



THERMAL SYSTEMS

# Innovative drying technology for **electronics** production



RDS  
Drying | Hardening

[www.rehm-group.com](http://www.rehm-group.com)

# Drying | Hardening

Versatile product portfolio  
for optimum drying processes



## Reliable drying performance forms the basis for excellent results

**A storm destroys up to 80% of hatching dragonflies. They fall into the water, their wings snap or the rain prevents them from hardening properly. Dragonflies can often be seen with mutilated wings, which is caused by a hatching error. It is only once the dragonfly has survived its first flight that it has a good chance of living to see the next four to eight weeks.**

This simple example from nature demonstrates the importance of an optimum drying process. Depending on the chemicals used in their materials, electronic products have different requirements as regards reliable hardening during manufacture. The RDS drying systems from Rehm are configured individually according to the customer's requirements. Numerous basic principles of physics are taken advantage of and implemented, in order to make the drying process as efficient as possible. We always accept the challenge of implementing innovative technologies in the form of systems which are ready for series production and is always happy to develop the best possible technological parameters together with the customer during the conceptualization phase.

# Flexible, safe and efficient

## Mature technology and expertise

**The RDS drying systems are used predominantly for drying and hardening lacquers, adhesives and casting compounds. Not only do they operate reliably and efficiently, they also offer individual solutions for specific fields of industry.**

From sensitive applications in semiconductors through to a complete conformal coating line with built-in dispenser for the precise application and drying of coating lacquers – we're happy

to advise you on the individual possibilities and system configurations we can implement for your special requirements. The RDS drying systems are flexible and offer sufficient scope to execute applications from the most diverse of application fields. Our mature technology covers the processing of all common adhesives and lacquers, electropastes, casting compounds, casting resins and underfill materials.



- › Heat transfer via convection and IR radiation
- › Flexible transport systems
- › Optimum profiling
- › Exceptional energy efficiency
- › Simple operation and process traceability
- › Minimal maintenance

**Can be  
perfectly  
integrated  
into the  
line!**

# The perfect system for every application

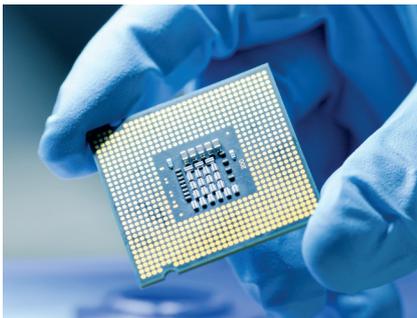
## Endless opportunities with the RDS

**Protective lacquer coatings increase the reliability and service life of your products. They enhance the tracking resistance of your components and provide protection against environmental influences such as moisture, corrosion, chemicals and dust. Casting compounds reduce mechanical stress, for example vibrations on the component.**

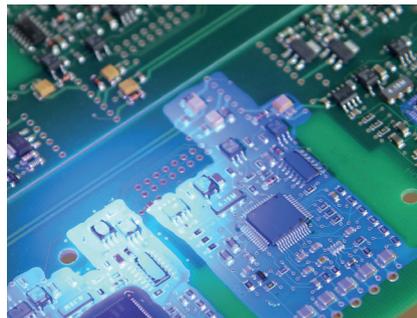
These materials need to be hardened reliably so that they can later work without any problems in end devices in the

automotive industry, medical technology or security-related modules in aerospace technology. The lacquer determines the process! Depending on the coating material, convection (i.e. moving warm air) is used in the drying process, or infrared radiation as an addition in the combination heating process for particularly flexible profiling. In the process, temperatures up to a maximum of 250 °C are used for optimum hardening of the components, depending on the product and process requirements.

### Industrial fields



Hardening and drying technologies for cleanroom requirements in the semiconductor industry



Hardening of adhesives, lacquers, casting resins, casting compounds, silicone gel etc.

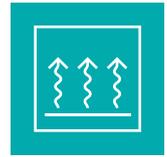


Drying process for protective lacquer coating

### RDS areas of application

**Glass** | Glob top applications | **Hardening of electropastes** | Chip-scale packaging | **Hardening of protective lacquers** | Burn-in of resistor pastes | **Hardening of casting compounds** | Hardening of adhesive lacquers and adhesives | **Hardening of green tape/ceramic blanks** | Hardening of component encapsulations | **Flip-chip processes** | Drying processes in hybrid metallisation | **Cleanroom requirements** | Hardening processes in hybrid production | **Hardening of resistor pastes in thick-film technology** | Hardening of underfill materials | **Hardening of casting resins** | Cavity fill for BGA housing

# Innovative procedures adjusted to material and product



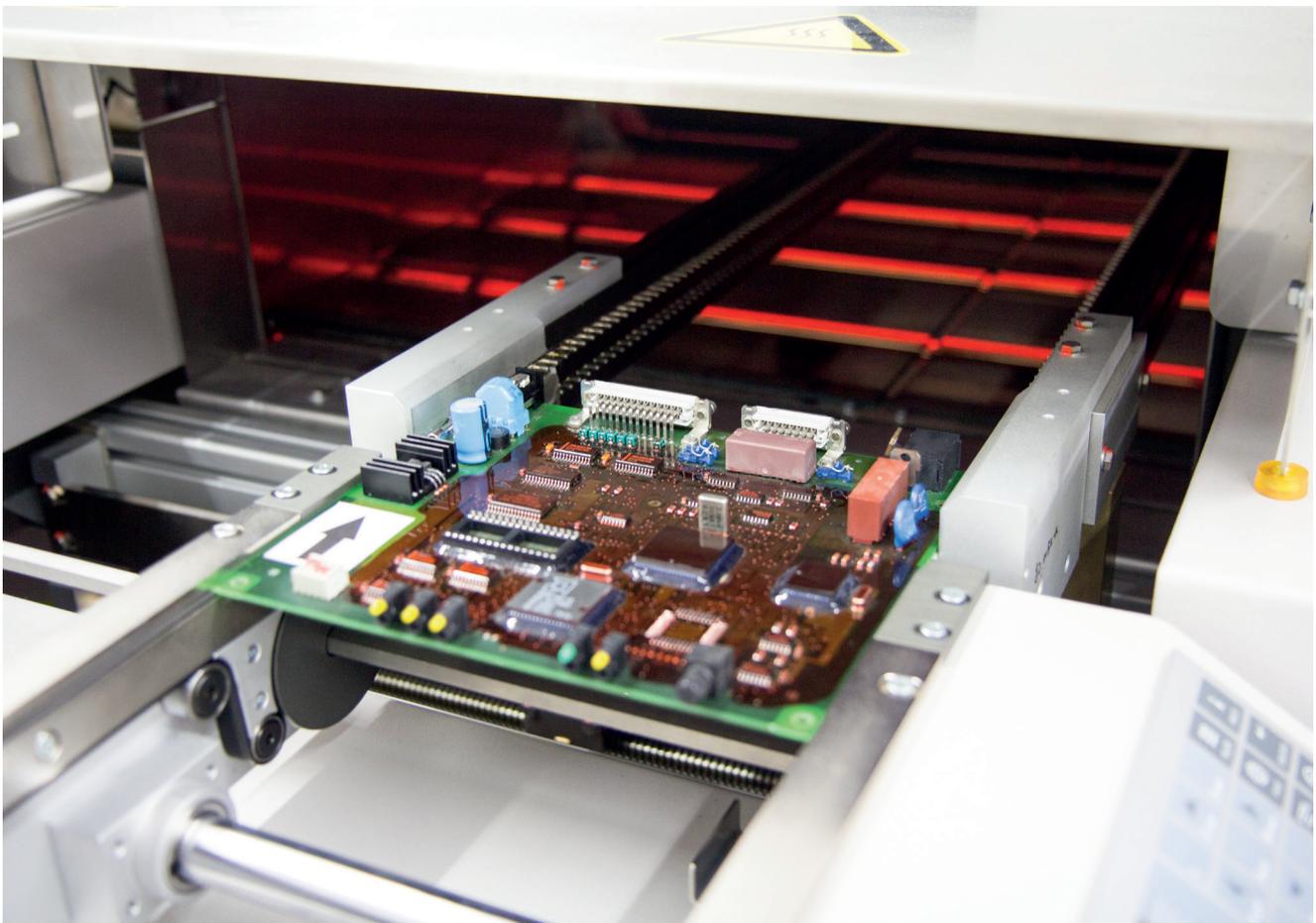
A slow heating of the assembly is essential, particularly when it comes to protective coatings that contain volatile solvents, because an excessively high temperature gradient during the heating phase can cause the top layer of the coating to harden too quickly and the underlying solvent

will no longer be able to escape. For this reason, the drying systems from Rehm Thermal Systems feature two short zones at the inlet area which are regulated separately in order to provide the optimum temperature gradient for the corresponding paint.

## Lacquer and casting hardening

To achieve the best drying results, it is important to precisely coordinate the process and material. We differentiate between physically hardening lacquers, which harden very quickly purely with the release of solvents, oxidative-hardening lacquers, which dry with atmospheric oxygen, chemically hardening lacquers, often 2K materials and radiation-hardening

lacquers which harden with UV radiation, for example. A separate UV dryer is required for the latter. The RDS systems are perfect for hardening polyurethane resin, acrylic resin, epoxy resins, acrylate resins and silicone-based casting compounds.





## Optimum heat management with IR radiation and convection

**Thanks to our many years of experience, we know precisely which actuators are needed to set up a system that can be adapted simply and individually to the various process requirements and product landscapes of our customers.**

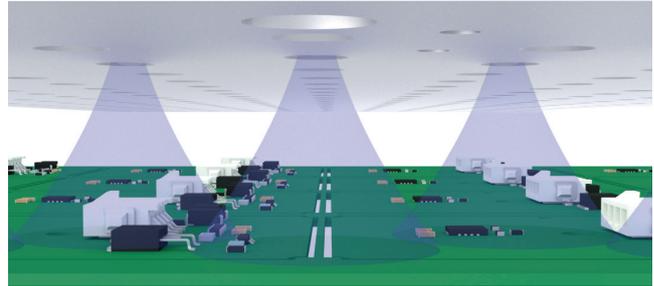
The RDS systems are modularly structured. The efficient upper and lower heaters work with infrared radiation (IR) and/or convection to dry the various materials reliably. By implementing these two heat transfer processes, the systems are optimally designed for the processing of lacquers and castings containing solvents. The RDS drying oven thus consists of several separately adjustable heating zones. In the warming-up phase, the component and the protective lacquer are heated

up. Both the upper and lower IR radiators can be controlled with different set-point temperatures. Thus in the inlet area of the dryer, an increased amount of IR radiation and a reduced convective heat transfer is applied to the component. This means that lacquers in particular are heated up evenly and, thanks to the low convection, are not dispersed onto the component.

In the drying phase, the temperature is maintained until the material has hardened completely. A stronger convection is needed for this, as the evaporating solvents need to be discharged. In the subsequent cooling phase, the components are cooled down gently.

## Convective drying

When drying using the convection process, the process atmosphere is heated up using a hot-air fan and then flows onto the components. The heating elements are attached above and below the transport system. The flow speeds of the upper and lower heating zones are individually adjustable so that the component is heated through evenly. This prevents tension in the material.

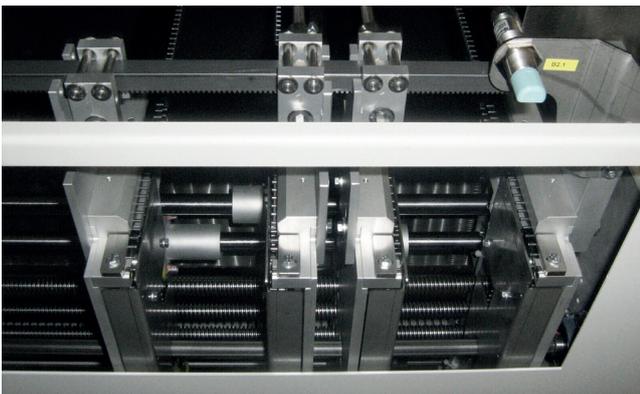


## Combination heating process with IR



In the combination heating process, the heat transfer is carried out with infrared radiation, which is supported by central convection heating. All heating chambers are equipped with high-performance IR radiators. The IR radiation penetrates the circuit board and drives out the solvents from the interior. This enables a faster and more efficient drying process. For the additional convection, the volume flow can be pre-set. The heating base of all IR radiators can also be equipped with glass covers to protect against contamination and for easier cleaning.

## Transport



Transport system

The RDS drying systems can be designed as single lane or dual lane transport, with a pin chain conveyor and variable width adjustment or as heavy load transport for goods carriers based on the customer's requirements. The optional underfloor return transport that can be integrated offers a space-saving solution for circuit board/goods carrier return. The following transport variants are available:

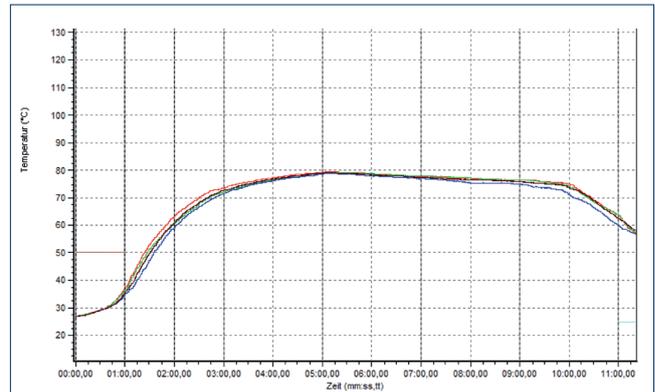
- › **Single lane transport: 80 – 460 mm**
- › **Dual lane transport: 2 x 90 – 250 mm**
- › **Heavy load transport: based on customer requirements**

- › **First-class heating performance and top heat management**
- › **Upper and underside heating using convection and/or IR heating elements**
- › **Variable heating chamber length and optimum process adjustment**
- › **Flexible transport systems based on customer request**

# Process stability thanks to clever features

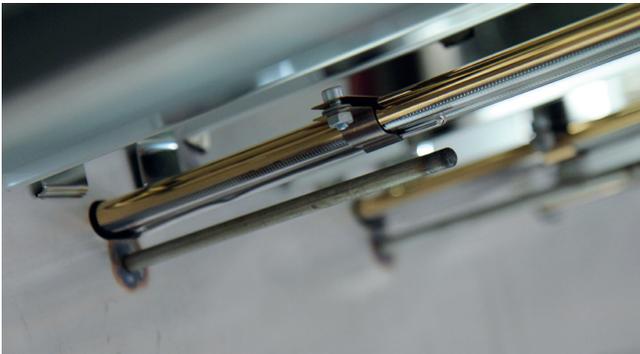
## Optimum profiling capability

The exceptional thermal insulation of heating zones and the individually adjustable temperatures allow for optimum profiling of your drying processes – which are perfectly adapted to the requirements of the products.



Temperature curve

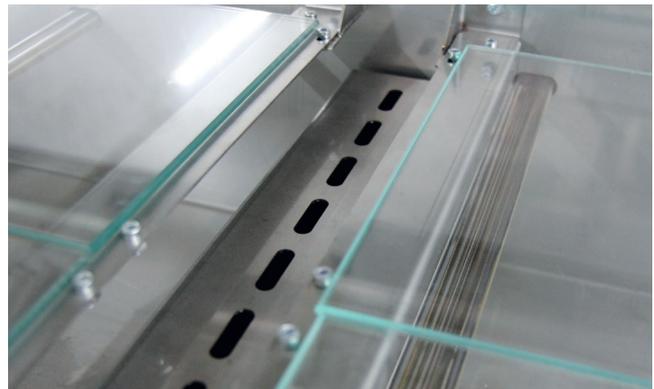
## Internal temperature monitoring



For optimum hardening of the components, the RDS dryers feature internal temperature monitoring. Thermal elements have been installed in every heating zone, which precisely measure the temperature in the system. The values are displayed on the monitor. As soon as the tolerance values are exceeded, an acoustic alarm signals and the heating is switched off.

## Exhaust system and integrated extraction

The exhaust system ensures safe removal of solvents among other things. Appropriate mechanisms are attached to the input and output of the process chamber, as well as between the heating zones. The process exhaust air is supplied directly to the extraction through the fan. The substances to be hardened and the exhaust products released determine the extraction volume. The extraction function is monitored by a pressure sensor. If there is a problem, the heating switches off automatically and the inflow of new components is stopped. This prevents any flammable gas mixtures from forming in the system.





## Gentle cooling to below 60 °C

**After the drying process, the warm process atmosphere is extracted. Despite this, the component still has an outlet temperature of around 60 °C. A separate air or water-cooled cooling unit is available as an option, and can be used to achieve significantly lower temperatures.**

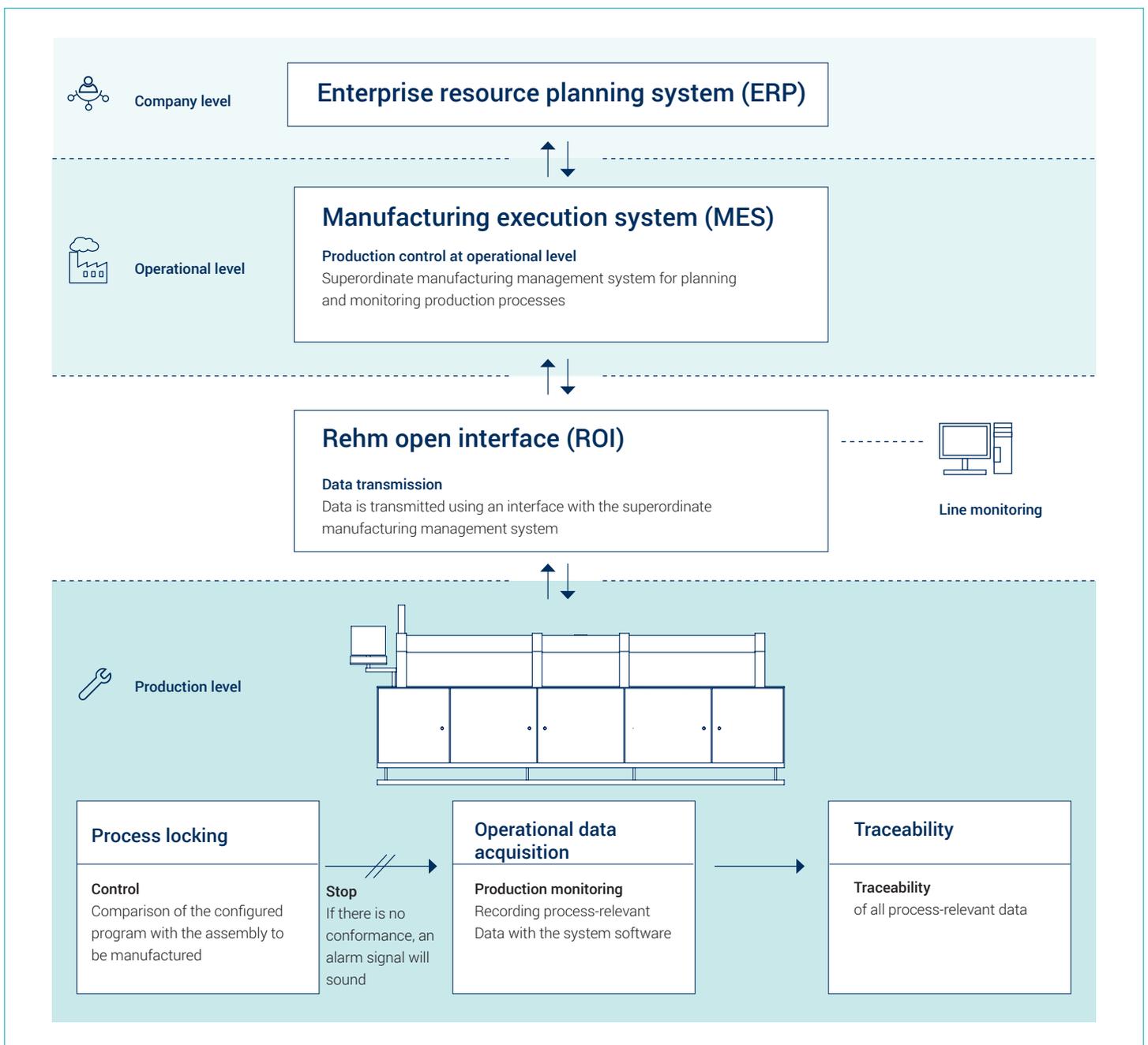
In the air-cooled cooling line, the hot process exhaust air is extracted via the attached exhaust hoses. As well as this, cold ambient air is aspirated and blown in via the panel of nozzles to cool the components. With the water-cooled cooling option, the cooling process is carried out via heat exchangers. There is the option of controlling the cooling process precisely with separately adjustable fans in the individual zones and influencing the cooling gradient accordingly.

- › **Implementation of optimum outlet temperatures**
- › **Optional air or water-cooled cooling unit**
- › **Temperatures can be set individually**
- › **System also available without cooling line**

## Process documentation, traceability, etc.

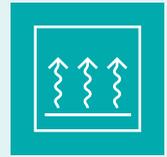
The variety of MES systems on the market requires individual adjustment of data transfer from the Rehm drying system to the client's superordinate manufacturing management system (MES). Superordinate to this is the ERP system, which the whole company keeps an eye on, and which allows for logistic optimisations across all sites. However, the MES system focuses on a company's individual production lines. Rehm uses an ROI interface (Rehm open interface) to transfer individual data. Machine-specific operational data that is due for the respective system is collected and passed on to the MES system as a bundle.

It is possible to ensure the seamless traceability of products, components or batches in this way. A data set is created for every assembly, which documents the relevant process parameter during the run. The assembly can be clearly identified and assigned via a barcode scan on the assembly itself, or by scanning the batch card. Process locking is also available as an option. Here, the scan is compared with the database and the assembly is only forwarded on to the system in the event of approval. Defects can be detected and prevented in this way and therefore lead to process improvements.



# Data and facts

## Detailed information RDS lacquer dryer



### Dimensions

Length:	2400 – 6600 mm depending on the system design
Width:	1400 mm
Height:	1400 mm

### Transport

Transport height:	950 mm ± 50 mm
Transport width:	80 – 460 mm
Speed:	30 – 3000 mm/min.
Clearance above/underneath:	100 mm

### Optionen

Air or water-cooled cooling unit*
Integrated extraction
Internal temperature monitoring
Throughput monitoring
Uninterruptible power supply
SMEMA and MES interface, Windows-based PC, traceability tools

### Exhaust air

Exhaust air volume:	up to max. 2000 m <sup>3</sup> /h
Pressure:	5 mbar

### Modular machine concept

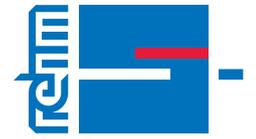
System	Heating zone length in millimetres	Number of IR heating zones	Number of convection zones	Drying time in minutes
RDS 2400	2400	10	1	2,6 – 24
RDS 3000	3000	12	1	3,3 – 30
RDS 3600	3600	14	1	4,0 – 36
RDS 4200	4200	16	1	4,6 – 42
RDS 4800	4800	18	2	5,3 – 48
RDS 5400	5400	20	2	6,2 – 56
RDS 6000	6000	22	2	6,7 – 64

\* Cooling unit depending on the system type 600 – 1200 mm

## Simple maintenance

**low**   
maintenance  
expenses

The control elements of the RDS drying system are easily accessible for minimal maintenance costs. The heating base of the IR radiator can also be equipped with glass covers to protect against contamination and for easier cleaning. This considerably reduces the maintenance required and increases the service life of the radiators. Here, Rehm relies on tried-and-tested components from the reflow soldering systems.



THERMAL SYSTEMS



## Rehm Worldwide

As a leading manufacturer of innovative thermal system solutions, we have customers on every continent. With our own locations in Europe, the Americas and Asia as well as 27 agencies in 24 countries we are in position to serve the international markets quickly and to offer outstanding on-site service – worldwide and round the clock!

