



Vacuum Furnaces

Standard Model Series

Spanning a wide range of applications,
Chugai Ro vacuum furnaces bring improved
productivity to many industrial fields.



CHUGAI RO CO., LTD.

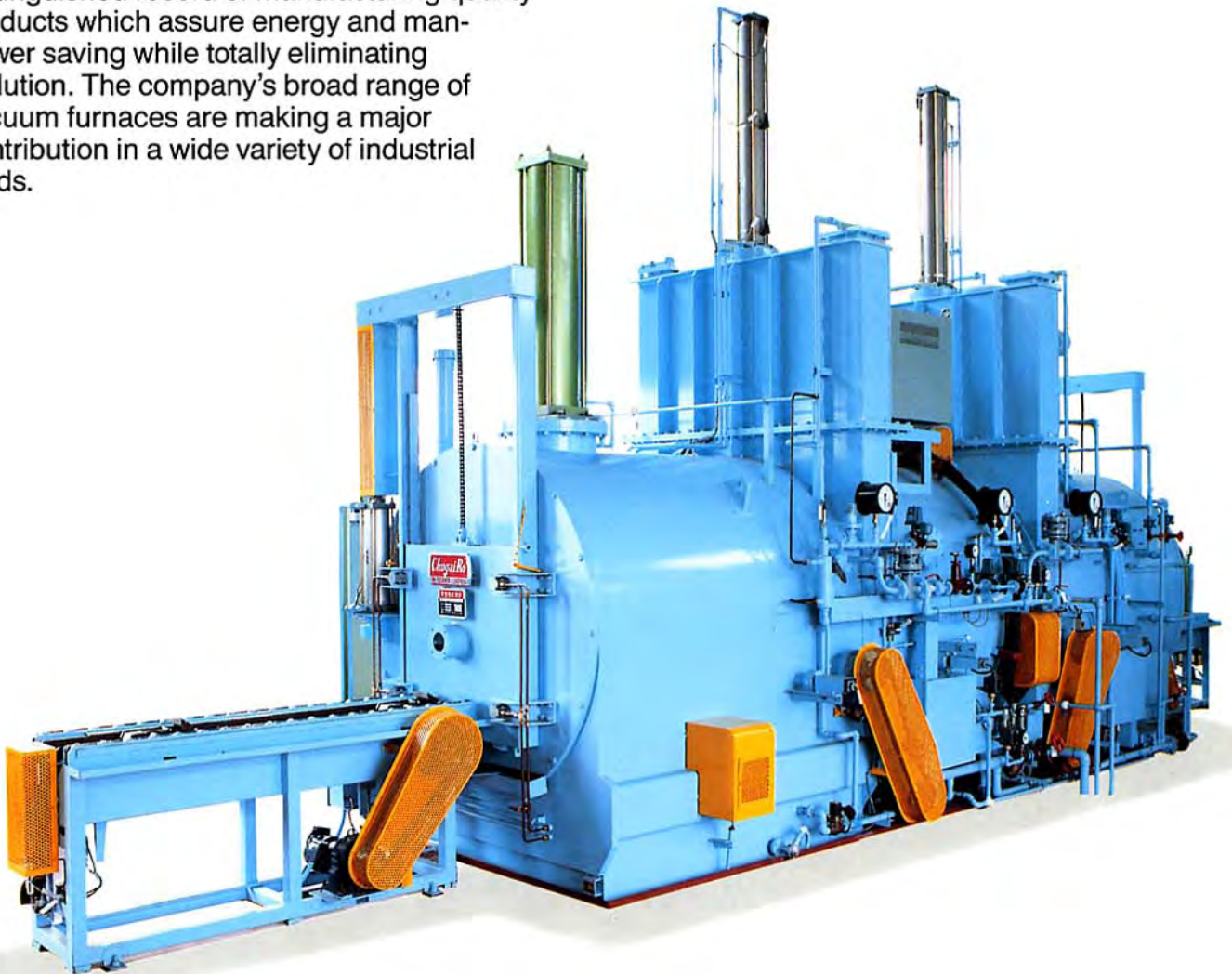
Vacuum furnaces for flexible production – the right quantity at the right time

Today, when diversified production in small quantities is important, the vacuum furnace has become indispensable for such major Japanese industries as the electronics, automotive and aerospace industries, as it enables heat treatments to be performed in the shortest possible time at the lowest cost.

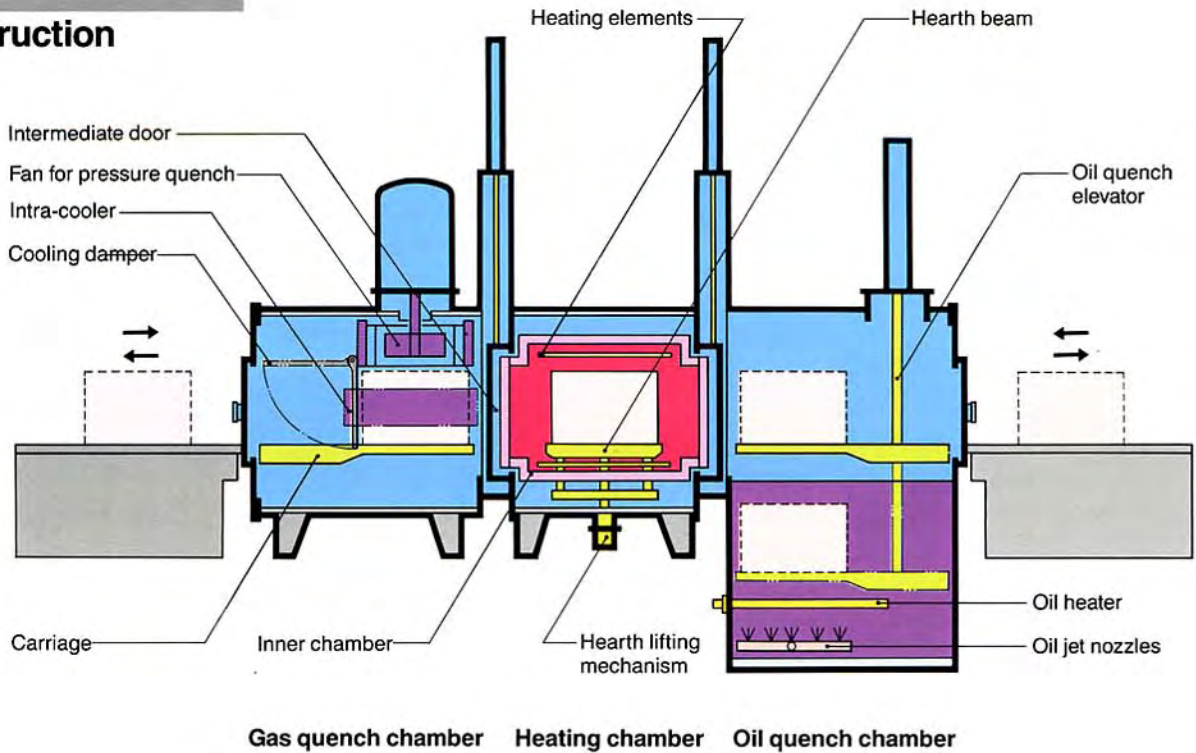
In 1974 Chugai Ro Co., Ltd., Japan's first designer and producer of the vacuum heat treating furnace of the oil quench system, developed the two-chamber vacuum heat treating furnace incorporating a pressure quench system. Since then, Chugai Ro has made rapid strides as a leader with a distinguished record of manufacturing quality products which assure energy and manpower saving while totally eliminating pollution. The company's broad range of vacuum furnaces are making a major contribution in a wide variety of industrial fields.

Chugai Ro's core design concepts—a modular format which enables our clients to choose the furnace which precisely matches their needs; and fully automatic operation—have earned for the company's vacuum furnaces an industry-wide reputation both in Japan and overseas.

Chugai Ro's versatile vacuum furnaces span a wide variety of applications, including quenching, tempering, annealing, solution treatment, brazing, sintering and carburizing. This brochure will help you choose the model which perfectly matches your specific requirements.



Construction



Models

The combination of a standardized gas quench chamber (serving also as charge vestibule), heating chamber and oil quench chamber enables you to select the optimum furnace for your workpieces and heat treating purpose.

CF		Used exclusively for gas quench, combining a pressure quench chamber with this furnace results in shorter quench time and enhanced energy saving.
QF		Capable of performing both gas quench and oil quench in one chamber. These two functions are compactly arranged to enable installation in a small space. Best suited for processing a wide variety of products.
CF-Q		Gas quench and oil quench are performed in separate chambers. Can be used for continuous operation as a straight-through furnace. Best suited for processing a wide variety of products.
CF-C		A straight-through furnace exclusively for gas quench. Suitable for continuous treatment.
QF-C		A straight-through furnace used for both gas quench and oil quench. Suitable for continuous treatment of a wide variety of products.

Standard Specifications

Size No.	Work Space (W × D × H mm)	Max. Charge (gross kg)	Heating Power (kW)	Max. Furnace Temperature (°C)	Vacuum Level (Pa)
10	300 × 500 × 300	100	40	1350	1 (7.5 × 10 ⁻³ Torr)
20	460 × 610 × 300	200	60		
30	610 × 920 × 460	450	105		
40	610 × 920 × 610	520	130		
50	760 × 1220 × 610	650	210		

*Furnaces of special specifications can be supplied on negotiation.

Examples of Heat Treating

Steel	Chemical Analysis (%)					Work Thickness (mm)				Heat Treating Temp. (°C)		Hardness after Tempering (HRC)
	C	Cr	Mo	W	V	20	50	80	150	Hardening	Tempering	
High Speed Tool Steel	0.80 ~0.90	3.80 ~4.50	4.50 ~5.50	5.50 ~6.70	1.60 ~2.20	●	●	●		1220	570	63 or more
Die Steel	1.40 ~1.60	11.00 ~13.00	0.80 ~1.20	—	0.20 ~0.50	●	●	●	●	1030	180	61 or more
	1.80 ~2.40	12.00 ~15.00	—	—	—	●	●	●	●	980	180	61 or more
	0.32 ~0.42	4.50 ~5.50	1.00 ~1.50	—	0.80 ~1.20	●	●	●	●	1030	610	46 ~ 48

● Pressure gas quench

● Oil quench

← Conventional gas quench range



Vacuum Draw Furnaces (T/VT Series)

These low temperature furnaces are designed to operate at temperatures below 750°C. Fitted with a cooling tube and recirculating fan, this batch furnace is used for drawing quenched materials. One of the options in this series allows for a maximum furnace temperature of 950°C, and can be used for annealing or normalizing cold forged parts and high-grade wire rods. Another type, the VT series, has an intra-cooler in the furnace, to cool the atmosphere gas directly, which greatly reduces the cooling time.



Features of Chugai Ro Vacuum Furnaces

1. Fully Automatic Operation via Program Controller

Press the start button—that's all that's needed for operation, as the program controller incorporates built-in control programs, including temperature, atmosphere, and operation cycle. Even when changing the work, fully automatic operation can be continued with another touch of the button.

2. Thoroughgoing Energy-Saving Design

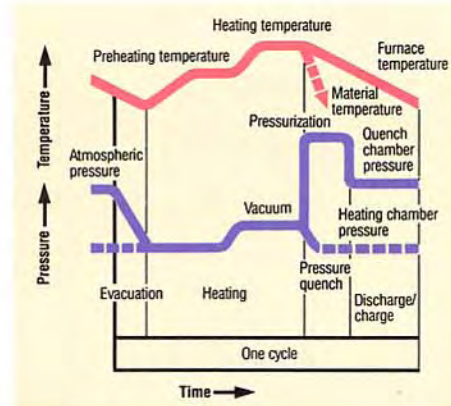
Since the heating chamber is fully vacuum-sealed by the intermediate doors, the next cycle can be started without lowering the furnace temperature, thus reducing heat loss to the minimum.

3. Expanded Heat Treatment Applications through Pressure Quench System

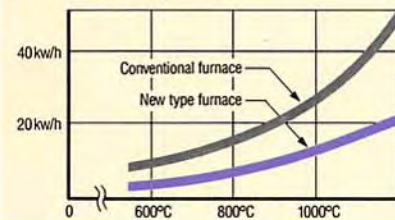
The pressure quench system, in which quench is performed in a pressurized gas atmosphere, greatly accelerates the quench speed, shortening the heat treatment cycle and thus enhancing productivity. The system, moreover, extends the fields of application for heat treatment and results in significantly improved product quality.

4. Improved Product Quality through Chugai Ro's Original Oil Quench System

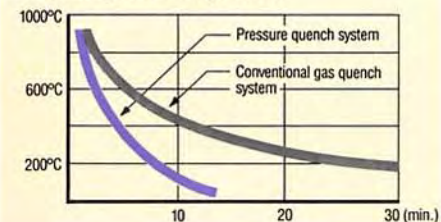
The oil quench tank is provided with a unique oil agitation mechanism which ensures the least distortion of processed products. In cases requiring higher accuracy, a hot oil quench system which heats quench oil up to a maximum of 180°C can be supplied.



Heat Loss Comparison



Quench Speed Comparison



Applications

Model	Treatment
Standard type	a) Quench: Cold oil quench (below 80°C) Gas quench b) Tempering/precipitation hardening (above 500°C) c) Annealing d) Solution treatment e) Brazing f) Sintering* (except dewaxing)
Option 1: Carburizing function (with gas injection equipment and fan)	g) Vacuum carburizing*
Option 2: Hot oil quench function	h) Precision quench/hot oil quench (100—180°C)
Option 3: High-vacuum function (with oil diffusion vacuum pump)	i) Nonferrous metal bright treatment/vacuum level 10^{-2} Pa

*The VS and VC Series are provided exclusively for sintering and carburizing, respectively.

Other Vacuum Furnaces

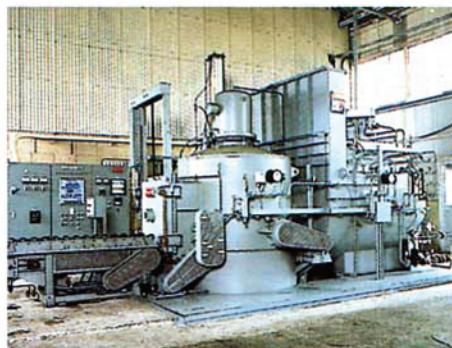
Vacuum Furnaces with Pressurized Gas Quench Systems (VP Series)

This series is used for heat treating high-speed steel, die steel and stainless steel. The cooling time has been greatly reduced by cooling materials at a pressure of 5 Bar (500 kpa). As a result, the gas cooling treatment range has been expanded.



Vacuum Carburizing Furnaces (VC Series)

These newly developed furnaces combine the advantageous features of the vacuum heat treating furnace and the atmosphere heat treating furnace, and can perform vacuum carburization, R gas carburization, methanol carburization, N₂ base carburization, etc. Moreover, this series can also perform various other kinds of heat treatment.



Vacuum Sintering Furnaces (VS Series)

The standard model in this series is a horizontal straight-through furnace consisting of a dewaxing chamber, sintering chamber and quench chamber. Special design attention has been paid to the treatment of evaporated wax, strict temperature uniformity in the sintering chamber, prevention of evaporation of alloy elements, etc. This series is best suited for sintering high alloy steels and electromagnetic alloys.



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● The descriptions and specifications are subject to change without notice.