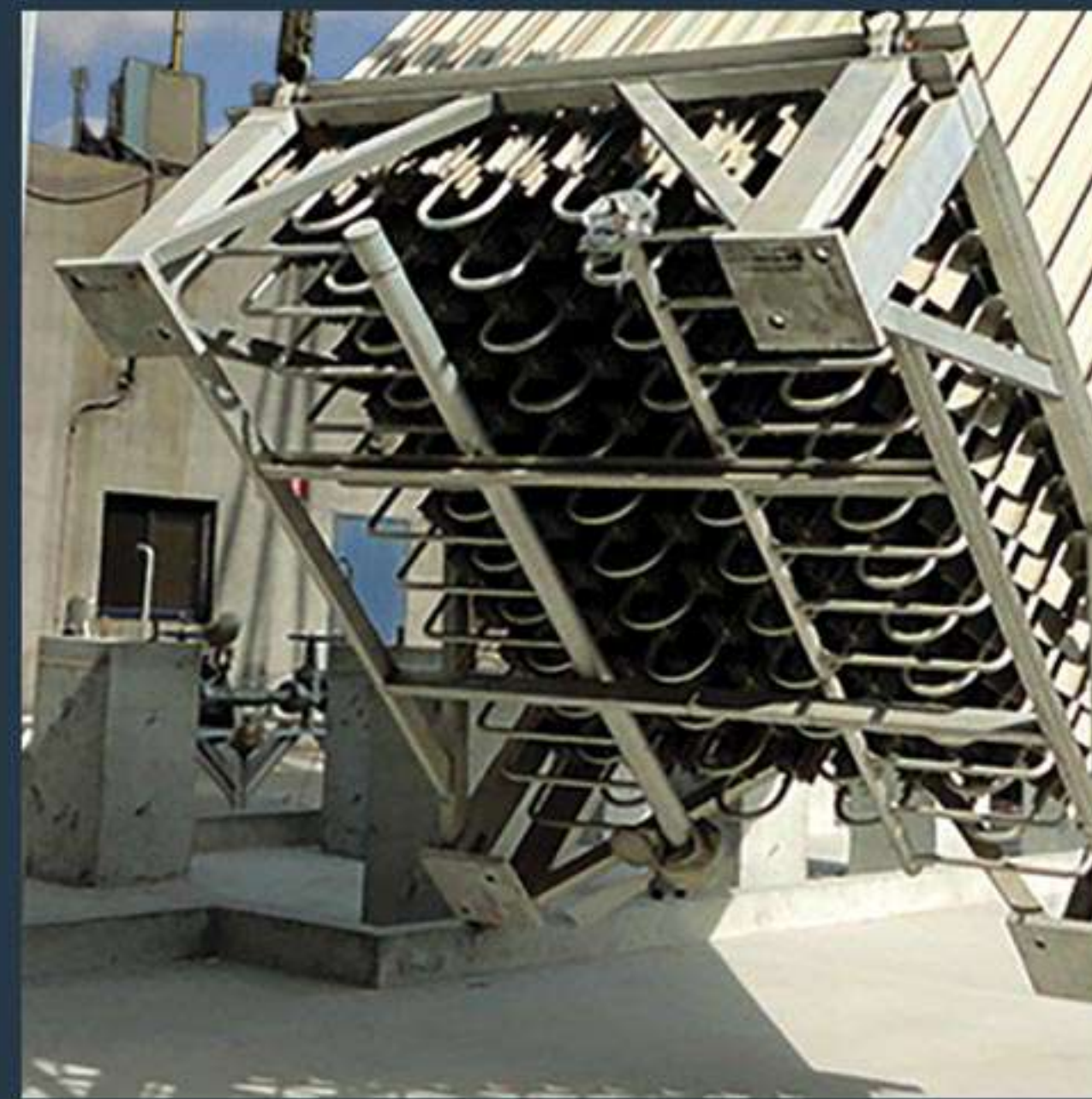
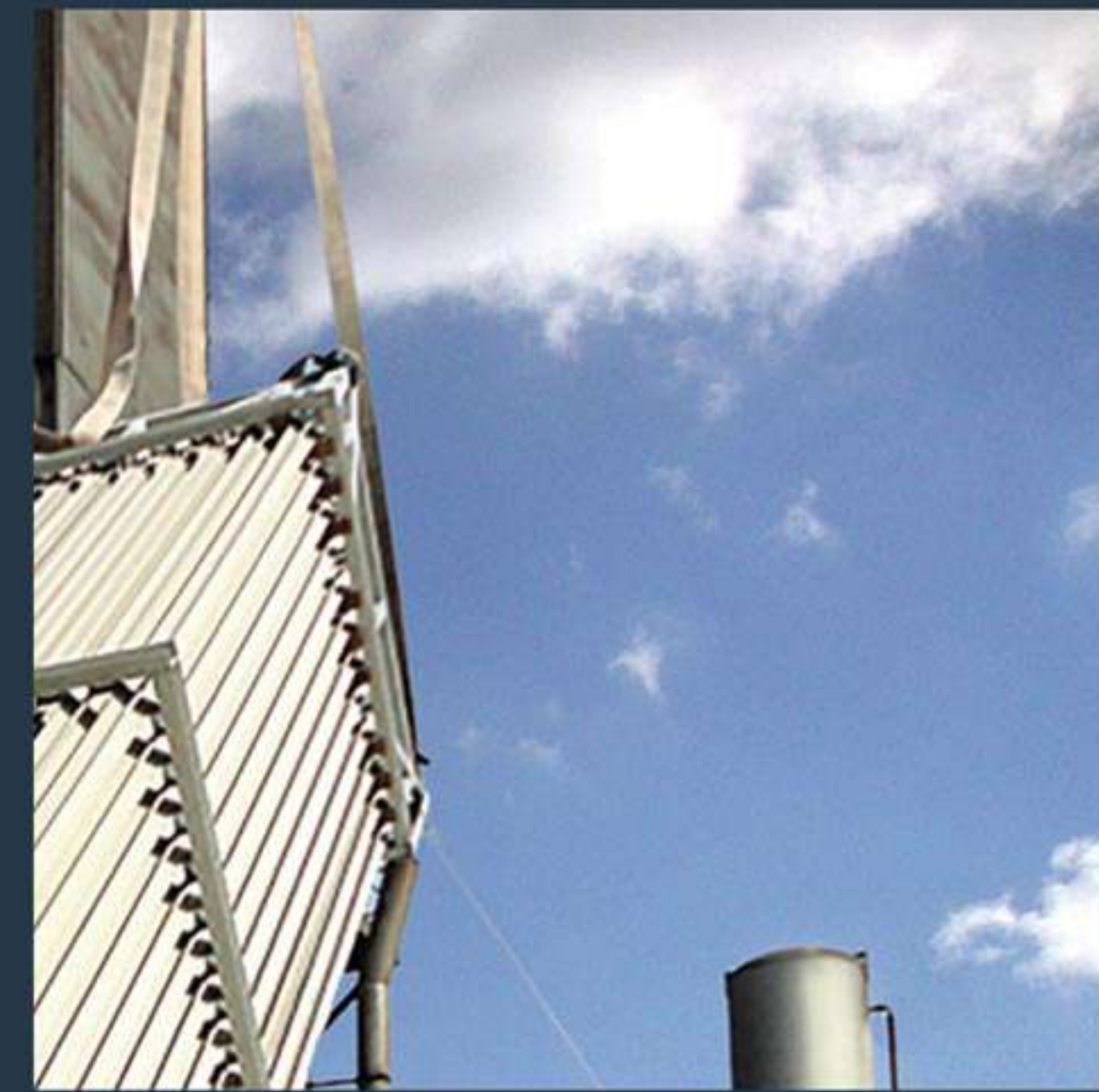


# Air-heated Vaporizers



# Air-heated Vaporizers

One thing we know:

Optimal efficiency, great ease of maintenance, operating safety, environmental compatibility and quality, combined with long life, are the decisive factors in your satisfaction as a customer.



## Welcome to HATCO!

HATCO is a company specialized in the planning, engineering, design and realization of turnkey, customized solutions for the air and gas compression and separation plants including all exclusive project's services.

Since founded in 1997, HATCO brand stands for quality and reliability, but also aim to innovation and development in the future. Thousands of compression packages operating across the country prove our reliability of products for special environments and heavy duty industries and air separation plants.

Our aim is to promote a constant improvement about products and we do manufacturing, developing and enhancing, at the same time, the quality of life. Today we are expanding our business and technology to air separation plants (ASUs) and hydrogen purifiers based on Linde technology as the world's leading industrial gas producer.

Our wealth of knowledge combined with the continuous dedication to research and experimentation allows us to constantly improve our products and develop innovative and tailor made solutions.

HATCO manufacturing factory and warehouses comprise all facilities for production and packaging all kind of compressed air& gas and air separation systems with highest quality and favorable delivery time.

Forwarded.

The recovery of large quantities of gases such as oxygen, nitrogen and argon is carried out through cryogenic decomposition of air. In the cryogenic (very cold) then condensed (liquid) states, these gases only take up around 1/800 of the volume they would require in the gaseous state which is the reason why storage for consumers is carried out as a fluid in thermally insulated tanks at temperatures down to minus 269°C. If required, the liquid gas is vaporized in a downstream vaporizer.



## HTS-VAP

The new generation based on Standard design.

Save energy costs and investments with the new generation of HTS-VAP for cryogenic gases. This generation of all aluminum vaporizers ensures maximum air circulation due to optimized fin and vaporizer geometrics.

A full range of ambient air heated vaporizers in different versions and for different customer applications.

### Design:

- According to PED 97/23/EC; CE-marked
- Max. Allowable working pressure 40 bar
- Cleaned for oxygen service
- Wind-loads up to 160 km/h
- Seismic requirements acc. to uniform building code-zone 4
- Low pressure drop
- Efficient fin tube design
- Optimized external and internal surfaces for optimum convection

### Benefit:

- Maintenance-free aluminum design
- Low weight
- Corrosion and temperature resistant
- Easy to assemble - no welding or brazing required
- Screwed connections at in- and outlet for models up to 350 Nm<sup>3</sup>/h
- Space-saving design, intensive convection
- Long lifetime



## HTS design;

The vaporizers are suitable for a design overpressure = max. Allowable working pressure (PS) of 40 bar and an allowable operating temperature range (TS) of +50/-269°C.

Design and testing was carried out in accordance with the directive 97/23/EC concerning pressure equipment, AD 2000-Merkblätter and DIN EN. The connecting flanges are DIN EN compliant.

The HATCO finned tubes and connecting flanges are made of aluminum alloy and the seals formed according to HATCO standards. Variations defined by specific order instructions are possible. The stressing of the materials used, at low temperatures for example, was taken into account during their selection.

### Explanation of type designation:

L = air heated

40 = max. Permissible working overpressure: 40 bar

8 F = number of finned tubes: 8

3 = length of single finned tube: 3 m

Partly the vaporizers have different foot standard of length, evident by an additional characteristic letter (-S; -L) of the type designation, for example L 40 - 30 F 6 - S.

### Explanation:

S = Short Version = 600 mm footing

L = Long Version = 900 mm footing



Flange - counter flange connection DN 40 / PN 40



Screwed connection M40 x 2 as well as pipe connection. To protect the operating staff when connecting the intervening pipelines, HATCO evaporators are fitted with edge protection.

vaporizer type	Dimensions (approx.)			weight (empty) [kg]	Nominal Capacity * N <sub>2</sub> [Nm <sup>3</sup> /h]	Connections (Inlet/Outlet) [mm]	ID. No.
	Depth [m]	Width [m]	Height [m]				
L 40 - 30 F 6 - L	1,84	1,54	7,14	788	1000	Flange/Counter Flange DN 40 / PN 40	M83562
L 40 - 30 F 6 - S	1,84	1,54	6,84	778			M59970
L 40 - 30 F 6 - S	1,84	1,24	7,14	644	800		M83563
L 40 - 24 F 6 - S	1,84	1,24	6,84	635			M69789
L 40 - 16 F 6 - L	1,24	1,24	7,14	450	520		M83564
L 40 - 16 F 6 - L	1,24	1,24	6,84	442			M69785
L 40 - 16 F 6 - L	1,24	1,24	5,14	3,27	350	Screwed: M40 x 2 Pipe: DN 25 (33 x 2,4) Socket welding end: ø 28,3	M76127
L 40 - 16 F 6 - L	1,24	1,24	6,84	320			M69784
L 40 - 12 F 4 - L	1,24	0,94	5,14	259	260	Screwed: M40 x 2 Pipe: DN 15 (21,3 x 1,5) Socket welding end: ø 18,2	N08413
L 40 - 12 F 4 - S	1,24	0,94	4,84	250			M70106
L 40 - 8 F 3	0,72	1,12	3,86	111	130		M71496
L 40 - 4 F 3	0,72	0,52	3,84	58	62		M71591

\*) The capacity is based on an ambient temperature of 20°C, 70 % rel. humidity, 15°C temperature difference between ambient and gas outlet temperature at a continuous 8-hours-operation

a) Standard vaporizer design is the long version; price and delivery time for the short version available on special request



Range of HTS-VAP run production, beginning in front with type L 40 - 4 F 3

# HTQ-VAP

The specially designed for higher quality fluids.

HTQ design;

The vaporizers are suitable for a design overpressure= max. allowable working pressure (PS) of 40 bar and an allowable operating temperature range (TS) of +50/-269°C.

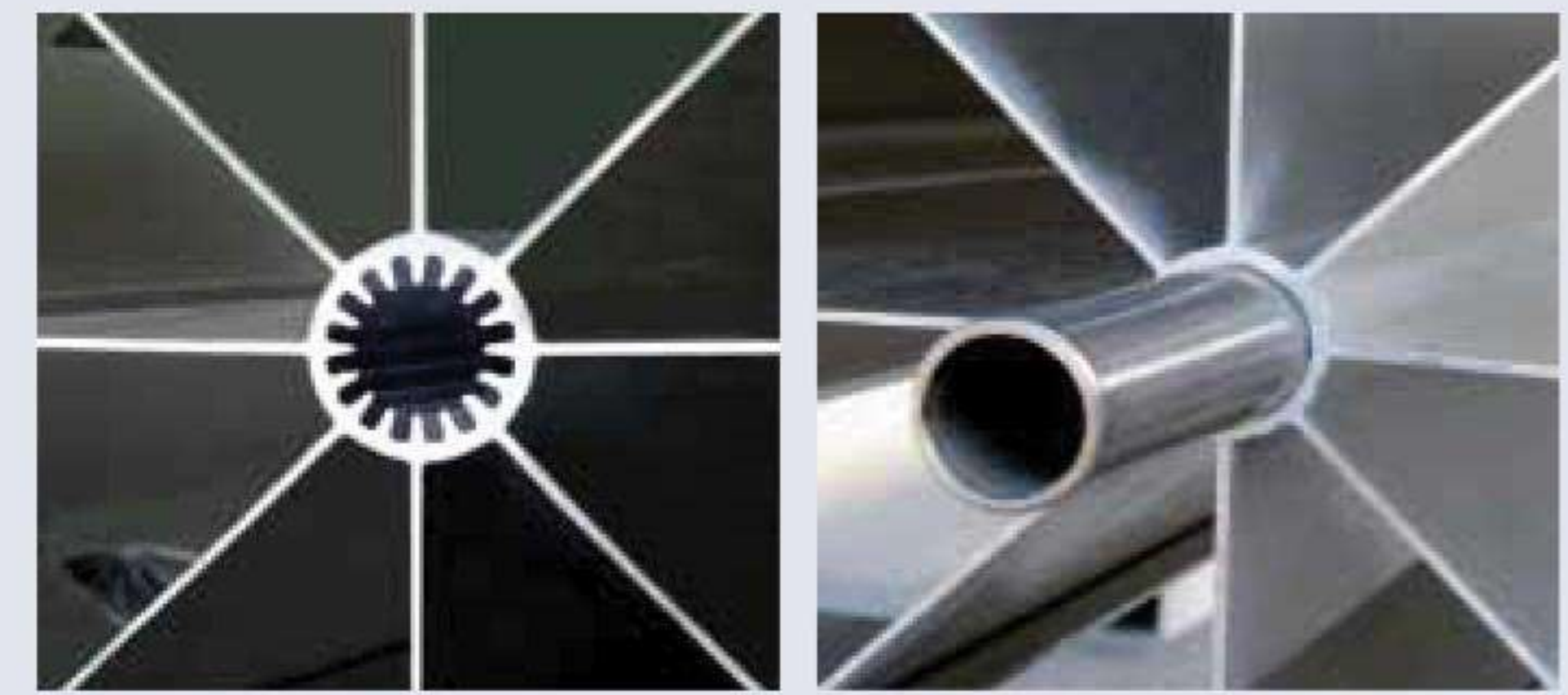
Design and testing was carried out in accordance with the directive 97/23/EC concerning pressure equipment, AD 2000-Merkblätter and DIN EN.

The material of the pipes, pipe bends and caps is corrosion-resistant austenitic CrNi-steel.

In general air heated vaporizers consist of light metal tubes with longitudinal ribs (finned tubes with star-shaped cross-section).

HQ-vaporizer are made in "duplex"-design, consisting of CrNi-steel pipes inserted into aluminum finned tubes for increased transfer of heat.

Factory-made, the inlet and outlet openings of the HQ-vaporizer are sealed gas-, dust- and moisture tight with shutter caps as well as in condition of low overpressure by protective gas.



Left image shows the conventional construction of a finned tube with star-shape cross-section; right image shows the "duplex"-design consisting of an austenitic steel pipe inserted into a aluminium finned tube.

Explanation of type designation:

L = air heated

40 = max. Permissible working overpressure: 40 bar

8 F = Number of Finned tubes: 8

3 = length of single finned tube: 3 m

HTQ = to be suitable for Higher Quality fluids

Remark: standard vaporizer design is the long leg version

(L = 900mm)



Inlet and outlet openings are sealed gas- and dust tight with caps, which must cut off prior installation. For highest purity and in order to avoid moisture tight in the course of carriage and stocking the HQ-vaporizers are delivered in condition of low overpressure by a protective gas.

vaporizer type	Dimensions (approx.)			weight (empty) [kg]	Nominal Capacity * N <sub>2</sub> [Nm <sup>3</sup> /h]	Connections (Inlet/Outlet) [mm]	Design [mm]	ID. No.
	Depth [m]	Width [m]	Height [m]					
L 40 - 30 F 5,8 - HTQ	1,84	1,54	6,976	960	660	pipe: DN 40 (48,3 x 2) material: stainless steel	"Duplex" (CrNi-steel pipes inserted into aluminum finned tubes)	L06453
L 40 - 24 F 5,8 - HTQ	1,84	1,24	6,977	796	530			N23418
L 40 - 16 F 5,8 - HTQ	1,24	1,24	6,978	550	340			N47708
L 40 - 16 F 4 - HTQ	1,24	1,24	5,106	399	230	pipe: DN 15 (21,3 x 2) material: stainless steel	"Duplex" (CrNi-steel pipes inserted into aluminum finned tubes)	N47706
L 40 - 12 F 4 - HTQ	1,24	0,94	5,106	312	170			N53823
L 40 - 8 F 3 - HTQ	1,12	0,72	3,826	139	85			N47675
L 40 - 4 F 3 - HTQ	0,52	0,52	3,826	72	40			N43865

\*) The capacity is based on an ambient temperature of 20°C, 70 % rel. humidity, 15°C temperature difference between ambient and gas outlet temperature at a continuous 8-hours-operation





## Pressure build-up.

The vaporizers are suitable for a design overpressure= max. Allowable working pressure (PS) of 40 bar and an allowable operating temperature range (TS) of +50/-196°C (HQ-type+50/-269°C).

Design and testing was carried out in accordance with the directive 97/23/EC concerning pressure equipment, AD 2000-Merkblätter and DIN EN.

The HATCO finned tubes and connecting flanges are made of aluminum alloy and the seals are formed according to HATCO standards.

The HQ type is made in "duplex"-design, consisting of CrNi-steel pipes inserted into aluminum finned tubes.

### Explanation of type designation:

LD = air heated - pressure build-up

40 = max. Permissible working overpressure: 40 bar

5 F = number of finned tubes: 5

4 = length of single finned tube: 4 m

HQ = to be suitable for Higher Quality fluids

### Please take into consideration:

The data on the performance - that is, the withdrawal quantity of the product gas - depend on the operating pressure, and must therefore be requested separately.



Horizontal evaporators ensure high circulation forces.  
The image shows the types LD 40 - 5 F 4 and LD 40 - 5 F 2.

vaporizer type	Dimensions (approx.)			weight (empty) [kg]	Nominal Capacity * N <sub>2</sub> [Nm <sup>3</sup> /h]	Connections (Inlet/Outlet) [mm]	Design [mm]	ID. No.
	Depth [m]	Width [m]	Height [m]					
LD 40 - 5 F 4	4,174	0,655	0,58	44	8,8	pipe DN 25 (28 x 2) for connection to reducing braze-on flange DN 40/25 PN 40	Al-finned tubes	J46389
LD 40 - 5 F 2	2,171	0,655	0,58	37	4,4			J46390
LD 40 - 4 F 1,6	1,25	0,5	2,085	90	13,3			J46391
LD 40 - 5F 2 - HQ	2,171	0,74	0,58	50,5	4,4	Pipe DN 40 (48,3 x 2)	"Duplex"	K47971
LD 40 - 5F 4 - HQ	2,171	0,74	0,58	80	8,8		"Duplex"	R56440
LD 40 - 4 F 1,5 - HQ*)	1,153	0,5	2,034	60	9,5		"Duplex"	871321

\*) Allowable operating temperature range (TS) for +50/-269°C



## Operational efficiency.

The nominal operational efficiency of the vaporizers is based on a reference ambient temperature of +20°C for N<sub>2</sub> (see tables of technical data). In this case, the difference in temperature between the ambient temperature and gas outlet is ≤15°C.

The operational efficiency is dependent on various boundary conditions such as ambient temperature, wind velocity, air humidity, air circulation, ingress of sunlight, period of operation and the medium used.

The following diagrams show how the nominal output is affected by the medium used (Fig. 1: Conversion factor), the ambient temperature (Fig. 2: Correction factor) and the period of operation (Fig. 3: Power factor).

Note:

As the boundary conditions are subject to large fluctuations, the information provided should be regarded as average, approximate values.

In Fig. 4, calculations are shown by way of example for determining the anticipated nominal efficiency taking the operating medium, ambient temperature and period of operation into account.

Air heated vaporizers have a modular construction principle and can be connected together individually according to the required output.

The specified nominal performance figures apply to eight-hour permanent operation; after that, the performance of the vaporizers may drop because of frosting.

For longer periods of operation it is therefore advisable to arrange the vaporizers modules in parallel.

While one vaporizer group is working, the other vaporizers can regenerate. This prevents non-productive intermissions- gas withdrawal is assured at all times.

Medium	Conversion Factor
N <sub>2</sub>	1
Ar	1.5
H <sub>2</sub>	1.75
O <sub>2</sub>	0.92
CH <sub>2</sub>	0.76
CO <sub>2</sub>	0.33
He	3.1

Fig. 1: Conversion factor for the nominal efficiency of various media

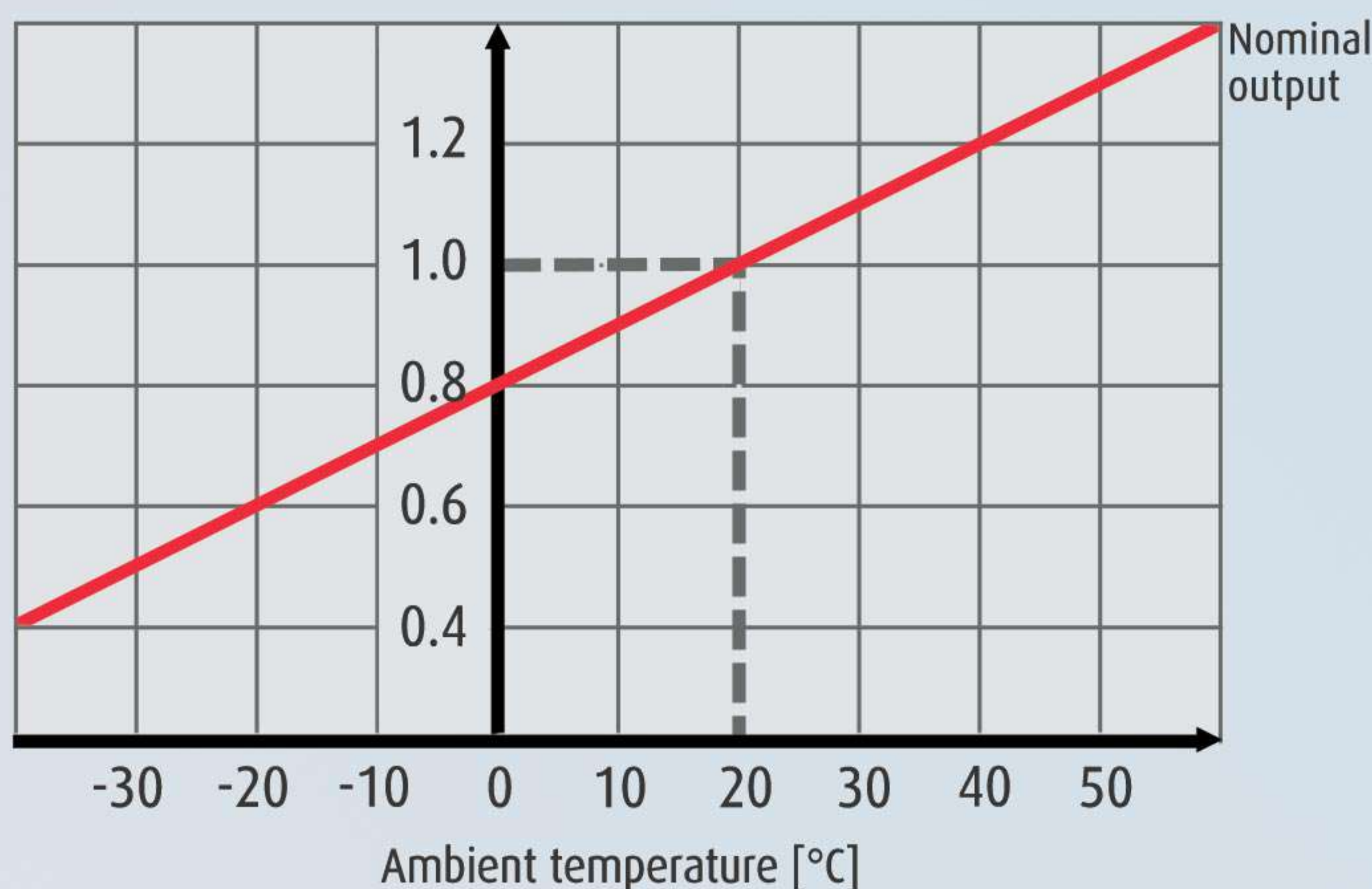


Fig. 2: Correction factor - for the nominal operational efficiency as a function of ambient temperature

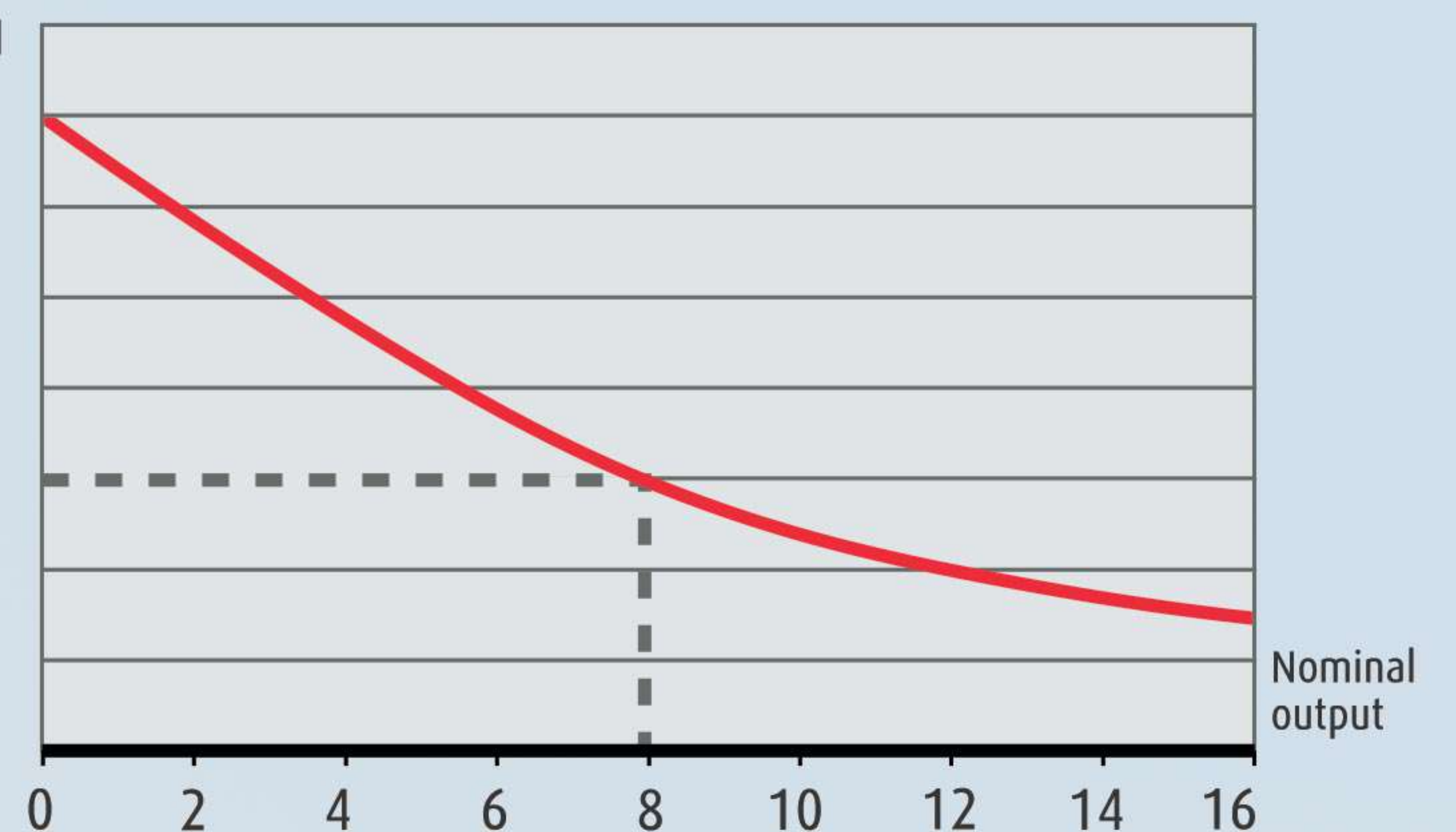


Fig. 3: Power factor - for the nominal operational efficiency as a function of operational duration

Examples for vaporizer type L40 - 8F 3; nominal output at +20°C according to Fig. 1 = 130 Nm<sup>3</sup>/h:

Example 1: For N<sub>2</sub> at +20°C and 8 h duration of operation:

Nominal output = 100 % x conversion factor 1 x correction factor 1 x power factor 1 = 100 %

i.e. nominal output (N<sub>2</sub>) = 130 Nm<sup>3</sup>/h

Actual output (N<sub>2</sub>) = 130 Nm<sup>3</sup>/h x factor 1 = 130 Nm<sup>3</sup>/h

Example 2: For O<sub>2</sub> at -20°C and 2 h duration of operation:

Nominal output = 100 % x conversion factor 0,92 x correction factor 0,6 x power factor 1,25 = 69 %

i.e. nominal output (N<sub>2</sub>) = 130 Nm<sup>3</sup>/h

Actual output (O<sub>2</sub>) = 130 Nm<sup>3</sup>/h x factor 0,69 = 90 Nm<sup>3</sup>/h

Fig. 4: Sample calculations for determining nominal output



## Know-how, quality, inspection, documentation.

HATCO is committed to customer's satisfaction:

The only acceptable standard by which we can measure quality success.

Our customers expect us to supply safe and reliable plants and components which operate both economically and in an environmentally friendly manner, reflecting the current state of technology.

Since a period of almost half a century HATCO designs and manufactures air-heated vaporizers for cryogenic applications.

The new range of Lead- and Special-Vaporizer is a direct result of our ongoing product development.

They conform to the latest technical standards, are proven, effective in performance and simple to use.



Every vaporizer must meet the demands of the required proof test. The final inspection and pressure test are performed exclusively by trained and responsible qualified personnel and monitored by the Notified Body. All measuring instruments are calibrate and checked periodically.



HATCO vaporizers for air-heated gas transformation—safe, reliable supply made to measure.

Quality management is an indispensable part of our corporate strategy and therefore a managerial responsibility carried out at all levels of the company.

Extensive testing ensures the highest welding quality and safety.

The inspections will be carried out by applying the directives and operating instructions of the HATCO quality management- system as well as supervised by the independent official notified body.

The cleanliness of our products, even oxygen applications, naturally conforms to the purity requirements of the EN 12300 standard. Because of the pressures that they will be subjected to in later operation, and the associated risks, units like vaporizers are subject to stringent manufacturing requirements.

All named vaporizer types of these prospectus comply with the essential safety requirements defined in Annex I of directive 97/23/EC concerning pressure equipment.

Each delivered vaporizer is unambiguously documented by the declaration of conformity according to global standards, issued by company, and related to the fabrication number. The associated operating instructions contain a type-relevant data sheet.

## **SHEQ - safety, health, environment and quality policy.**

At the all divisions of HATCO, we do not want to harm people or the environment.

We will comply with all applicable legal, regulatory, internal and industry requirements.

We strive to be leading in SHEQ to meet safe, secure and healthy working conditions and supplying safe, compliant and environmentally responsible products and services for our customers.

Our SHEQ management and policy is in line with the following:

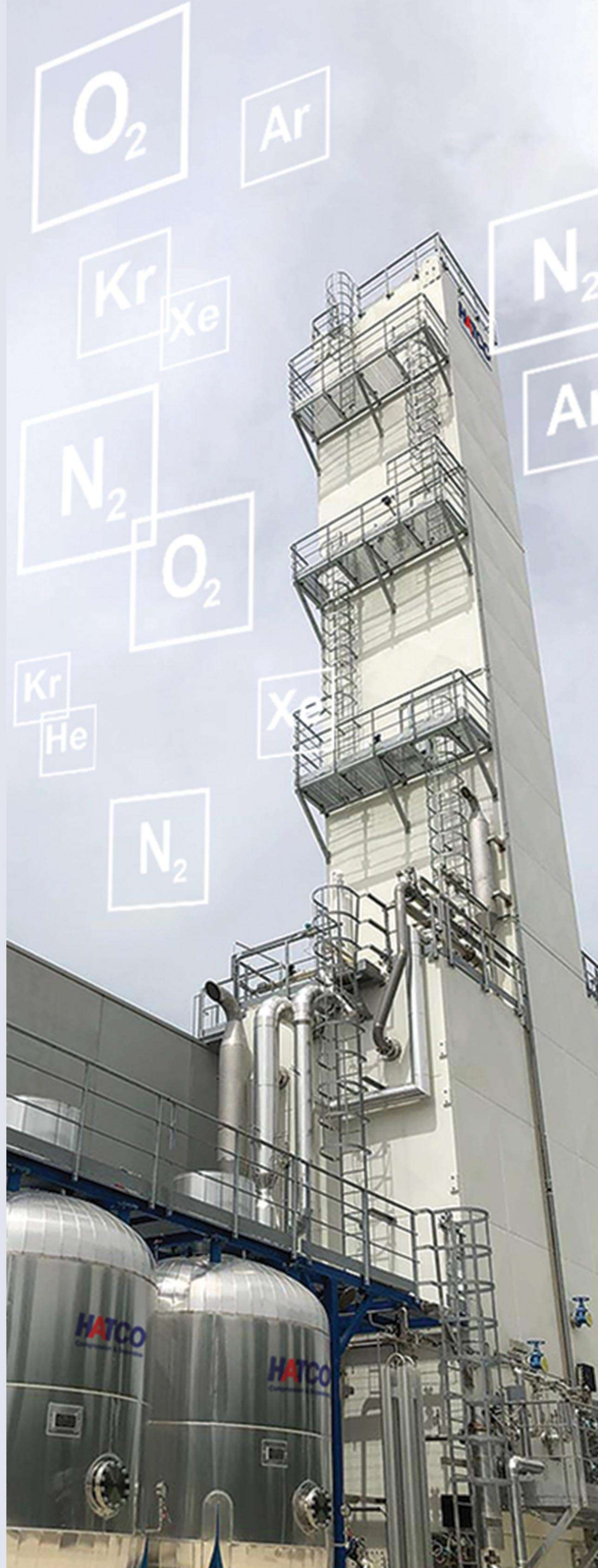
- ISO 9001
- ISO 45001
- ISO 14001
- PED 97/23/EC (Module H)
- SCC checklist
- Work safety and environmental protection legislation

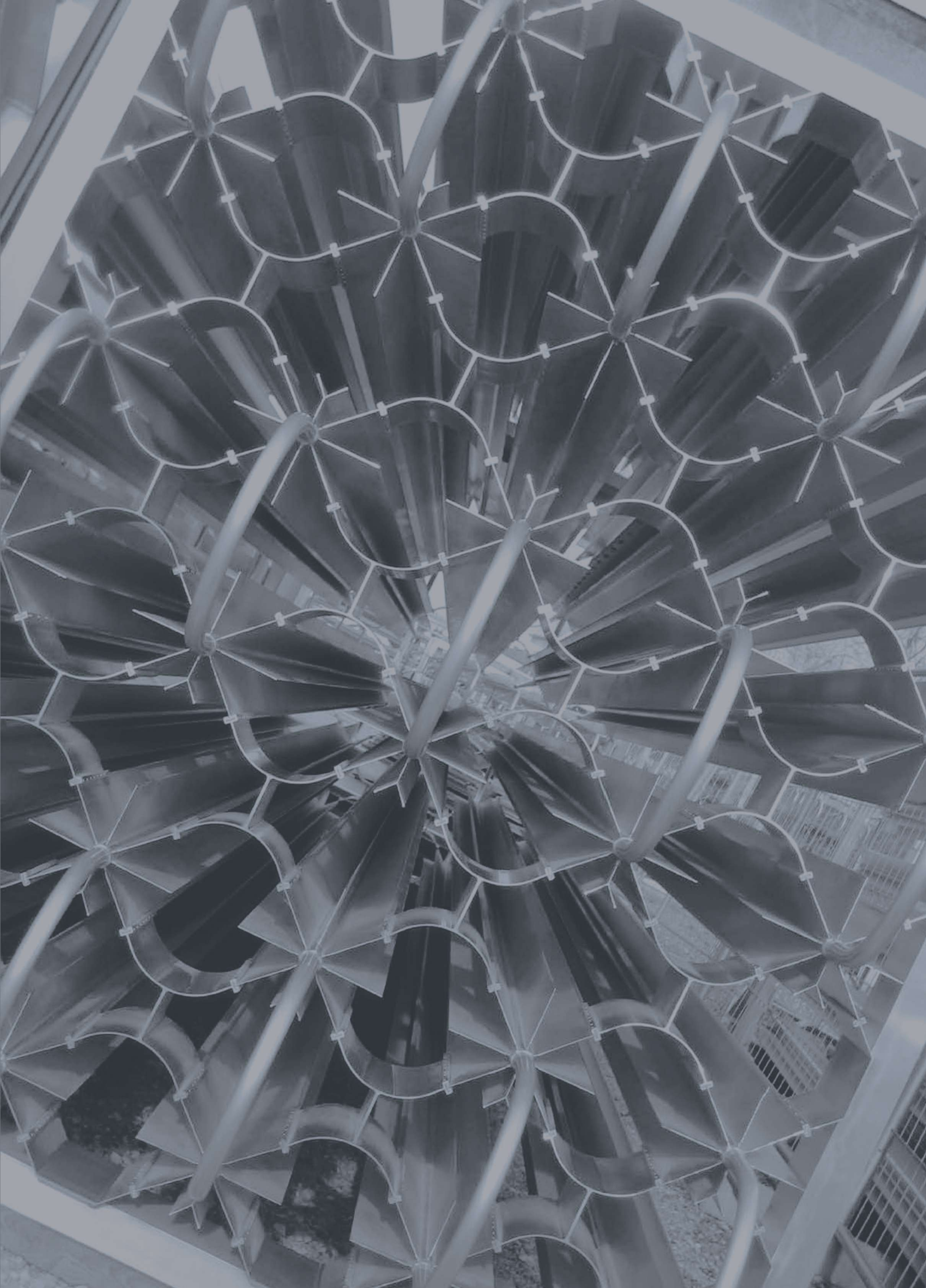
**To achieve this vision,  
SHEQ is 100 % of our behavior, 100 % of the time.**



## Core competencies at a glance.

- **Plant engineering**
  - Cryogenic air separation plants
  - Compressed air plants
  - Compressed process gas plants
  - Hydrogen purification plants
  - Adsorption air/nitrogen plants
  - Compressed air and gas purification plants
- **Component manufacturing**
  - Cold boxes and modules
  - Plate-fin heat exchangers
  - Cryogenic columns
  - Cryogenic storage tanks
  - Air-heated vaporizers
  - All types piping systems
  - Centrifugal air & gas compressors
  - Screw air & gas compressors
  - Reciprocating air & gas compressors
  - Adsorption air / nitrogen systems
  - Compressed air & N<sub>2</sub> gas storage / process tanks
  - Air and gas filtration drums
  - Plant's steel Structures
  - Plant's Control systems
- **Project execution**
  - Recourses assignment & management
  - Preparing and equipping of the site workshop
  - Technical and communication center
  - Logistic and loading
  - Field constructions
  - Installation of the all equipment
  - Expert Inspection and supervision
  - Clear punch list
  - Pre commissioning
  - Commissioning and delivery
- **Service and guarantee**
  - Plant modifications
  - Spare parts
  - Operational support, troubleshooting and repairs
  - Long-term service contracts
  - Operator training





**HATCO**

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