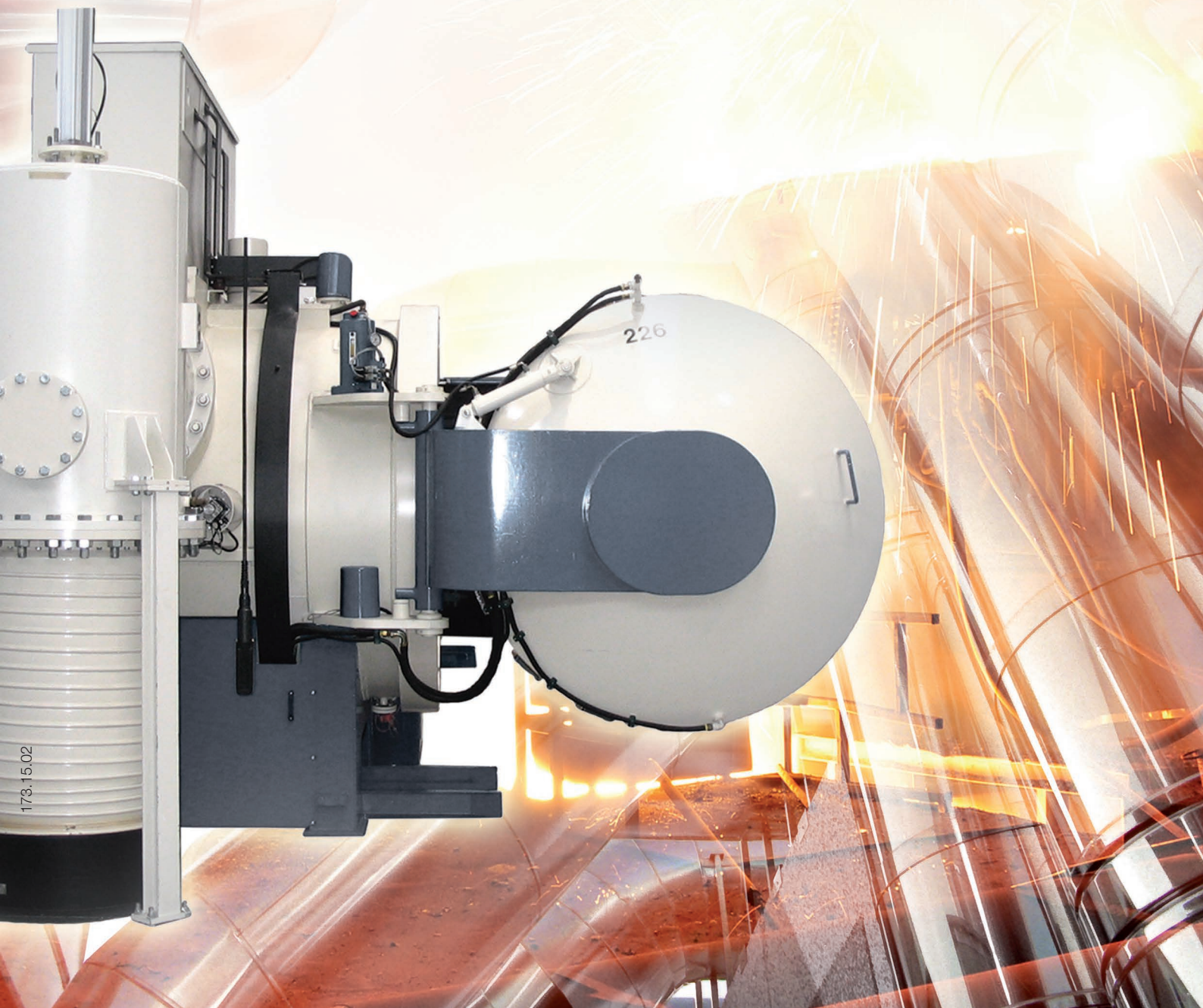
Leybold

Innovative Vacuum Solutions

for heat-treatment furnaces



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Heat-Treatment: Product / Application Matrix

STANDARD DUTY e.g. Tempering, Annealing, Hardening	DEMANDING DUTY e.g. Brazing, Soldering, Nitriding	SPECIAL DUTY e.g. Sintering, MIM, Carburizing
■ Clean furnace outgassing (Pumps need to handle mainly air and humidity) ■ No vapors or particles	■ Pumps need to handle aggressive or reactive outgassing as flux agents or ammonia ■ Vapors might condense inside pump	■ Outgassing contains excessive vapors or particles ■ Pumps need to handle condensing substances as binder or hydrocarbon vapors which could build deposits
Product / Application Fit ■ Full application capability ■ Cost effective maintenance and service demand ■ Optimal cost / performance ratio **PERFECT FIT**	**Product / Application Fit** ■ Application capability depends on process details ■ More frequent oil-exchanges ■ Potential corrosion risk **SUITABLE**	**Product / Application Fit** ■ Application capability strongly depends on process details ■ Very frequent oil exchanges ■ Risk of pump failures by deposits **LIMITED SUITABILITY**
Product / Application Fit ■ Full application capability ■ "Install and forget" solution with standard maintenance and service intervals, not influenced by application **SUITABLE**	**Product / Application Fit** ■ Full application capability ■ Optimal cost / performance ratio ■ "Install and forget" solution with standard maintenance and service intervals, not influenced by application **PERFECT FIT**	**Product / Application Fit** ■ Application specific solution required ■ Deposit removal by dynamic flushing ■ Pump wetting could avoid deposits ■ Standard service intervals **SUITABLE**
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Leybold offers a broad line of vacuum pumps and accessories, enabling the selection of optimum pump systems for all heat-treatment applications.

Vacuum solutions – optimized by experience

SOGEVAC

- Oil-sealed rotary vane pump
- Proven, industrial design
- Air or water cooled
- Best price / suction-speed ratio

DRYVAC

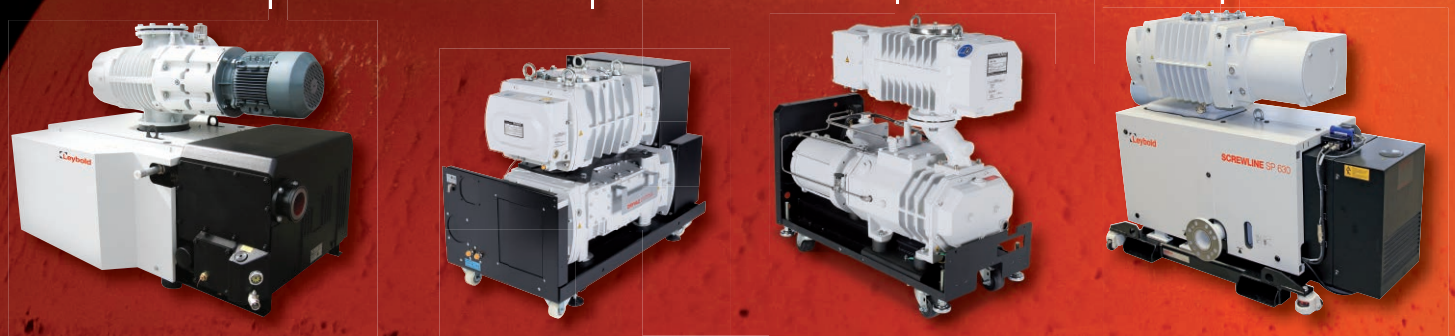
- Dry compressing, most innovative screw pump
- High vapor and particle tolerance
- Lowest power demand
- Fully water cooled, extreme compact design
- Built-in frequency converter enables maximum process control

LEYVAC

- Dry compressing screw pump
- High vapor and particle tolerance
- Fully water cooled and compact design
- For small to medium suction speed demand

SCREWLINE

- Dry compressing “heavy-duty” screw pump
- Cantilevered bearing design allows compression stage disassembly and cleaning
- Lowest operation temperatures ensure lowest tendency to build-up layers
- Air or water cooled



Innovative **Vacuum**

Oil-Sealed Vacuum Solutions
for standard duty

Systems based on SOGEVAC rotary vane pumps in combination with Roots blowers from the RUVAC WA, WS or WH families are the industrial standard for all moderately demanding processes.

- Typical processes:
  - Tempering
  - Annealing
  - Hardening
- Suited for processes with a low particle generation
- Products with moderate surface contamination
- Adaptation to more demanding applications is possible through smart accessories

RUVAC WAU 2001 / SOGEVAC SV 630 B adapter version

RUVAC WH 2500-FC / TwinFilter 500 / SOGEVAC SV 470 B adapter version

Application Example

- **Hardening and tempering of shafts and toothed wheels (gears)**

The application challenge is minor as the vacuum system must mainly handle the initial air and humidity content of the furnace plus small quantities of impurities which evaporate from the product surface.

Solution:

- **RUTA pump system with rotary vane vacuum pumps from the SOGEVAC line.**

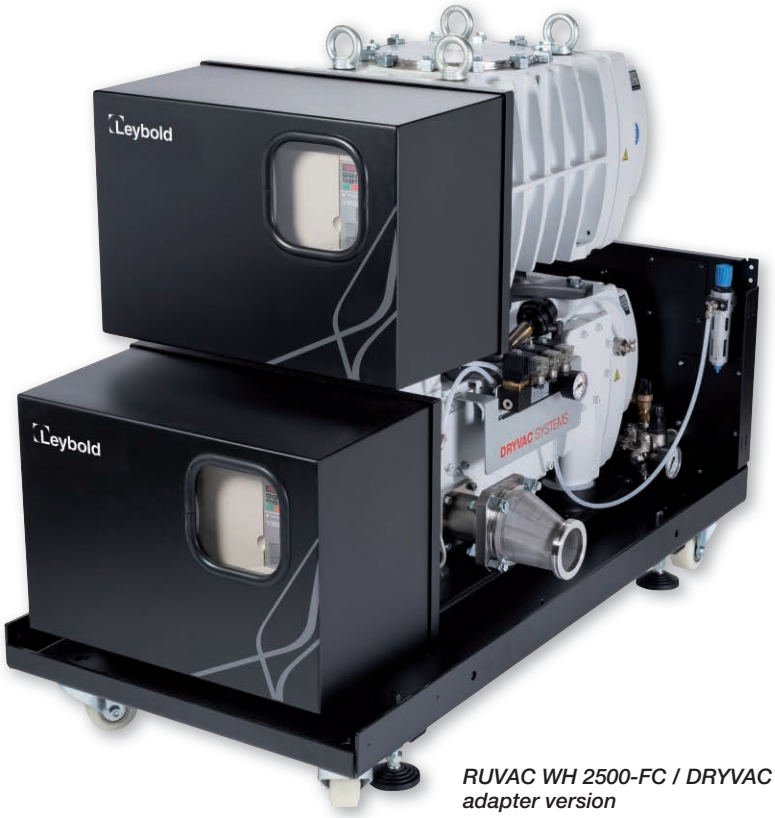
For this application the use of oil-sealed rotary vane pumps is economically the best choice since the pumps are not subjected to any major loads.

To enable usage also at applications with higher particle contamination the combination with dust-filters is useful.

Vacuum systems based on SOGEVAC rotary vane pumps deliver the best cost vs. performance ratio for the broad base of less demanding heat treatment applications

Solutions for each heat-treatment

Dry screw pumps offer best performance in applications which involve the handling of aggressive vapors.
They are also preferred if end users want to minimize their maintenance demands.



RUVAC WH 2500-FC / DRYVAC DV 650 adapter version

Dry Vacuum Solutions for demanding duty

Systems based on DRYVAC or LEYVAC dry screw pumps in combination with roots blowers from the RUVAC WA, WS or WH families are the optimal solution for more demanding heat-treatment processes.

- Typical processes:
  - Brazing
  - Soldering
  - Nitriding & Plasma-Nitriding
- Suited for processes which include the handling of aggressive vapors as NH_3 or acidic flux
- Products with high surface contamination
- Suited for users asking for minimized maintenance and service demand
- Build-up of process layers inside compression room can often be removed by flushing processes with suitable solvents (please contact our application support)

RUVAC WH 700 / LEYVAC LV 140 adapter version

Application Example

- **Brazing of automotive heat exchangers**

If the brazing process includes the usage of flux materials to etch the surfaces, then this acidic material evaporates and enters the vacuum system. Such vapor would attack the oil inside oil-sealed pumps and can cause a pump corrosion.

Solution:

- **RUTA pump system with dry screw pumps from the DRYVAC or LEYVAC line.**

For this application the use of dry screw pumps is the best choice as those pumps have no problem to handle the flux outgassing from the furnace. Thus will stay gaseous and will leave the pump at the exhaust without condensation and without causing any corrosion. The user will not be subject to short maintenance intervals, the standard annual oil-exchange of a dry screw pump is sufficient.

application

Moderate pump temperatures decelerate build-up of layers of caused by reactive hydrocarbon vapors. Dry screw pumps with cleanable compression stage enable a simple on site cleaning by the end user himself, thereby ensuring highest furnace uptime, even for dirty applications.

Dry Vacuum Solutions for special duty

RUVAC WAU 2001 / SCREWLINE SP 630 adapter version

Systems based on SCREWLINE dry screw pumps in combination with roots blowers from the RUVAC WA, WS or WH families are the “heavy duty” solution even for the most demanding heat-treatment processes.

- Typical processes:
  - Sintering
  - Carburizing
  - Nitro-Carburizing
- Suited for processes which include the handling of cracked hydrocarbon vapors which tend to build layers inside the compression room
- Moderate pump temperatures decelerate build-up of layers
- Products with high surface contamination
- Compression stage can be cleaned manually by end user
- Build-up of process layers inside the compression stage can often be removed by flushing processes with suitable solvents or by a regular manual cleaning (please contact our application support)

RUVAC WAU 2001 / SCREWLINE SP 630 frame mounted version

Application Example

- **Sintering of cemented carbide cutting tools**

During dewaxing cracked polymer binder vapors (mostly PEG - Polyethylenglycole) enter the pump and partly condense inside the pumps’ compression stage. Oil-sealed pumps operate unreliable and do require very frequent maintenance and service. Over time dry pumps will build up layers inside the compression stage and will require a cleaning step.

Solution:

- **RUTA pump system with dry screw pumps from the SCREWLINE line.**

As the SCREWLINE has moderately low temperatures inside the compression stage the entering cracked polymer vapors show only a slow reaction rate towards longer chains which build up layers on rotor and stator.

The required cleaning intervals are extended to a maximum. Removal of Polyethylenglycole caused layers can be done by a dynamic water flushing. If polymers such as Polypropylene or Polystyrole are used other cleaning agents can be used to improve efficiency. On a regular basis, the user can also execute a manual cleaning to ensure that the complete compression stage of the SCREWLINE is free from process build-up.

Paraffin binders evaporate without thermal decomposition. If their vapors enter the SCREWLINE, the internal temperatures of the pump are just in the right window to avoid build-up of layers by cracking and to keep the condensate in liquid phase. Paraffin binder vapors can be handled without any enhanced maintenance demand.

The innovative power efficiency control unit for diffusion and oil vapor jet pumps ensures minimized power consumption perfectly adapted to the current heating demand.

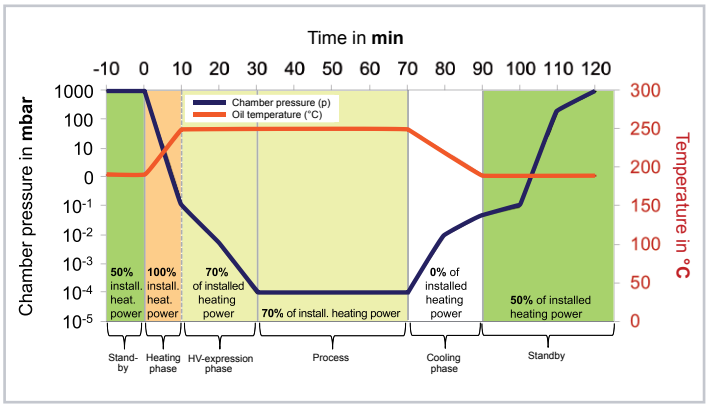
DIP 20000 + DIP 50000

DIJ 20

Diffusion Pumps
for heat treatment with Smart Power Management

DIP and DIJ oil diffusion pumps are high vacuum pumps without wearing and moving components.
The pumping effect of these pumps is created through the diffusion of the gases which are to be pumped into the oil vapor stream.
Compared to other high vacuum pumps the pumping speed with regard to the inlet flange diameter is very high.

Leybold can offer a model range between 3,000 l/s to 50,000 l/s for operating pressures between 10^{-2} mbar and 10^{-7} mbar.

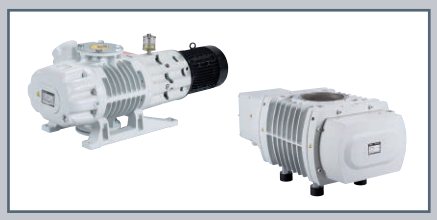


Minimized energy consumption over the complete furnace process cycle by usage of smart power management.

Full line vacuum solutions for heat-treatment furnaces

Roots-vacuum boosters

Complete range of industrial roots-pumps: RUVAC WAU / WSU as economical standard; RUVAC WH as most innovative, compact and robust alternative. Reach highest process control and increasd suction speed by use of our matched frequency converters.



Vacuum and pressure gauges

Reliable monitoring and control for all vacuum processes.

Helium leak detectors

Designed for the requirements of industrial series production. Well-proven and easy to use in production and quality control programs.

Turbomolecular pumps

Hydrocarbon-free high-vacuum generation by a wide range of innovative and flexible products. TURBOVAC line with mechanical rotor suspension, TURBOVAC MAG line with magnetic rotor suspension and the TUBOVAC i(X) series with hybrid rotor suspension.

Refrigerator cryo pumps

Hydrocarbon-free high-vacuum generation with highest water-vapor pumping capability, long maintenance intervals, installation in any orientation.

Industrial vacuum valves

A wide selection of reliable vacuum valves of all sizes and with various drive types. Proven robustness for industrial furnaces.
KF valves from DN16 to DN50
ISO-K valves from DN 63 to DN 500
ISO-F valves from DN 630 to DN 1000

Market experience

We are the leading supplier of vacuum products for heat treatment furnaces. Since more than 165 years customers all over the world have relied on our experience and expertise.
We are your best partner!

Reliability

All products must pass an extended qualification program with strict toll gates before they are released into the market. For all serial products we have a continuous improvement program in place.

Sales and Service

- Worldwide service network - we are where you need us
- On-site support by our field service team
- 24 hours / 7 days a week
- Exchange program with back-up pool management
- Customized service contracts
- Remote service
- Extended warranty program

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CH06 / 1040.0 DE AEOF 100879

BICOM 13467.13810.02 173.15.02 1.2.10.16 mzs Printed in Germany on chlorine-free bleached paper