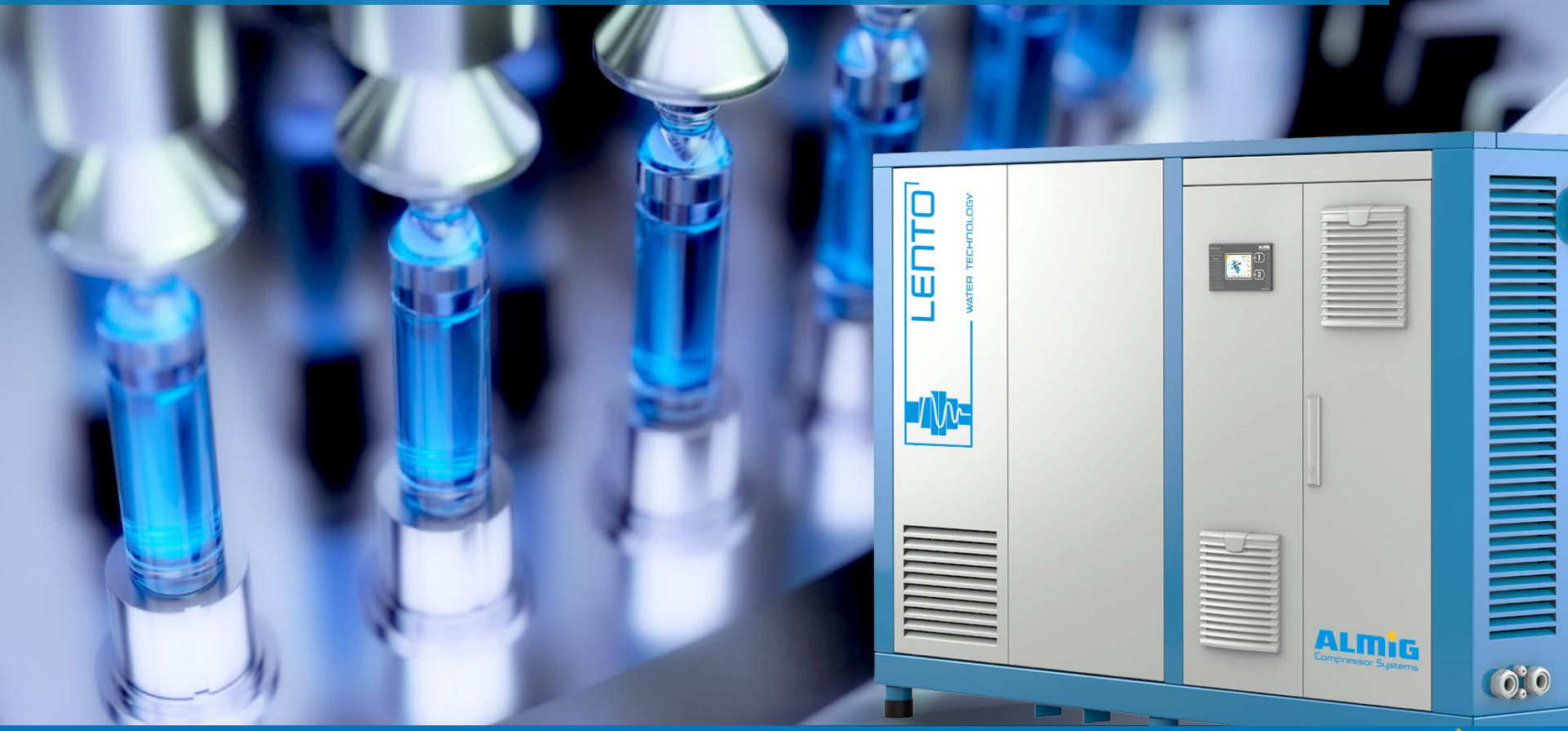
Compressor Systems
Made in Germany

LENTO Series

LENTO 15 - 132

Oil-Free water injected compressor series



ALMiG
Compressor Systems

The LENTO Series

Index

ALMiG Product Identity

ALMiG
Compressor Systems

High Efficiency, Low Noise, Best Performance

Product Identity

Your next screw compressor:

- **All ALMiG screw compressors have passed a performance test run, to guarantee its quality and to confirm its technical parameters. No ALMiG compressor leaves the factory untested. This is part of our quality promise.**
- **The compressor comes ready to run at the point of installations**
- **Thanks to isolated panels, the compressor is exceptionally well sound insulated**
- **Standard operating temperatures are between 5°– 45°C**
- **Powder coating protects the canopy against harmful environmental influences**

High Efficiency, Low Noise, Best Performance

Product Identity

An intelligent and modular system concept starts with a well thought-out base frame

- Solid and stable, built for industrial use
- The installation is not directly on the ground, but on vibration damping elements
  - No transmission of plant vibrations
  - Protection against corrosion caused by ground humidity
- Easiest handling of the unit thanks to accessibility from all sides for forklifts (please mind centre of gravity)
- All extensions of the unit, no matter if it is heat recovery, water cooling or integrated refrigerant dryer – dimensions of footprint will not change
- Optional cover beneath the base frame for further reduction of noise level

High Efficiency, Low Noise, Best Performance

Product Identity

Modular design & high quality components

Quality starts with the selection of the right materials and components. We go one step further and develop modules, which make it easier for assembly, operation and maintenance of the unit:

- **Canopy**
- **Motor-Airend-Unit**
- **Electric cabinet**
- **Cooler-Fan-Unit**

Service friendliness comes as standard with ALMiG.

- **Direct access to all serviceable components from only one side. This means the other side could be placed closer to the wall.**
- **No doors or pillars blocking the way, easy removeable panels**

LENTO overview

ALMiG
Compressor Systems

The LENTO Series

Overview

Application	100% oil-free compressed air for industry (pharmaceuticals, food, chemicals etc.)
Output	LENTO I: 15 – 30 KW LENTO II: 30 – 55 KW LENTO III: 45 – 75 KW LENTO IV: 75 – 110 kW
Operating pressure	5 – 10 bar
Control unit	Air Control P Air Control HE
Cooling system	Water-cooled (Standard) Air-cooled (Option) LENTO IV water-cooled only
Drive System	Direct & Speed controlled

The LENTO Series

Overview

LENTO

WATER TECHNOLOGY

LENTO 15	LENTO 31	LENTO 46	LENTO 76
LENTO 18	LENTO 37	LENTO 56	LENTO 90
LENTO 22	LENTO 45	LENTO 75	LENTO 110
LENTO 30	LENTO 55		

0,86 m³/min — **Flow** — 19,88 m³/min

Applications & References

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Applications

- Electronics
- Cosmetics
- Solar
- Food & Beverage
- Medical & Hospitals
- Pharmaceutical
- Automotive
- Chemical
- Textile









The LENTO Series

References

A selection of companies which rely on 100 % oil-free compressed air from ALMiG

Dräger

Tucher

Universitätsklinikum Essen

Nypro HEALTHCARE

Fraunhofer

AREVA

RÖCHLING

BAD MEINBERGER

Mercedes-Benz

SALUTAS Pharma GmbH

früh KÖLSCH

Royal Perth Hospital

FRESENIUS MEDICAL CARE

KULMBACHER

PlantExtrakt® natura sănătăţii tale

cosmetics

ROMINA MINERALBRUNNEN

JENOPTIK

Technology in detail

ALMiG
Compressor Systems

The LENTO Technology

Components

Air Control P
Smart controller that monitors, visualises and documents

SCD frequency controller
The integrated power pack, according to EMC guidelines

SCD Motor
Highly efficient drive motor, IP 55 protection class ISO F; compact, powerful, reliable

Integrated refrigerant dryer
Permanent generation and exchange of the required coolant, optimum biological and chemical water quality, for dry compressed air at the compressed air outlet

The LENTO Technology

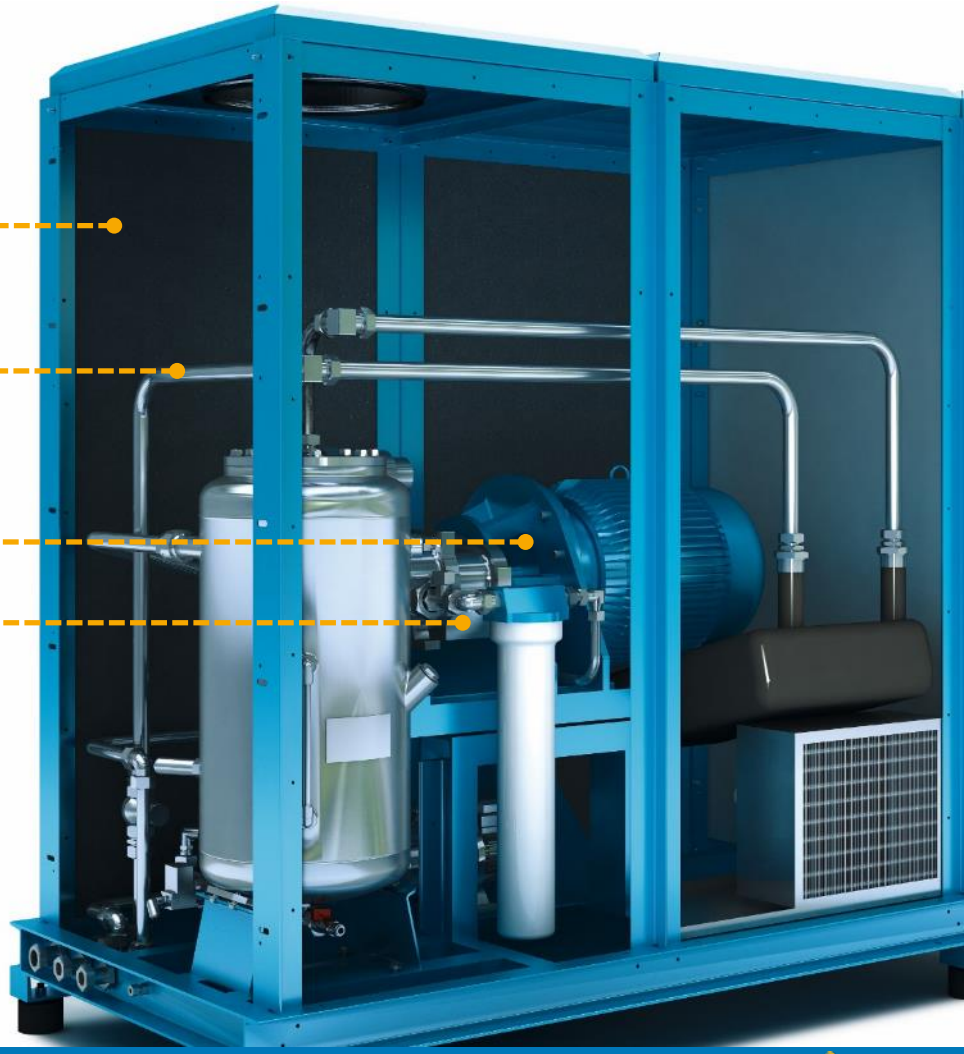
Components

Sound proofed canopy
Fully closed canopy incl sound absorbing materials

Water circuit
Closed water circuit with independent, integrated water treatment, multistage separation for dry compressed air

SCD direct drive
High efficient power transfer

Airend
Single-stage, water-injected; very low compression temperatures of less than 60° C, close to isothermal economical compression

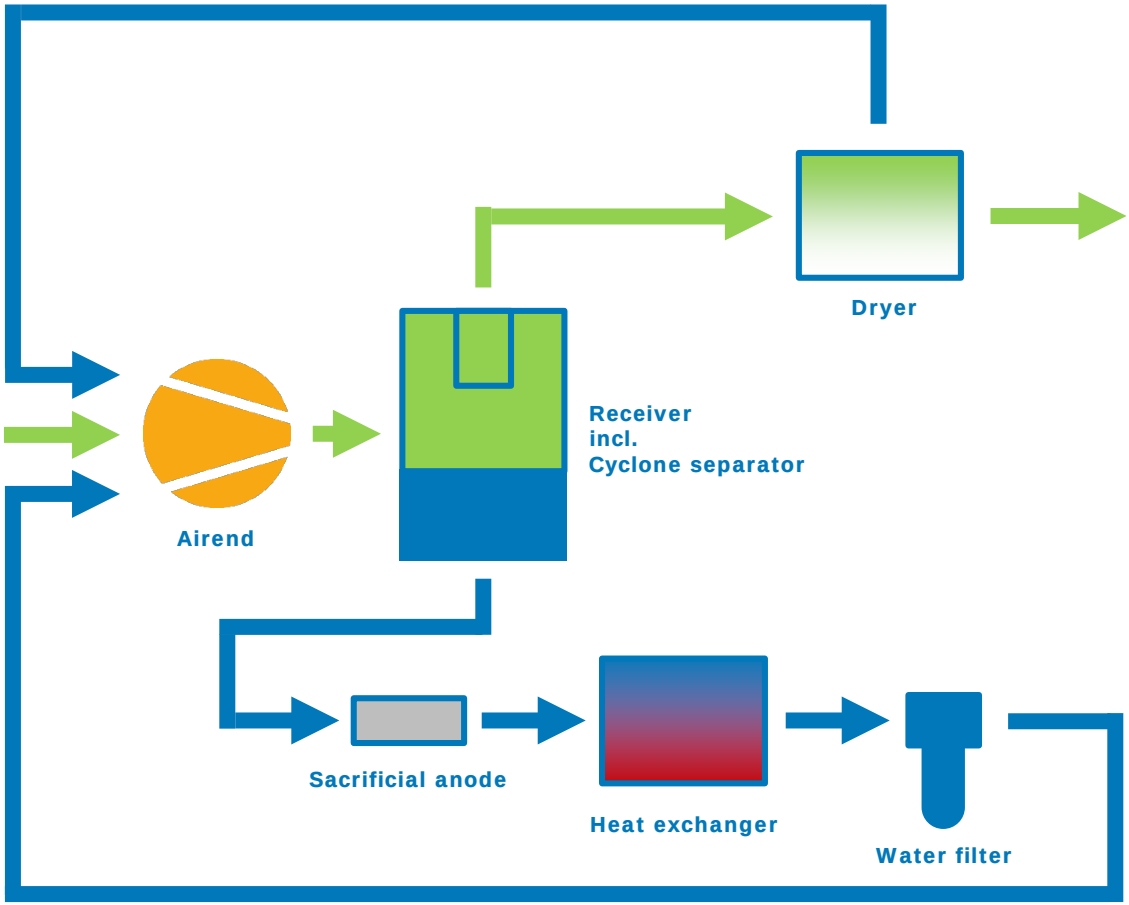


The LENTO Technology

How it works

Air circuit

1. Air is sucked into the compressor airend via the intake air filter and thereafter enters the stainless steel separation receiver as an air / water mix
2. The cyclone separator separates water and compressed air
3. The compressed air, 100 % saturated with water, passes into the integrated refrigerant dryer
4. The compressed air is dried in the integrated refrigerant dryer. The pure water that then accumulates is returned to the process.
5. The 100 % oil-free compressed air leaves the compressor dry and with a pressure dew point of ≥ 3°C and a delta T of 7-8°C

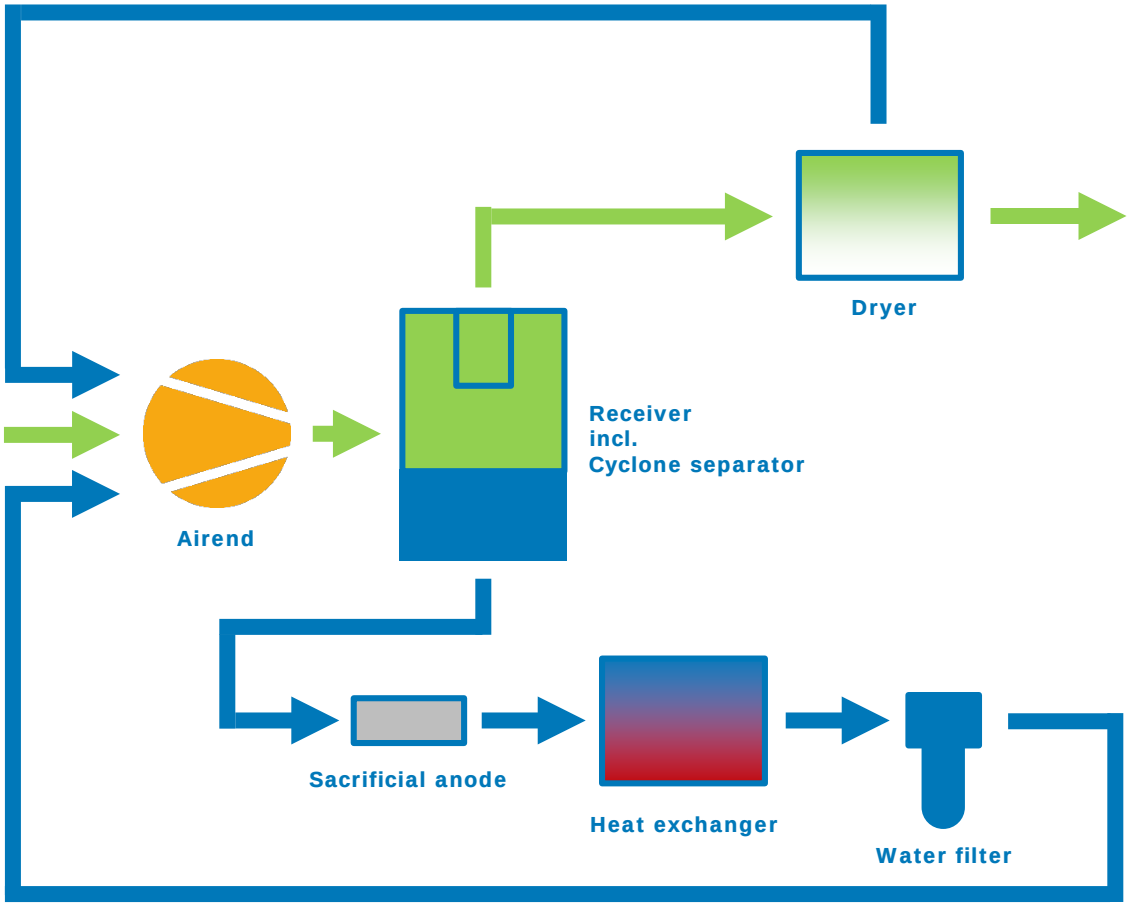


The LENTO Technology

How it works

The water circuit

1. Water is injected into the compressor airend and thereafter reaches the stainless steel separation receiver as an air / water mix
2. The cyclone separator separates water and compressed air (no build-up of pressure losses)
3. The separated water is supplied with minerals via a sacrificial anode
4. The water cools down in the heat exchanger
5. The water filter filters out suspended matter and the water re-enters the compressor airend by injection



TOP reasons

ALMiG
Compressor Systems

The integrated “water producer”

TOP 1

The integrated refrigerant dryer is an essential part of water treatment and serves primarily to produce fresh water

Positive side effect

- “Automatic” dry compressed air
- It is frequently possible to do without an external refrigerant dryer
- Saves the operator investment costs

Pressure dew points of ≥ 3°C at 100 % operation are given

- In the case of the speed-controlled LENTO plants the pressure dew point improves at < 100 % operation

The refrigerant dryer is controlled directly via the AirControl P

- All the important parameters can be read off via AirControl

The integrated “water producer”

TOP 1

When comparing spec. performance with other systems, the following must be taken into account:

- **Power consumption [kW] of the dryer**
- **Pressure loss Δ p [bars] of the dryer**

are already included in the LENTO performance data

Example

55 kW compressor “Stand alone dryer“
Power consumption = ~ 1.4 kW
Pressure loss = ~ 0.3 bars

1. **The 1.4 kW power consumption must be added on for other systems**
2. **1 bar pressure = 7 % higher power consumption**
   0.3 bar pressure = 2.1 % higher power consumption
   2.1 % of 55 kW = 1.2 kW

2.6 kW must be taken into account!
~ 4.5 % higher power consumption than is apparent at first glance

ALMiG Compressor Systems

Certified compressed air quality

TOP 2

Distinguished institutions confirm LENTO's high compressed air quality

TÜV Rheinland

No detectable oil in the compressed air purity class 0

Official Class 0 certification according DIN ISO 8573-1

Institute FRESENIUS

Germs and solid particles are significantly reduced owing to the process (washing machine effect)

Full report on oil content, particles and microbiology

Institute Dr. Appelt

Compressed air contains no copper

LENTO as a “washing machine”

TOP 3

FRESENIUS Institute test: Proven reduction of contamination

IN			OUT	
Oil	100%		Class 0	Oil
Particles	100%		~ 18%	Particles
Bacteria	100%		< measurement level	Bacteria*1

The compressed air is “washed clean” by the LENTO

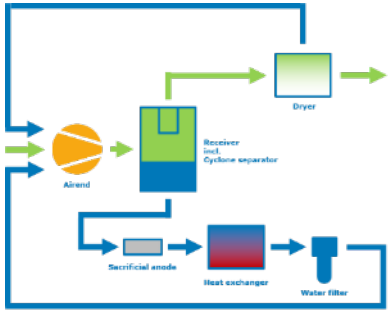
*1 Why is the compressed air free from bacteria / viruses / germs / fungi

- Owing to the constant replacement of the “cooling water” inside the LENTO
- The internal pressure kills off the “living cultures”
- The cooling water / condensate from the refrigerant dryer is “biologically dead” (similar to distilled water)

Water treatment “simple and efficient”

TOP 4

VS



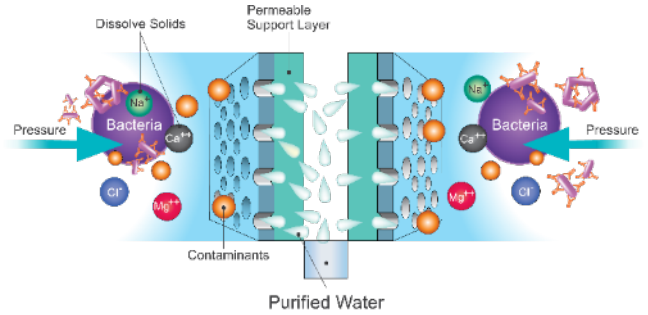
LENTO, simple and safe

It produces fresh water independently by means of the integrated refrigerant dryer, no matter where the unit is located
➔ **No external water supply needed**

Chalk-free supply of fresh water via the air humidity
➔ **System is always “clean”**

Minerals are constantly being fed into the fresh water by means of a sacrificial anode
➔ **The water does not attack any materials**

Water remains in the system only for a very short time, because fresh water is constantly being produced
➔ **No viruses, bacteria & algae**



Elaborate treatment “Osmosis“

A permanent supply of fresh water from the outside is required
➔ **Costs of laying pipes**

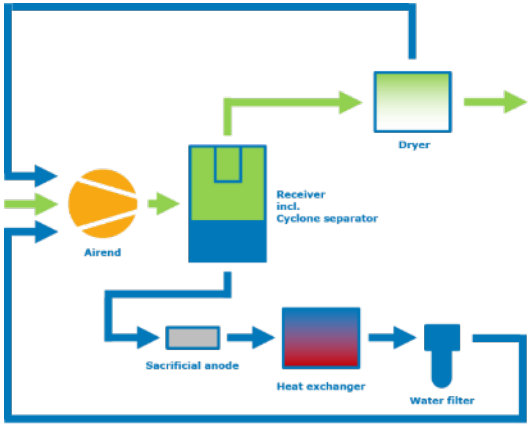
Dissolved chalk can enter the system via the fresh water
➔ **System can become congested**

Demineralised water makes material age
➔ **Poor operational reliability**

The water remains in the system for a long time because only the water consumed via the compressed air is replaced hence
➔ **Fast aging process**

Water treatment “simple and efficient”

TOP 4



Basis of calculation: $m_{water\ in} = \frac{f_{max\text{-}TU} \cdot \varphi_1 \cdot V_1 \cdot 60}{1000}$

Air temperature at intake [°C]
(Temperature at installation location)
30

Relative humidity of intake air φ_1 [%]
60

Compressor delivery volume V_1[m^3/min]
7,7

Final compression pressure P_2 [bar ü]
8 calculate

Quantity of water taken into the compressor
8,41 [l/h]

Example calculation for fresh water production

LENTO 55

Volumetric flow rate	7.7 m³/min (@ 8 bar)
Water volume when filled	72 L
Ambient temperature	30° C
Relative humidity	60 %

$$\frac{72\ L}{8{,}41\ L/h} = 8{,}5\ h$$

Water inside the LENTO is exchanged every 8.5 hours

- Short time in system because a great deal of freshwater is constantly being produced
- Level sensors built in to ensure that excess water is drained off
- The water can be discharged into the sewerage system without any treatment

Easy maintenance
TOP 5

Access to all components and maintenance items is easy via panels which are easy to remove

- **Less time required for maintenance**
- **Maintenance is cheaper**
- **LENTO downtimes are reduced**

Economic efficiency

TOP 6

Speed-controlled & direct drive

- **Low on maintenance and high on efficiency (η = 99.9%)**
- **Optimal adaptation of delivery volume to current compressed air requirements**
- **Energy savings up to ~ 25 %**

Condensate = pure water

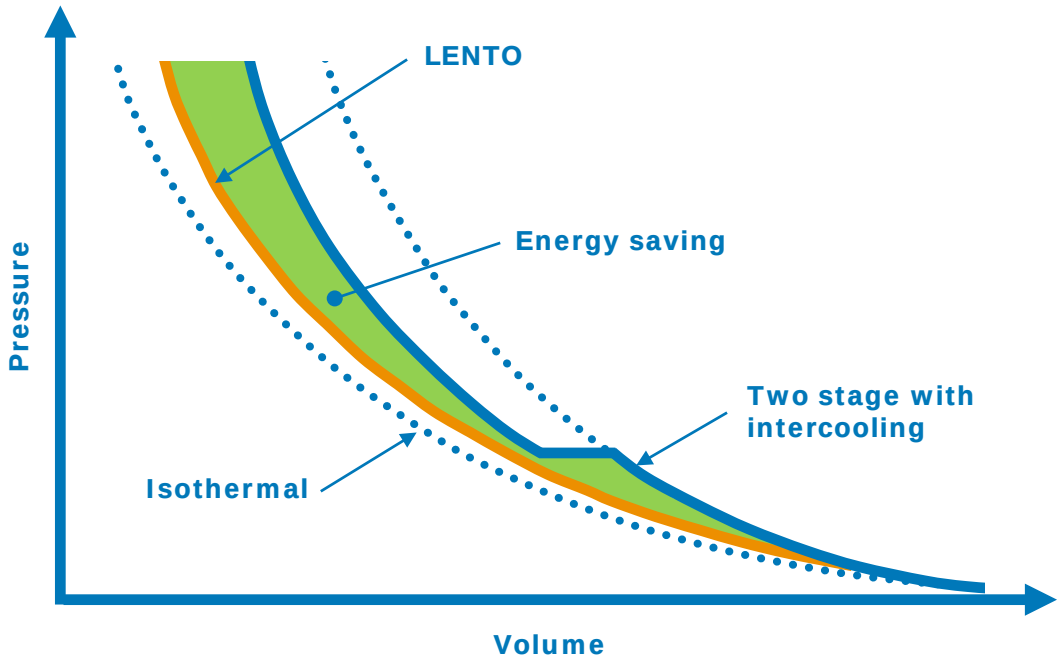
- **Absolutely clean condensate**
- **Can be discharged directly into the sewage system (without costly treatment)**
- **No consequential costs**

Economic efficiency

TOP 6

Isothermal compression

- Water possess a much better heat absorption capacity than other mediums
- Causes a very low temperature rise compared to other technologies
- Temperatures will not exceed 60°C
- Close to the isothermal compression
- Better compression efficiency
- Greater economic efficiency



Economic efficiency
TOP 6

Compared to oil-lubricated systems

- **No fine separator**
- **No filter battery necessary for producing oil-free compressed air**
    - **No pressure loss ➔ money saved**

Example:

55 kW / 3,000 operating hours / Δp = 1 bars / 0.10 €/kWh

1 bar pressure loss. = 7 – 8% more energy

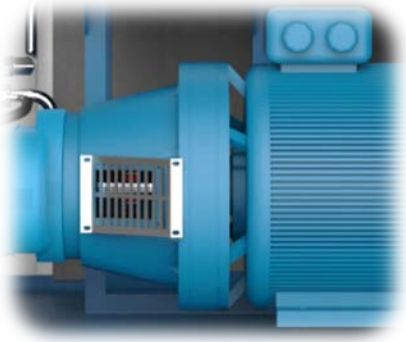
(7% of 55 kW) x 3000 hrs x 0.10 €/kWh = ~ 1150.- €

Operational reliability – Drive system

TOP 7

VS

Direct Drive



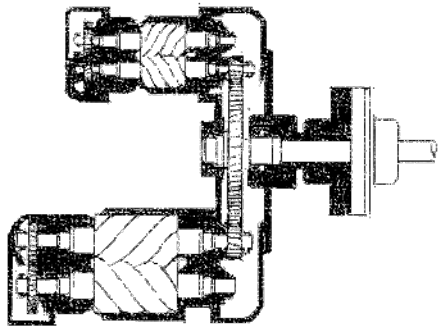
The simplest drive system available

- **Absolutely resilient**
- **No maintenance**
- **Highest possible efficiency (η ~ 99.9%)**

Low speeds (~ 1,000 – 5,000 rpm)

- **Little strain on the mechanical components**
- **No oil in the compressor (LENTO 15 – 55)**

Synchronous gear



With a highly complex gear

- **Expensive if worst comes to worst**
- **Requires much maintenance**
- **Transmission losses per gear (η ~ 98%)**

High speeds (>20,000 rpm)

- **Great strain on the mechanical components**
- **High quantities of oil for cooling bearings & gears are necessary (Example: ZR 55 = 30L oil)**

Operational reliability – Bearings

TOP 7

VS

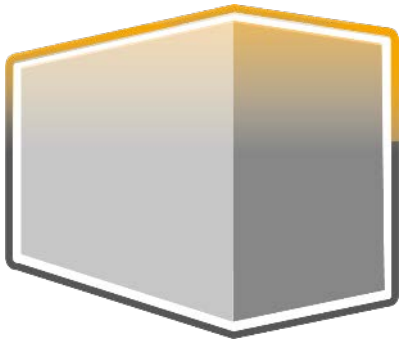
Roller bearings w. grease lubrication

- Tried and tested, absolutely bearing technology
- Grease with far better lubrication properties than water
- maximum operational reliability
- low maintenance requirements

Note:

LENTO 15 - 55 (grease-lubricated bearings)

LENTO 56 - 110 (oil lubricated bearings)



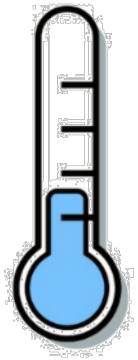
Water-lubricated sliding bearings

- If water supply fails immediate stoppage due to damaged bearings
- System significantly more complicated and susceptible than with standard bearings
- During longer stillstand periods, bearing can wear off

Operational reliability – Temperatures

TOP 7

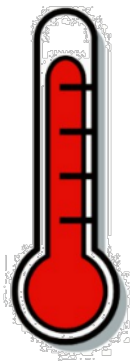
VS



Single stage water injection

As a cooling medium, water ensures the lowest final compression temperatures (Δt max. 20K above intake temperature)

- Close to the isotherm -> economic efficiency
- Single-stage compression is possible
- It is possible to forego an aftercooler
- Few components -> high operating reliability
- Can be installed even at worse ambient temperatures



2-stage “dry” compression

Since there is no cooling medium in the airend, the final compression temperature is very high (Δt at least 170K above intake temperature)

- High temperature – poor economic efficiency
- 2nd stage compression is necessary
- 3 coolers are required (1x oil, 2 x air)
- Significantly more components -> poor operational reliability / higher costs
- Can only be installed at worse ambient temperatures under certain circumstances

Operational reliability – Parts & Materials

TOP 7

Water level sensors

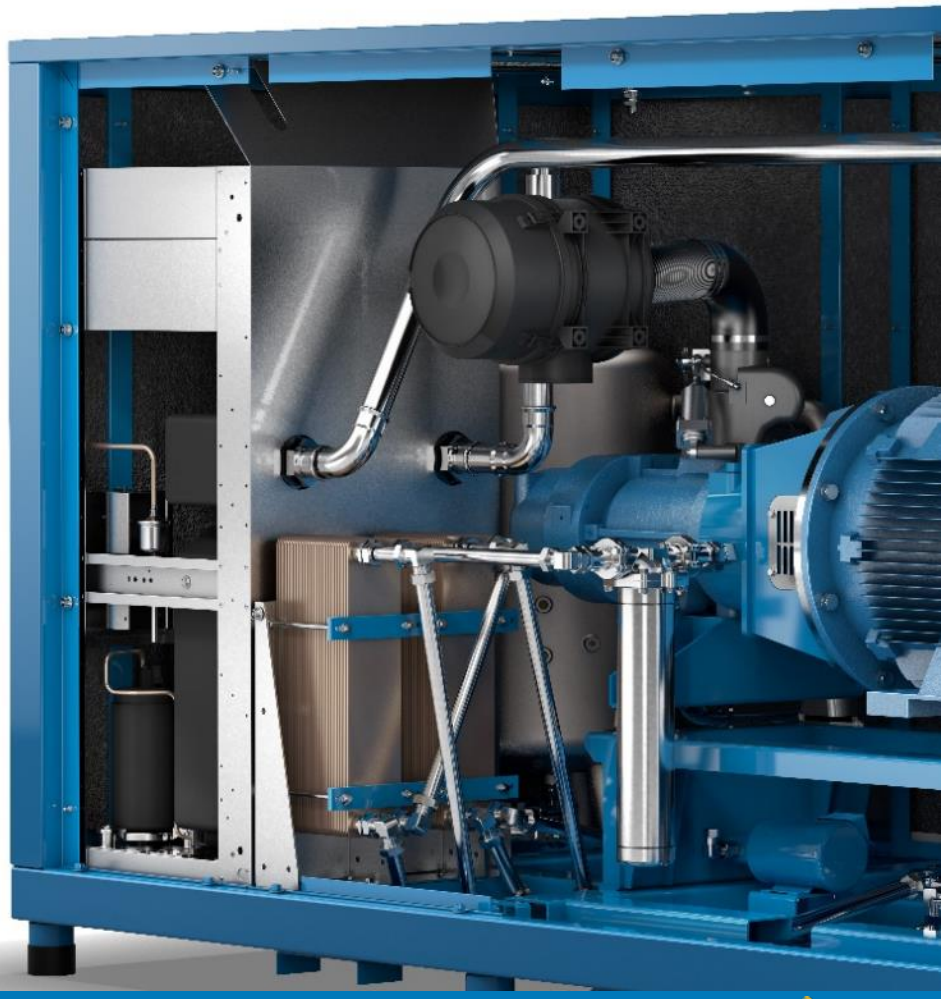
- Safe monitoring by means of 2 sensors (min. and max.)
- System is not able to „overrun“ or „run dry“

Stainless steel piping

- Entire compressor is equipped with stainless steel piping
- No hoses installed

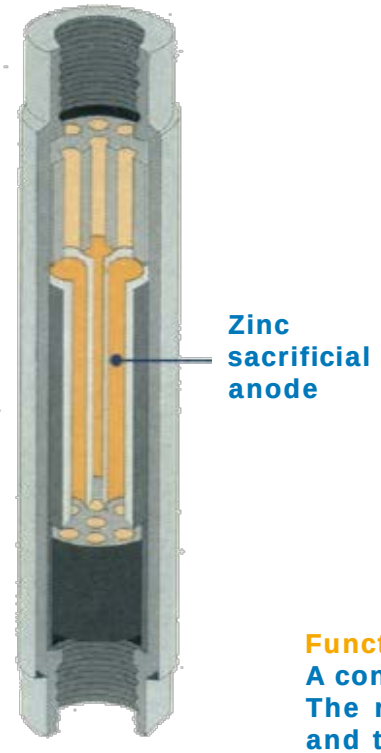
Stainless steel water filter

- Long lifetime



Operational reliability – Sacrificial anode

TOP 7



The sacrificial anode ensures that:

- The water is balanced in terms of minerals
- Spent minerals are returned to the water
- Water-conductive parts are not adversely affected
- Chalk is kept “suspended” and does not form deposits
- The system is absolutely low on maintenance
    - Replacement of the anode only every 10.000h

This clever system is used in many applications, for example as corrosion protection in shipbuilding.

Function:
A conductive connection is made between the metal to be protected and the sacrificial anode. The result is a primary element, in which the metal requiring protection functions cathode and the less precious metal as an anode. This causes a flow in the direction of the metal to be protected. Now the less precious sacrificial anode metal now emits its electrons into the oxygen, is oxidised and dissolves. In this local element the water is the electrolyte, which facilitates conveyance of the loaded particles and thus closes the circuit. Over time the sacrificial anode is spent and must be renewed.

Operational reliability – Pump & Control

TOP 7

The water pump ensures that…

- **… the internal water pressure has built up before the compressor starts up**
  - **All important components are supplied with water**
  - **The mechanical seals are moistened with water**
  - **Full operational reliability is provided**

AIR CONTROL P

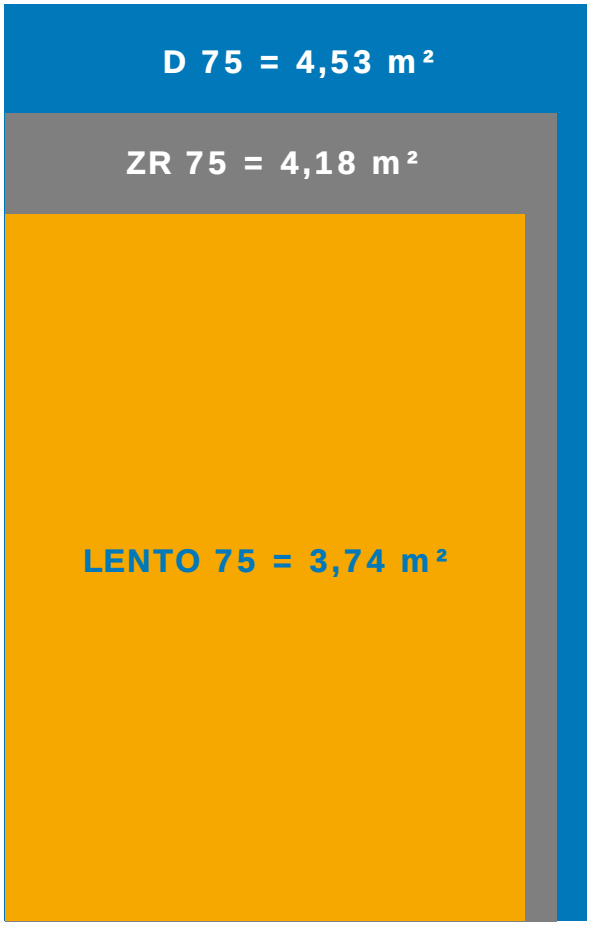
- **Pressure infinitely adjustable in 0.1-bar stages**
- **All important operating information can be read off the graphic display**
- **Touchscreen display**
- **Base load change possible for 1 master + 6 slaves**
- **The refrigerant dryer is also managed via the control system**

Operational reliability – Footprint

TOP 8

Small footprint

- **Thanks to the “simple” water treatment system it is possible to design the LENTO plants to be significantly smaller than other oil-free systems**
- **If space is a problem, the LENTO is exactly the right thing!**



Operational reliability – Quality standard

TOP 9

Warranty

ALMiG
Compressor Systems

Warranty
AirCare

Certified warranty, covered by ALMiG

ALMiG AirCare offers you a free of charge, 5 years warranty extension

- **The use of genuine ALMiG parts will protect your investment**
- **Authorised partners will deliver the best possible service**
- **Full warranty on:**
  - **ALMiG Compressors**

  +

  - **ALMiG Heat recovery modules**
  - **ALMiG Refrigerant dryers**
  - **ALMiG Adsorption dryers**
  - **ALMiG Oil / Water separators**
  - **ALMiG Condensate drains**
  - **ALMiG Filters**

Summary

The LENTO Series

Summary

- Water injected airend technology
- Class 0 certificated
- 100 % oil-free compressed air
- High efficient IE3 drive motor
- Variable speed drive technology
- Competitive specific performance
- Air cooling & water cooling
- Modern compressor controller
- Safe operation
- Low service costs
- Attractive warranty program

Thank you!

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