



# **Innovative Vacuum Solutions** for heat-treatment furnaces



# Vacuum solutions – optimized by experience

## Forevacuum Pumps:

### **SOGEVAC B / BR**

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

### **DRYVAC DV**

- Dry compressing screw pump
- High vapor and particle tolerance
- Lowest power demand
- Fully water cooled, extreme compact design
- Build-in frequency converter
- For medium to big pumping speed

### **LEYVAC LV**

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

### **VARODRY VD**

- Dry compressing screw pump
- High vapor and particle tolerance
- Lowest power demand
- Fully air cooled and compact design
- For small to medium pumping speed

### **SCREWLINE SP**

- "Heavy-duty" screw pump
- Cantilevered design allows housing disassembly and pump cleaning
- Lowest operation temperatures ensure low layer build-up tendency
- Air or water cooled



# Heat-Treatment: Product / Application Matrix

<b>STANDARD DUTY</b> e.g. Tempering, Annealing, Hardening ■ Clean furnace outgassing (only air and humidity) ■ No vapors or particles	<b>DEMANDING DUTY</b> e.g. Brazing, Soldering, Nitriding ■ Outgassing contains aggressive vapors as flux agents or ammonia ■ Condensable vapors	<b>SPECIAL DUTY</b> e.g. Sintering, MIM, Carburizing ■ Outgassing contains excessive vapors or particles ■ Condensable vapors as binder or hydrocarbons
<b>Product / Application Fit</b>	<b>Product / Application Fit</b>	<b>Product / Application Fit</b>
<ul style="list-style-type: none"> <li>■ Full application capability</li> <li>■ Cost effective maintenance and service demand</li> <li>■ Optimal cost / performance ratio</li> </ul>	<ul style="list-style-type: none"> <li>■ Application capability depends on process details</li> <li>■ More frequent oil-exchanges</li> <li>■ Potential corrosion risk</li> </ul>	<ul style="list-style-type: none"> <li>■ Application capability depends on process</li> <li>■ Very frequent oil exchanges</li> <li>■ Risk of pump failures by deposits</li> <li>■ SV-BR-version as alternative for carburizing</li> </ul>
<b>PERFECT FIT</b>	<b>SUITABLE</b>	<b>LIMITED SUITABILITY</b>
<ul style="list-style-type: none"> <li>■ Full application capability</li> <li>■ "Install and forget" solution with application independent standard maintenance and service intervals</li> </ul>	<ul style="list-style-type: none"> <li>■ Full application capability</li> <li>■ Optimal cost / performance ratio</li> <li>■ "Install and forget" solution with application independent standard maintenance and service intervals</li> </ul>	<ul style="list-style-type: none"> <li>■ Application specific system design required</li> <li>■ Deposit removal by dynamic flushing</li> <li>■ Pump wetting could avoid deposits</li> <li>■ Maintenance intervals depending on process</li> </ul>
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<b>SUITABLE</b>	<b>SUITABLE</b>	<b>PERFECT FIT</b>

Leybold offers a broad line of vacuum pumps and accessories, enabling the selection of optimum pump systems for all heat-treatment applications.

# Oil-Sealed Vacuum Solutions

for standard duty

## Innovative Vacuum Solutions for each heat-treatment application

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

### 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”



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

# Dry Vacuum Solutions

for demanding duty

“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

Systems based on DRYVAC, VARODRY 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  $\text{NH}_3$  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 the pump with suitable solvents (please contact our application support)



RUVAC WSU 501 / VARODRY VD 100  
frame mounted 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, VARODRY 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.

# Dry Vacuum Solutions

## for special duty

“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.”

Systems based on SCREWLINE SP 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 the pump with suitable solvents or by a regular manual cleaning (please contact our application support)



RUVAC WAU 2001 / SCREWLINE SP 630  
adapter version

### Application Example

#### ■ Sintering of cemented carbide cutting tools

During dewaxing cracked polymer binder vapors (mostly PEG - Polyethylen glycole) 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 SP line.

As the SCREWLINE SP 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 sta-

tor. The required cleaning intervals are extended to a maximum. Removal of Polyethylen glycole 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 SP is free from process build-up.

Paraffin binders evaporate without thermal decomposition. If their vapors enter the SCREWLINE SP, 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.



RUVAC WAU 2001 / SCREWLINE SP 630  
frame mounted version

# Diffusion Pumps

## for heat treatment with Smart Power Management

“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 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  $10^{-1}$  mbar and  $10^{-7}$  mbar.

- Stable high vacuum
- High forevacuum tolerance
- High pumping speed
- Safe and economical
- CE compliant electronics supplied
- No wear caused by revolving parts
- Simple to operate
- Maintenance friendly design for rapid and simple replacement of the heating elements
- Ample accessories available
- Flexible electrical wiring for world-wide deployment
- Innovative efficiency control

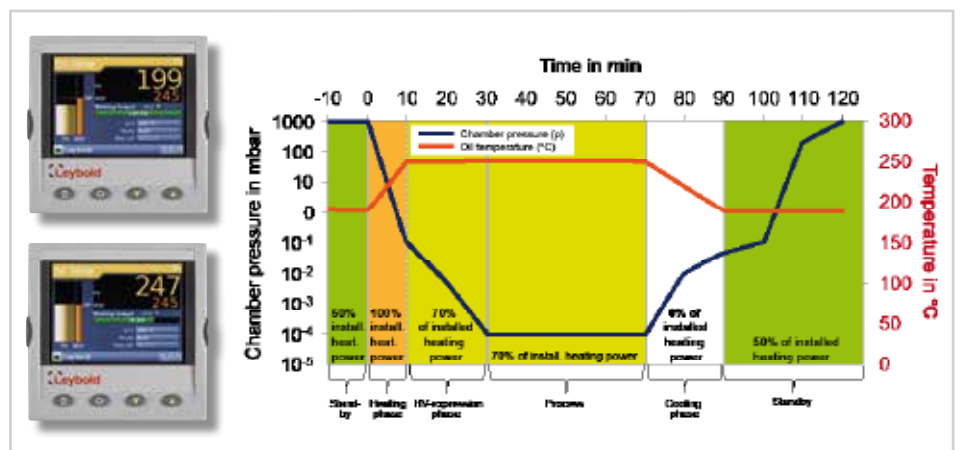


DIP 20 000 with thermal insulation

DIJ 35



Diffusion pump cold cap baffle

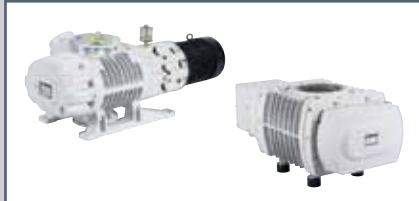


Minimized energy consumption over the complete furnace process cycle with smart power management

# 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 increased suction speed by use of our matched frequency converters.



## Vacuum and pressure gauges

Reliable monitoring and control for all vacuum processes. Robust vacuum sensors designed for demanding industrial environments.



## Helium leak detectors

Designed for the requirements of industrial series production. Well-proven and easy to use in production and quality control programs. Proven industrial design with rugged components. Fast operation: Quick run-up and ready to start within seconds.



## 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 TURBOVAC i(X) series with hybrid rotor suspension.



## 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 1850 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



**Pioneering products. Passionately applied.**