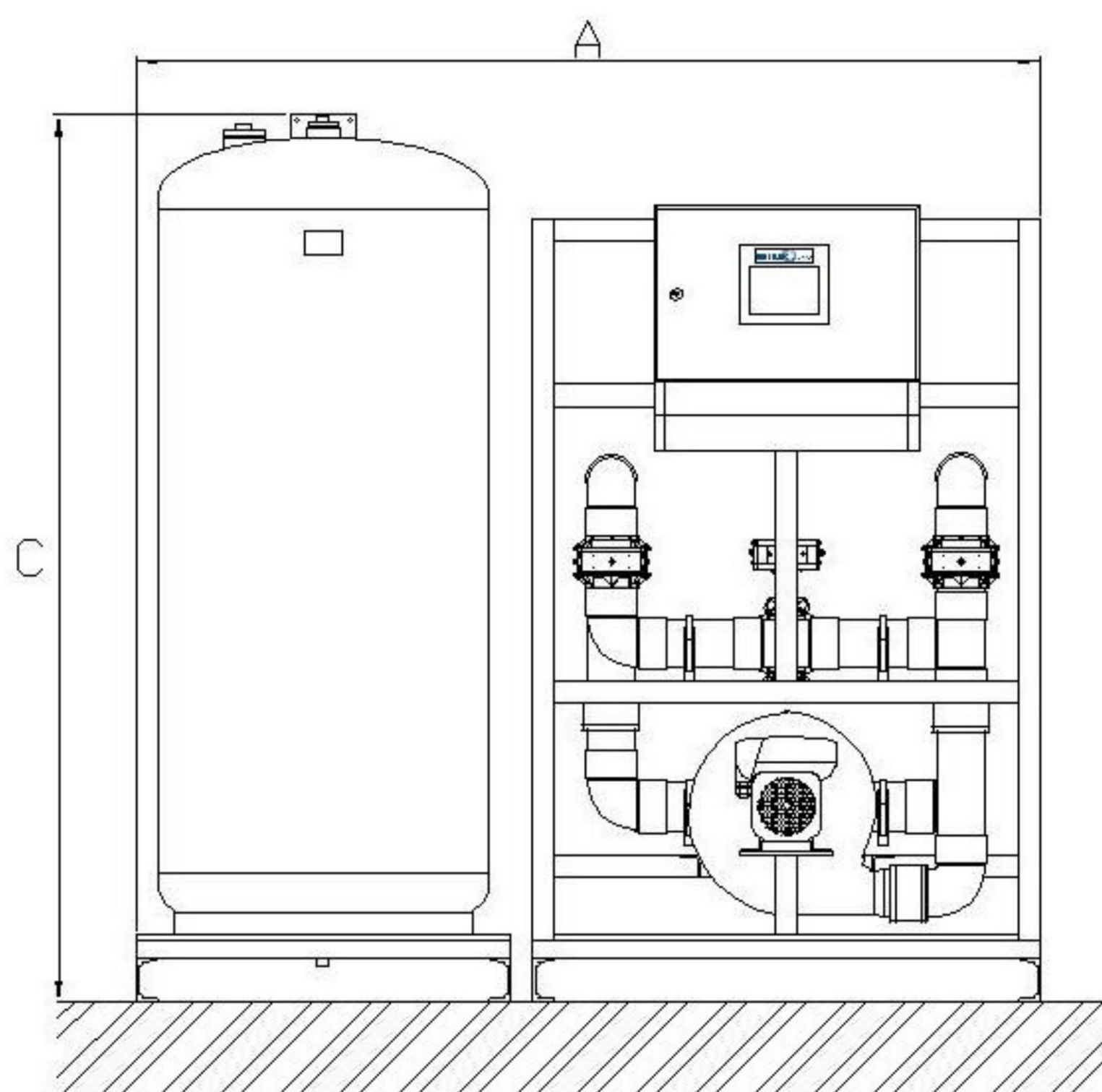
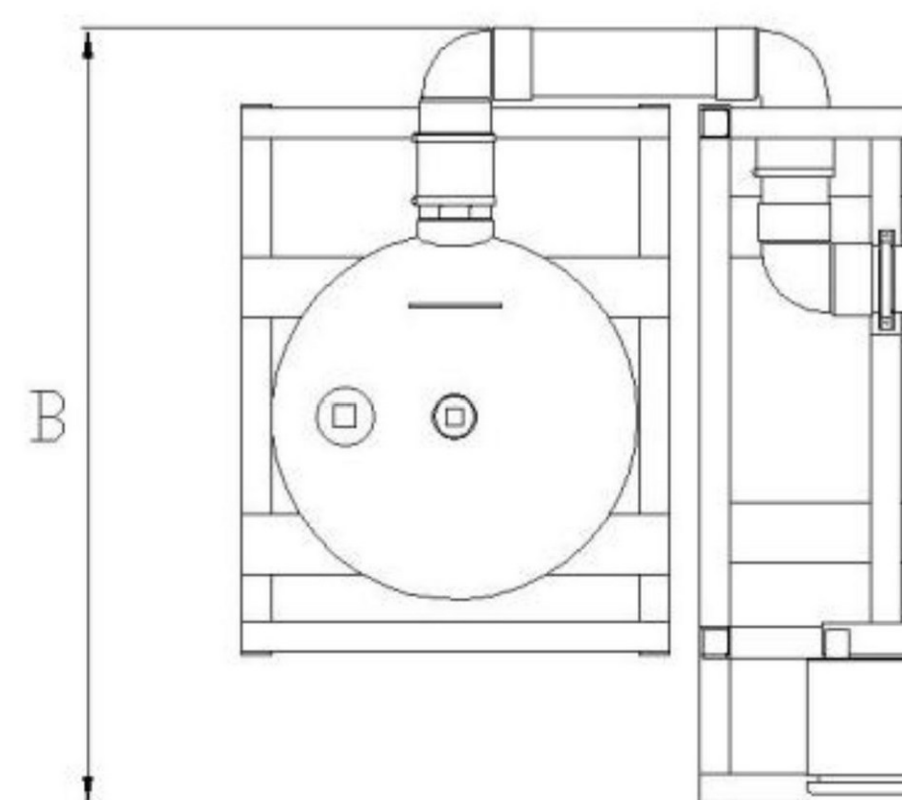
because an adsorber runs for the majority of the
day. In addition, the diameter of the pipe is matched
to the size of the ventilator so no heat can enter the
cold store as a result of friction.

Every fruit and vegetable variety has its own CO₂
production and maximum permitted CO₂ value. For
this reason, Besseling produces different capacities
of adsorbers so that we can always supply a solution
for your application.

panel for setting the
rber is equipped with

Type	Capacity CO ₂ per 24 hours (kg.)	Voltage (V)	Power		Fuse (A)	Plug (poles)	Phase	No. (c)
			connection (kW)	consumption (kW)				
US 20	10	230	0,39	0,39	16	2	1	7
US 175	85	230	0,5 - 1,1	0,5	16	2	1	7
US 255	125	230	0,5 - 1,1	0,8	16	2	1	7
US 405	200	230	0,5 - 1,1	1,1	16	2	1	7
US 605	300	400	1,6 - 3,0	1,6	16	5	3	7
US 805	400	400	1,6 - 3,0	2,1	16	5	3	7
US 1105	550	400	1,6 - 3,0	2,6	16	5	3	7
US 1405	700	400	1,6 - 3,0	3,0	16	5	3	7
US 2005	1000	400	4,0 - 7,5	5,5	35	5	3	8

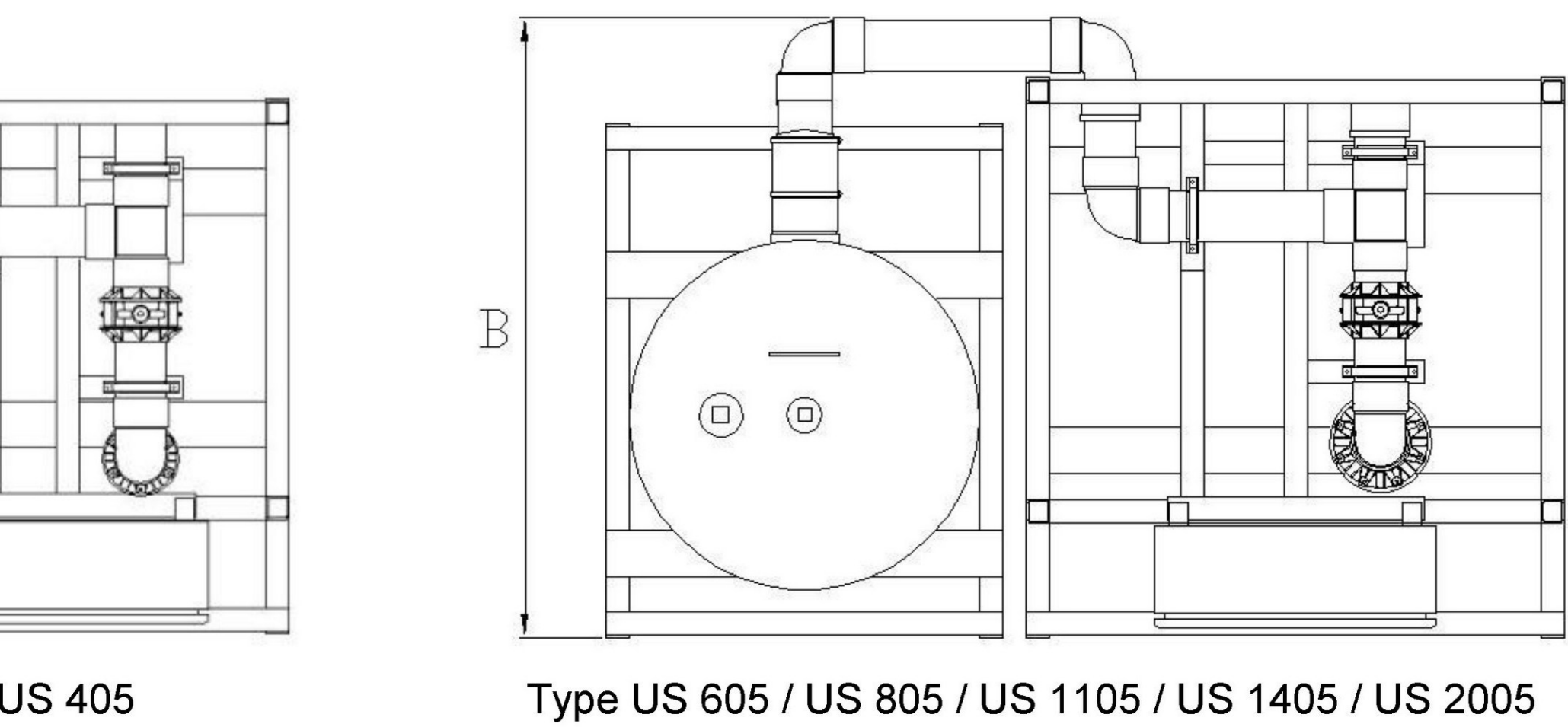
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Type US 175 / US 255 / US 405

Size (B)	PVC connection (mm)	Adsorber lung (m ³)	No. of skids	Dimensions			Weight (kg)
				A Width (mm)	B Depth (mm)	C Height (mm)	
75	1/4	-	1	780	800	1800	200
75	90	4	2	1780	1325	1800	480
75	90	4	2	1700	1325	1840	520
75	110	6	2	1700	1300	2060	670
78	110	8	2	2050	1350	2010	970
78	125	8	2	2150	1400	2050	1120
78	125	10	2	2250	1400	2460	1320
78	125	12	2	2450	1600	2350	1830
80	160	12	2	2950	1750	2380	2200

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US 405

Type US 605 / US 805 / US 1105 / US 1405 / US 2005

PSA nitrogen generator

By lowering the level of oxygen in the cold store, respiration is slowed down and the 'metabolism' of important nutrients in fruits and vegetables is reduced. The objective is to keep the oxygen level in a cold store as low as possible in order to maintain quality and delay the ageing process as much as possible.

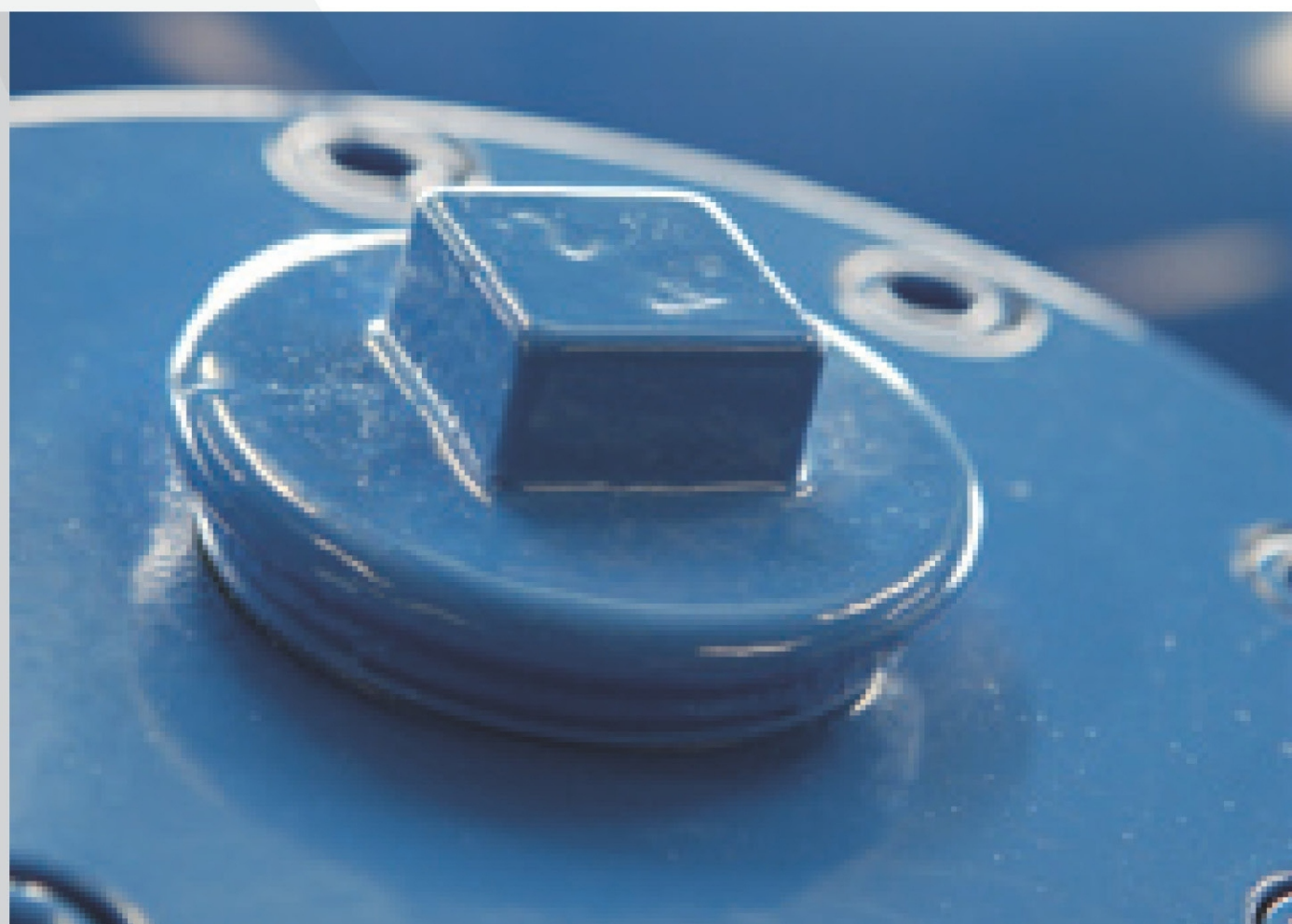
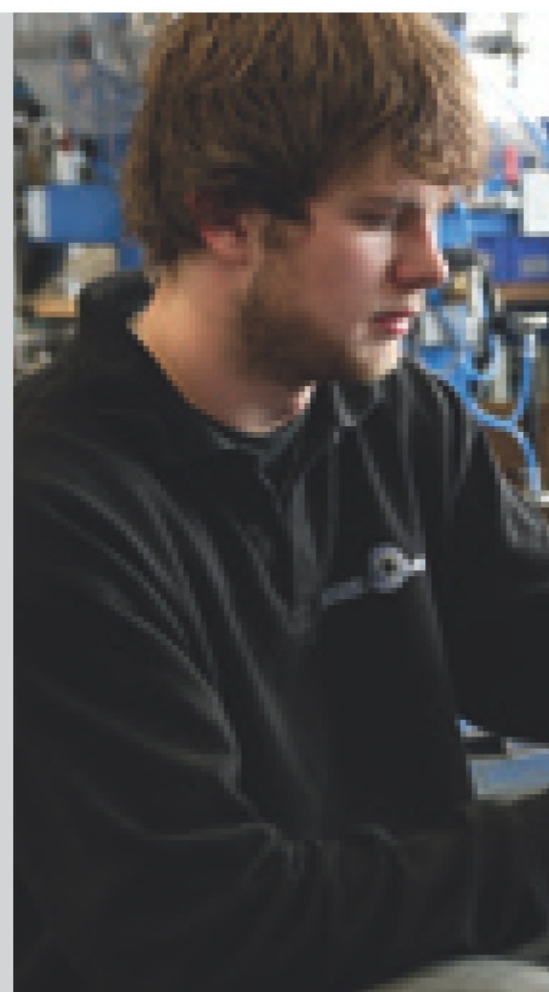
The reduction of the oxygen level in a cold store can be accelerated using a PSA (Pressure Swing Adsorption) nitrogen generator. A PSA generates pure nitrogen from normal ambient air which will be used to expel the oxygen from the cold store.

The Besseling PSA nitrogen generator consists of two vessels fitted with extremely high-quality CMS (carbon molecular sieve). A CMS is capable of adsorbing oxygen molecules for a particular length of time. When saturation is reached, the system automatically switches to the other vessel by means of valves. The saturated vessel is

prepared for the next cycle by which the adsorbed oxygen is purged. Thanks to this simple process, the lifespan of the PSA nitrogen generator is long.

All our PSA nitrogen generators are equipped with automatic drains so no flow of liquid is possible.

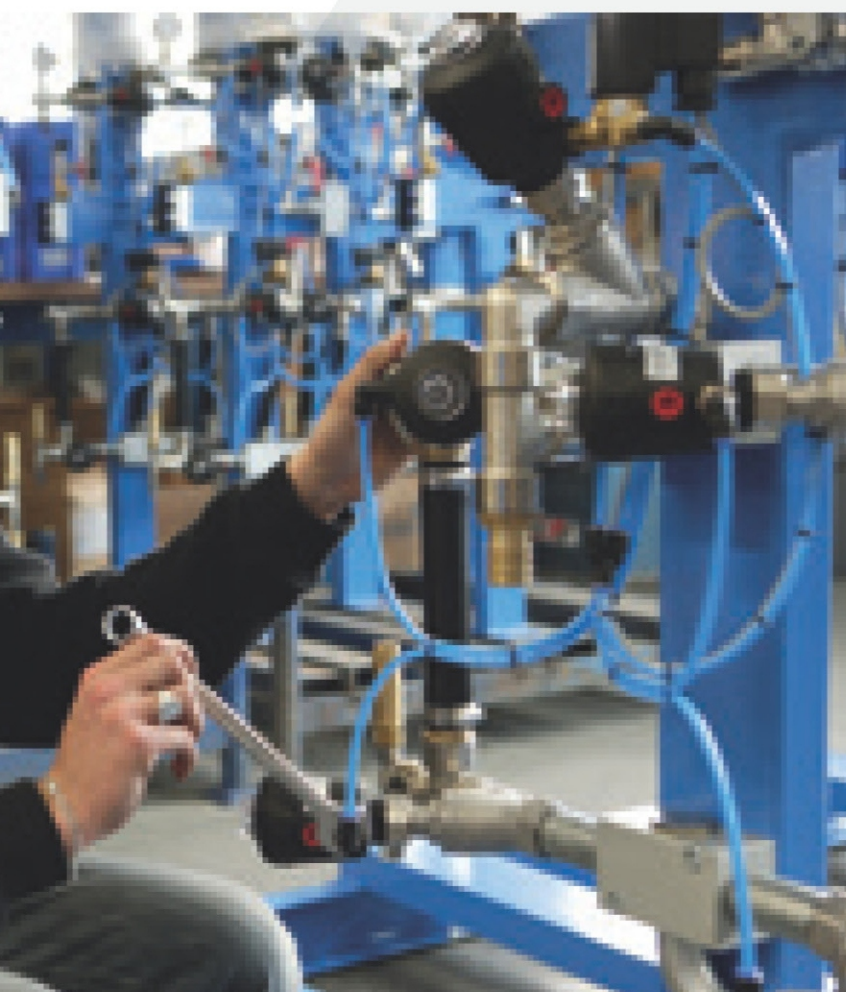
Besseling offers different models of PSA nitrogen generators. The capacity is chosen according to the volume and number of cold stores.



by depressurizing it, after
molecules are released and
the principle, the reliability and
generator is extremely high.

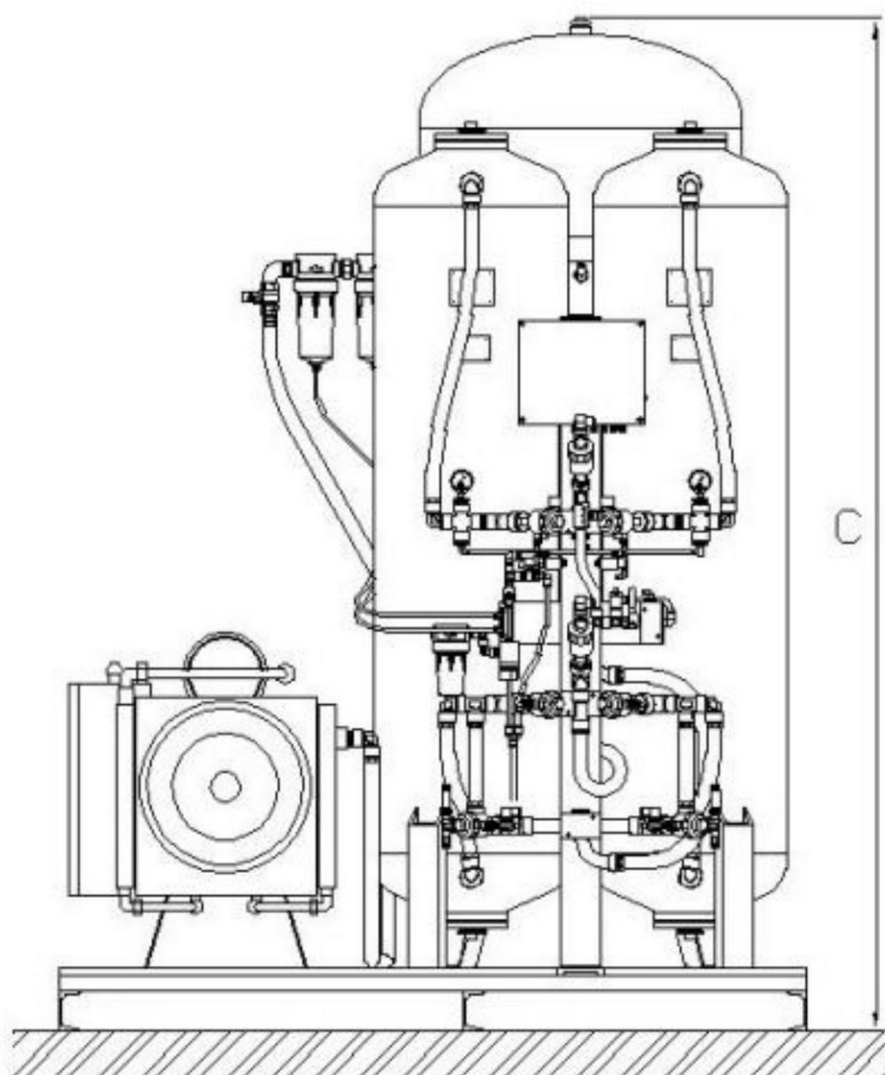
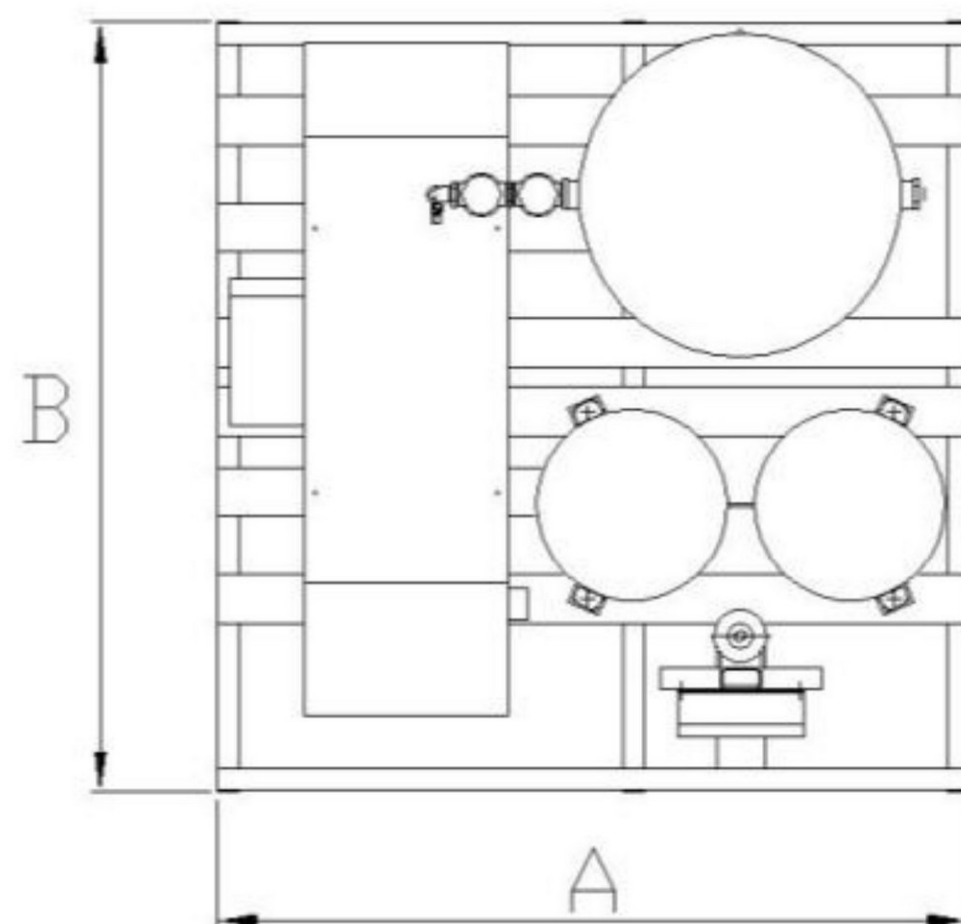
ors are provided with filters
fluid or oil can reach the CMS.

capacities of PSA nitrogen
osen/determined depending
ber of the cold stores.



Type	Capacity per hour		Voltage (V)	Power compressor (kW)	Power PLC (V)	Fuse (A)	Plug (poles)
	1% O ₂ (Nm ³)	0,5% O ₂ (Nm ³)					
UP1-4	4	3,2	400	1,5	230	16	5
UP1-6	6	4,8	400	2,2	230	16	5
UP1-8	8	6,4	400	3,0	230	16	5
UP1-12	12	9,6	400	4,0	230	16	5
UP1-17	17	13,6	400	4,0	230	16	5
UP1-22	22	17,6	400	5,5	230	16	5
UP1-33	33	26,4	400	7,5	230	T25	5
UP1-48	48	38,4	400	11,0	230	35	5
UP1-65	65	52,0	400	15,0	230	63	Direct
UP1-93	93	74,4	400	22,0	230	100	Direct
UP1-124	124	99,2	400	30,0	230	160	Direct
UP1-150	150	120,0	400	37,0	230	160	Direct
UP1-182	182	145,6	400	45,0	230	250	Direct

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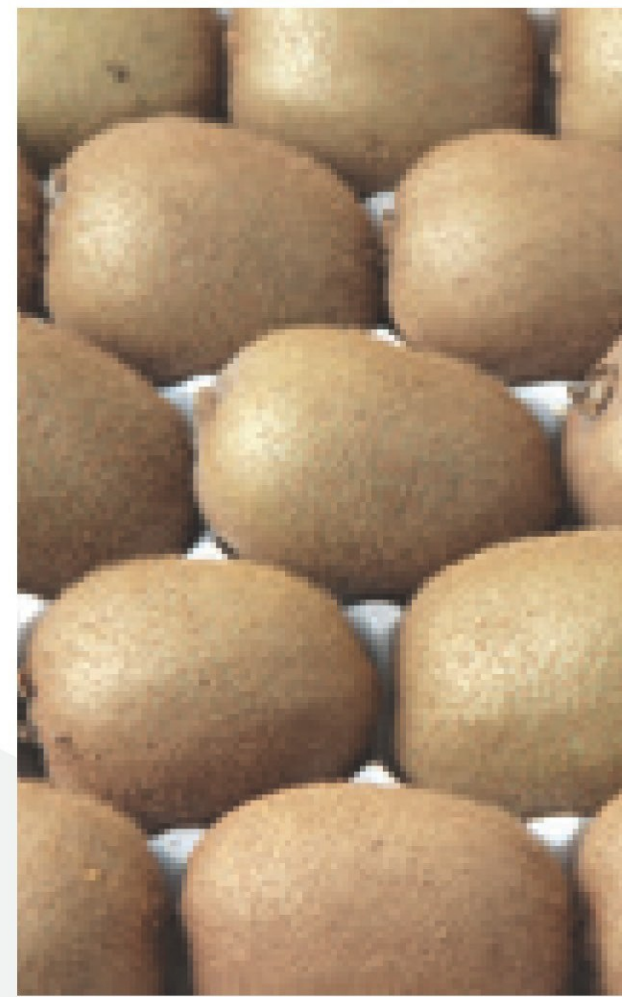


	Phase	Noise (dB)	N ₂ receiver (Ltr)	N ₂ tube (mm)	No. of skids	Dimensions			Weight (kg)
						A Width (mm)	B Depth (mm)	C Height (mm)	
	3	64	200	12	1	1200	1150	1750	250
	3	70	200	12	1	1200	1150	1750	375
	3	70	200	12	1	1200	1150	1750	450
	3	71	200	12	1	1400	1200	1750	600
	3	71	270	12	1	1400	1200	1900	700
	3	71	270	32	1	1500	1220	1900	770
	3	75	500	32	1	1600	1500	2300	895
	3	75	500	32	1	1600	1500	2300	1066
	3	79	1000	32	1	1850	1900	2550	1700
	3	79	1000	32	1	2000	1925	2550	2400
	3	84	1000	50	3	2800	1800	2300	2700
	3	84	2000	50	3	3000	2000	2300	3000
	3	84	2000	50	3	3500	2000	2400	3600

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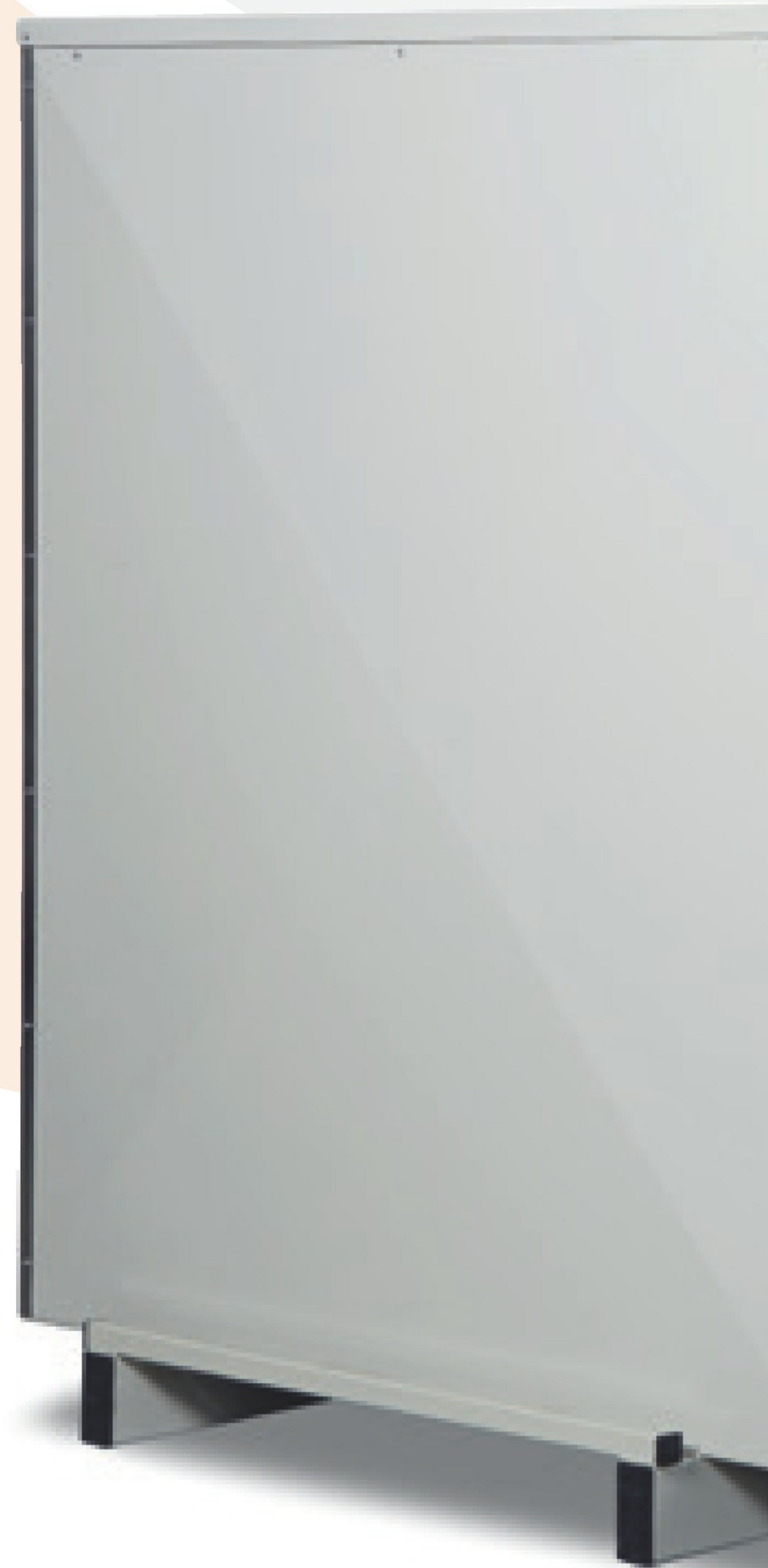
Ethylene converter

Ethylene gas is produced by fruit and vegetables and accelerates the growth, development, ripening and ageing of the product. Some fruit varieties, for example kiwis, are extremely sensitive to ethylene. The Besseling ethylene converter quickly and easily removes this harmful ethylene gas. In this way, your products retain their 'eternal youth'.



The ethylene converter consists of two columns, each with a heat storage medium, a catalyst, heating elements and one ventilator. In turns, cold store air is guided upwards and heated per column. The air then passes through the catalyst bed where the ethylene gas is broken down. Finally, the air flow passes through the second catalyst bed, where the remaining ethylene is broken down and the air cooled back down.

With the Besseling ethylene converter, an ethylene level of 1 ppb (0.0000001%) can be achieved without making use of chemicals. This makes the process extremely environmentally-friendly. Thanks to heat recovery and accurate control of the optimum temperature, the converter consumes minimal energy.

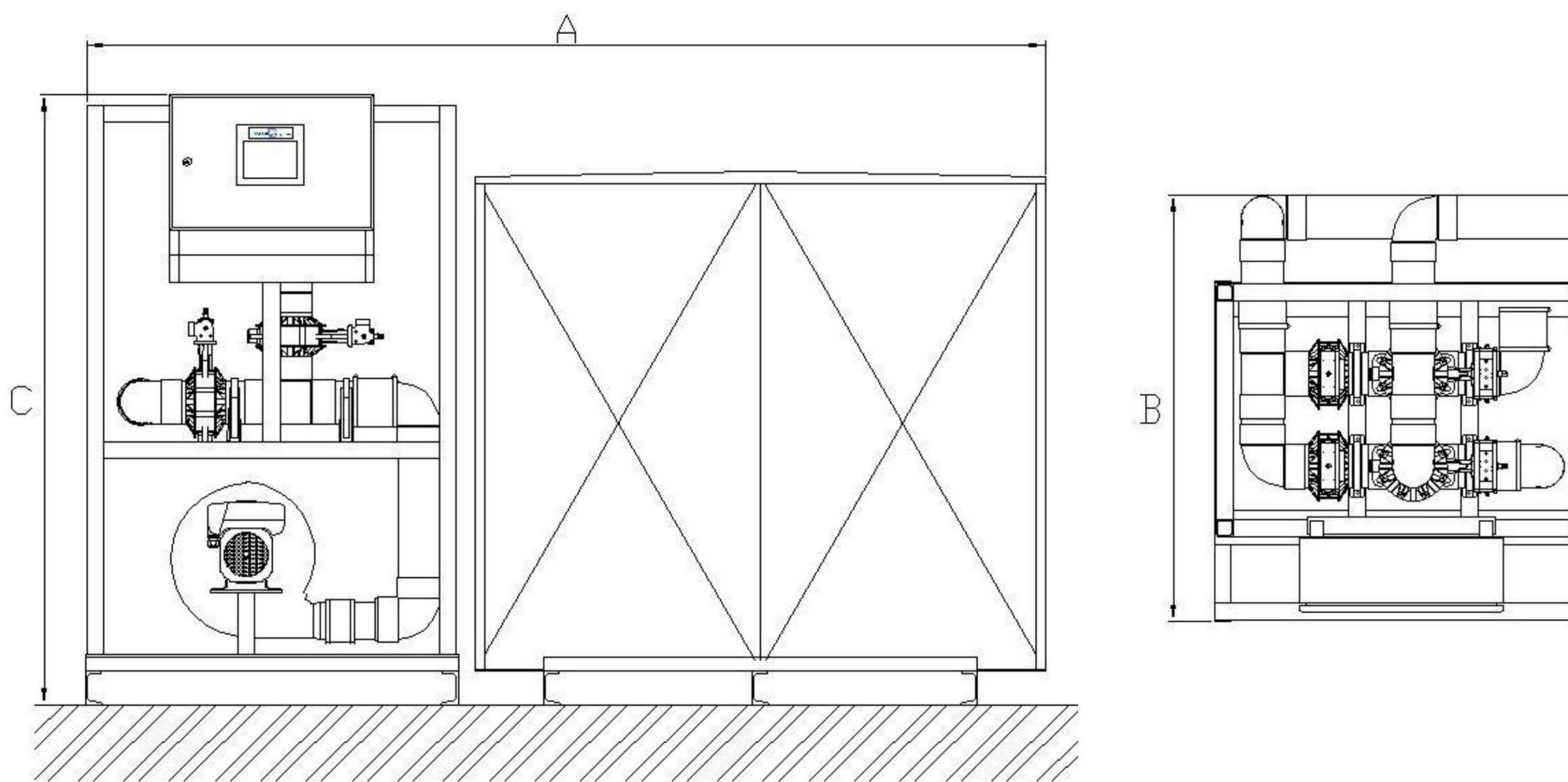


ETHYLENE CONVERTER



Type	Capacity per hour		Voltage (V)	Power (kW)	Fuse (A)	Plug (poles)	Phase	Noise (dB)	F
	PPM (m ³)	PPB (m ³)							
ES 10	2	1	230	0,6	16	3	1	75	
ES 100	124	72	400	2,5	16	5	3	75	
ES 200	180	108	400	3,0	16	5	3	75	
ES 300	320	192	400	3,5	16	5	3	75	
ES 400	400	240	400	3,5	16	5	3	75	
ES 700	720	432	400	5,4	T25	5	3	78	
ES 1000	1000	600	400	7,0	T25	5	3	78	
ES 1200	1280	768	400	7,0	T25	5	3	78	
ES 2000*	2000	1200	400	15,5	32	5	3	80	
ES 2400*	2400	1440	400	15,5	32	5	3	80	

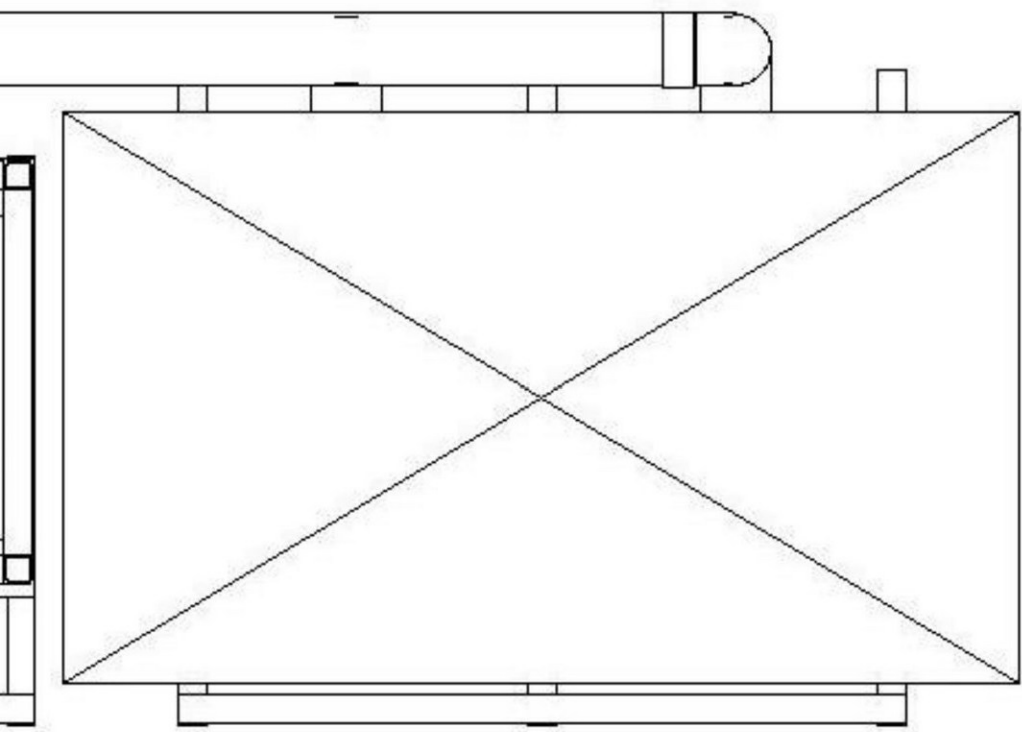
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* Please note that type ES 2000 & ES 2400 have an additional container on the left of the main control unit.

PVC connection (mm)	No. of skids	Dimensions			Weight (kg)
		A Width (mm)	B Depth (mm)	C Height (mm)	
1/4"	1	750	625	2000	250
90	2	2050	1020	1800	480
90	2	2150	1020	1800	780
90	2	2350	1050	1800	980
110	2	2450	1100	1800	1185
125	2	2850	1250	1800	1800
125	2	3050	1450	1800	2300
125	2	3250	1550	1800	2800
160	3	5150	1450	1800	4400
160	3	5550	1550	1800	5320

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Measurement & control technology

Measuring is knowing! Without accurate measurement and the appropriate control of the equipment, all kinds of things can go wrong. Besseling has developed its own measurement and control system (ACS - Atmosphere Control Station) which can be used to control a cold storage facility fully automatic. You only need to set the target values and the system will measure, control and maintain your desired atmosphere.

Quality and reliability at the heart of your system are extremely important! As such, the sensors approved by Besseling meet four important requirements; sustainability, stability, accuracy and response time.

ACS can easily be expanded with the addition of a cooling module that allows any type of cooling system to be managed. It controls the cooling valves, defrost valves and ventilators, based on target values which you can set yourself. Besides temperature, relative humidity can also be measured and regulated, as can the quantity of defrost water, if required. Thanks to this total concept, ACS is capable to control your entire cold storage facility.

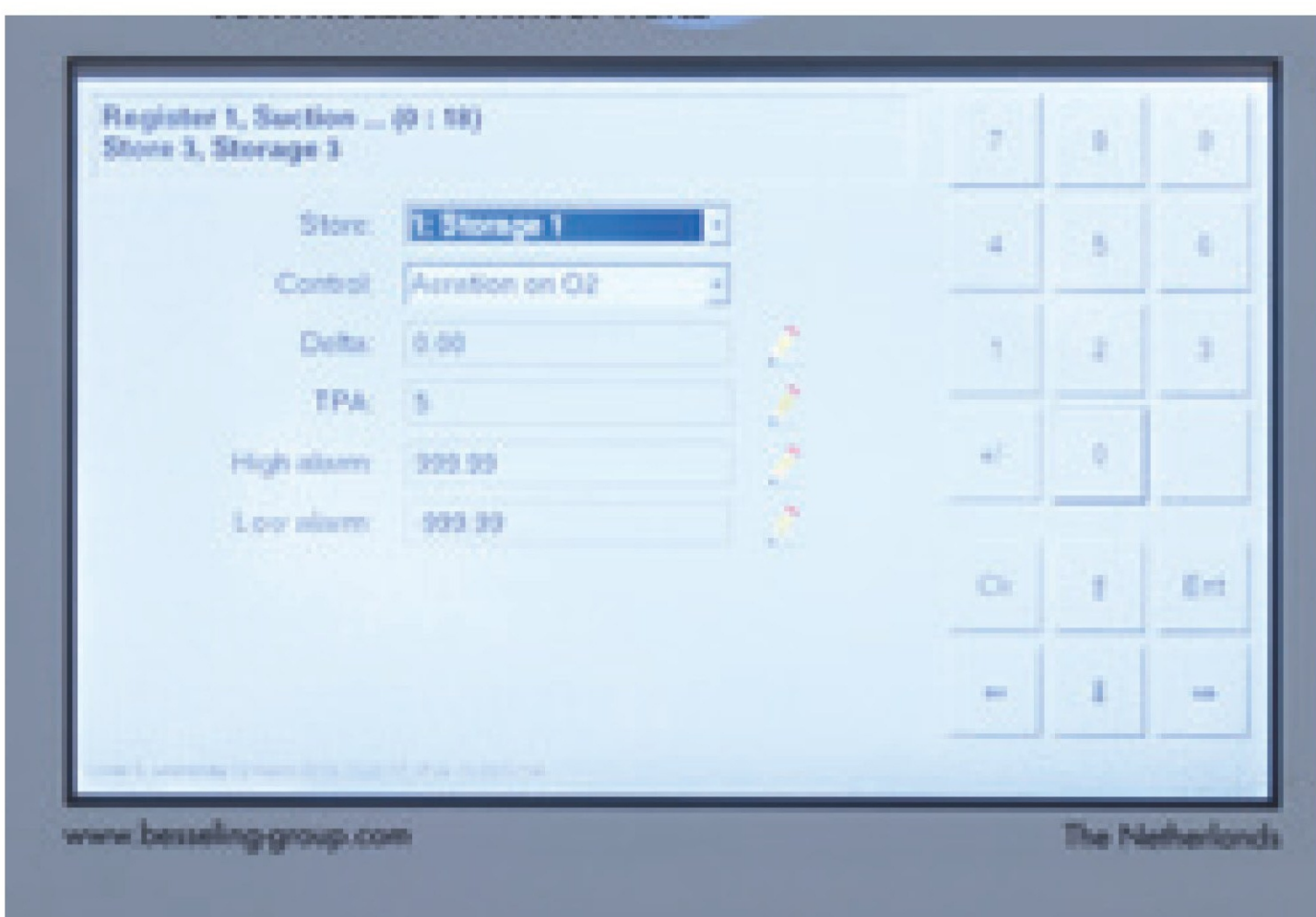
The analysis system is connected to a PC with BatNetV software. The settings can easily be adjusted. The measured data are stored in a database. The registered data can be displayed and printed, or used to generate various reports to compare different periods.

Besseling also supplies the necessary equipment for measuring and controlling CO₂ values.

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plies portable measuring
nual measurement of O₂



Cold store protection

During a storage season, a cold storage facility is constantly exposed to changing conditions that can directly affect the atmospheric conditions inside. Besseling offers solutions for optimum protection and security.

Breather bag / Bufferlung

As a result of changing air pressure and the temperature fluctuations inside the cold store, the air volume is constantly subject to changes. In order to neutralize these variations, a breather bag is fitted onto the cold store. The bag stores the excess air of the cold store and if necessary (in case of low pressure) returns it to the store. This prevents ingress of oxygen-rich outside air into the cold store.

Overpressure / underpressure protection

Under extreme conditions, a breather bag only is not sufficient anymore. For this reason, cold stores must also be equipped with overpressure and underpressure safety valves which starts operating at an overpressure/ underpressure of 10 mm water column. Without this safeguard, the ceiling and/or walls of the cold store can be severely damaged.

Aeration ventilator

The aeration ventilator keeps the oxygen percentage low during the loading and cooling period and allows oxygen to leave the store in a controlled manner during storage.



CO₂
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