



# HI-SHIFTER™

Batch Type Gas Carburizing Furnaces

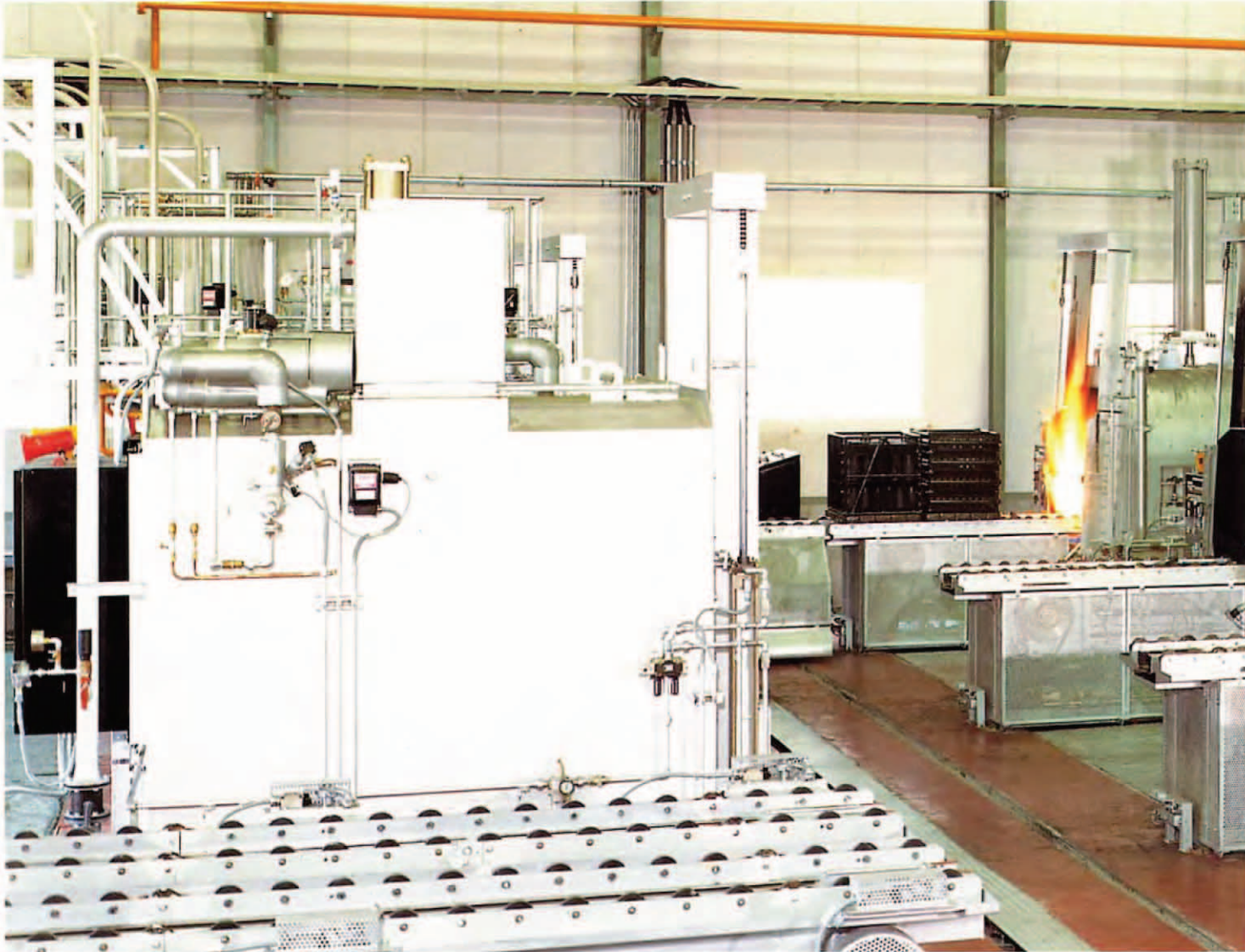
Offering Process Versatility—  
Gas Carburizing, Carbonitriding, Clean Hardening,  
Clean Annealing, Carbon Restoration.



**CHUGAI RO CO., LTD.**



# The Ideal Heat Treat Furnace for Today's Diversified Needs

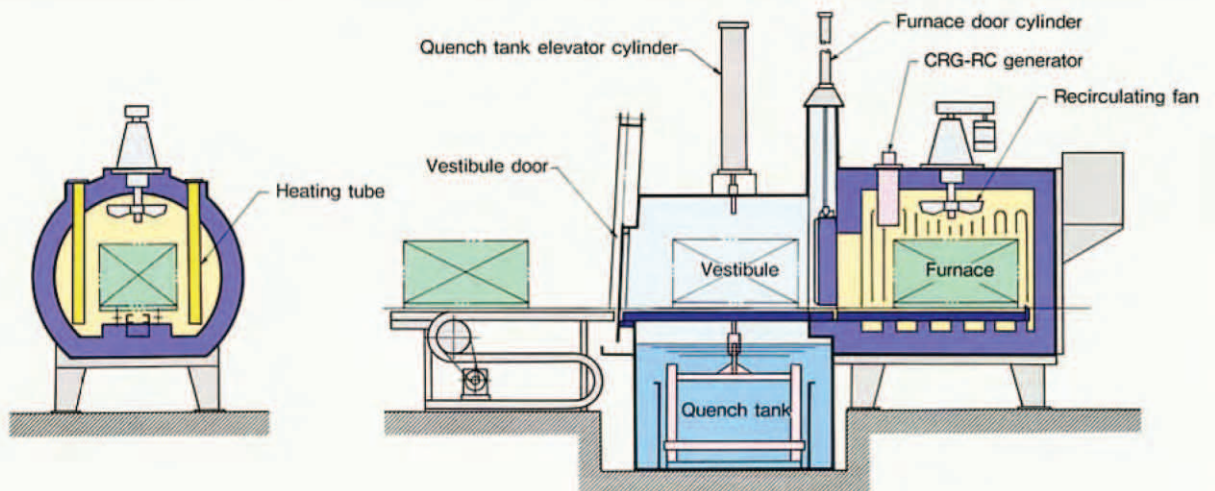


The Chugai Ro batch type gas carburizing furnace marketed in 1954 was Japan's first complete atmosphere heat treat furnace. Since then, these furnaces have been highly evaluated and trusted by users in a variety of industries—automobiles, bearings and machinery to name just a few. Relying on a wealth of experience and expertise gained from more than 750 furnace installations, Chugai Ro has developed a new, even more versatile and energy-efficient heat treat furnace. This new furnace increases overall productivity by improving efficiency and modernizing plant facilities. The **HI-SHIFTER™** furnace uses ceramic fiber as the insulation material which greatly reduces the time needed for drying, heating and seasoning. The shortened heat treat cycle time directly improves productivity while reducing energy consumption. **HI-SHIFTER™**... an innovative system to meet today's diversified needs.



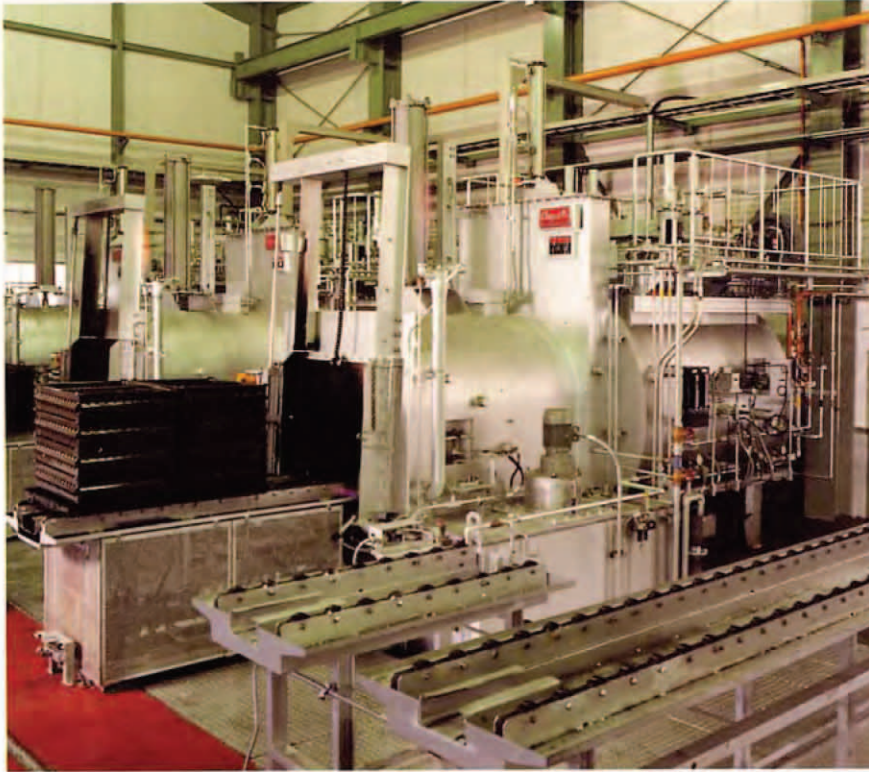


# HI-SHIFTER™





# Many Advantages Resulting from a Proven Track Record



## Flameless HI-SHIFTER™

This furnace using a vacuum vestibule enhances safety in operation and furthers energy saving. It also ensures an improved working environment.

## Features

### 1. Excellent temperature and atmosphere distribution

The round cross-sectional design of the furnace improves the furnace atmosphere circulation, resulting in much better temperature distribution. A powerful recirculating fan assures the uniformity of atmosphere and temperature distribution.

### 2. Ceramic fiber lining

The furnace uses ceramic fiber as the insulation material which absorbs only about one quarter of the heat that conventional insulation does. This reduces by 75% the time required to raise and lower furnace temperature. The time required for seasoning of the furnace is also reduced.

### 3. Fuel saving by waste heat recovery

Fuel consumption is reduced by approx. 15% owing to waste heat recovery by recuperators (combustion type).

### 4. Increased production

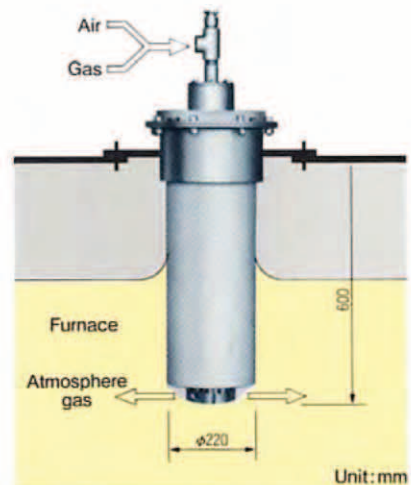
The shorter heat treat cycle time ensures a 50% increase in annual production.

### 5. Automated process

Workpieces can be loaded and unloaded by a single handler system. Temperature, cycle time and atmosphere control is automated with the operation panel precisely indicating operating conditions. A complete line consisting of a stock table, pre-washer, HI-SHIFTER™ furnace, post-washer, and draw furnace can be designed for automatic operation.

### 6. Efficient quenching

The quench tank is equipped with a two-stage elevator and a high performance agitator to shorten the cycle time and ensure high hardenability. The uniform velocity of a quench oil flow in the tank reduces quench distortion. Easy maintenance is one of features of this tank.



## Endothermic Gas Generators

### ●CRG-RC(Cartridge Type)

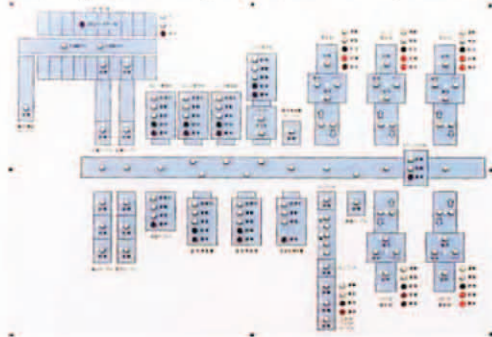
This is a new, easy-to-maintain gas generator that uses a newly developed high-performance catalyst. Since quality gas is generated at a low cracking temperature of 850 to 950°C the reaction retort is incorporated into the furnace. When producing atmosphere gas, the CRG-RC generator consumes 20% or less of the total thermal energy required to produce endothermic gas by any other method.



**Production and Cost Comparisons**

HI-SHIFTER™-Super		
Furnace design	Square cross section brick-lined (electrically heated)	Round cross section ceramic fiber lined (gas fired)
Atmosphere gas generator	CRG-R gas generator (separate type)	CRG-RC gas generator (cartridge type)
Heat-up and seasoning curves		
Heat cycle		
Production	100	150
Heat treat cost	100	41

Graphic panel showing all heat treat line operation



**7. Reliable and unique heating tubes**

The combustion type furnace uses radiant tubes. The electric heating type uses electro-tubes. Both of these tubes ensure a long service life, economical operation and ease of repair and replacement.

**8. High performance oil cooler**

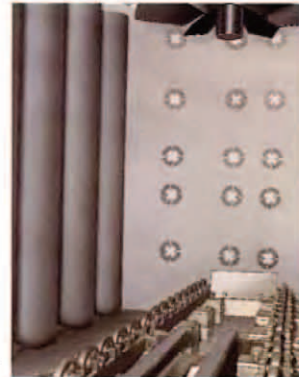
A compact and easy-to-maintain spiral type oil cooler is used.

**9. Lower price and shorter delivery**

The HI-SHIFTER™ furnace fully reflects the know-how Chugai Ro has gained in building more than 750 HI-SHIFTER™ furnaces. Thorough standardization of design has resulted in a lower price and a shorter delivery time. Carefully selected materials and components ensure high reliability for years to come. On site installation is expedited because the furnace is assembled and tested in Chugai Ro's factory. This ensures that the equipment will be ready for commercial operation in as short a time as possible.

**10. Straight-through version available**

A straight-through version of the HI-SHIFTER™ furnace is offered to allow workpieces to be conveyed in the same direction. With upstream and downstream equipment, this furnace can form an efficient heat treat line.



Electric heating type



Combustion type



**Automatic atmosphere control equipment**

Precise atmosphere gas control is a key to gas carburizing. The HI-SHIFTER™ furnace uses two-channel (temperature and carbon potential) program controller which responds to signals from an oxygen probe. The Carb Master AI series control system uses an infrared absorptive gas analyzer which controls the carburizing atmosphere gas precisely.



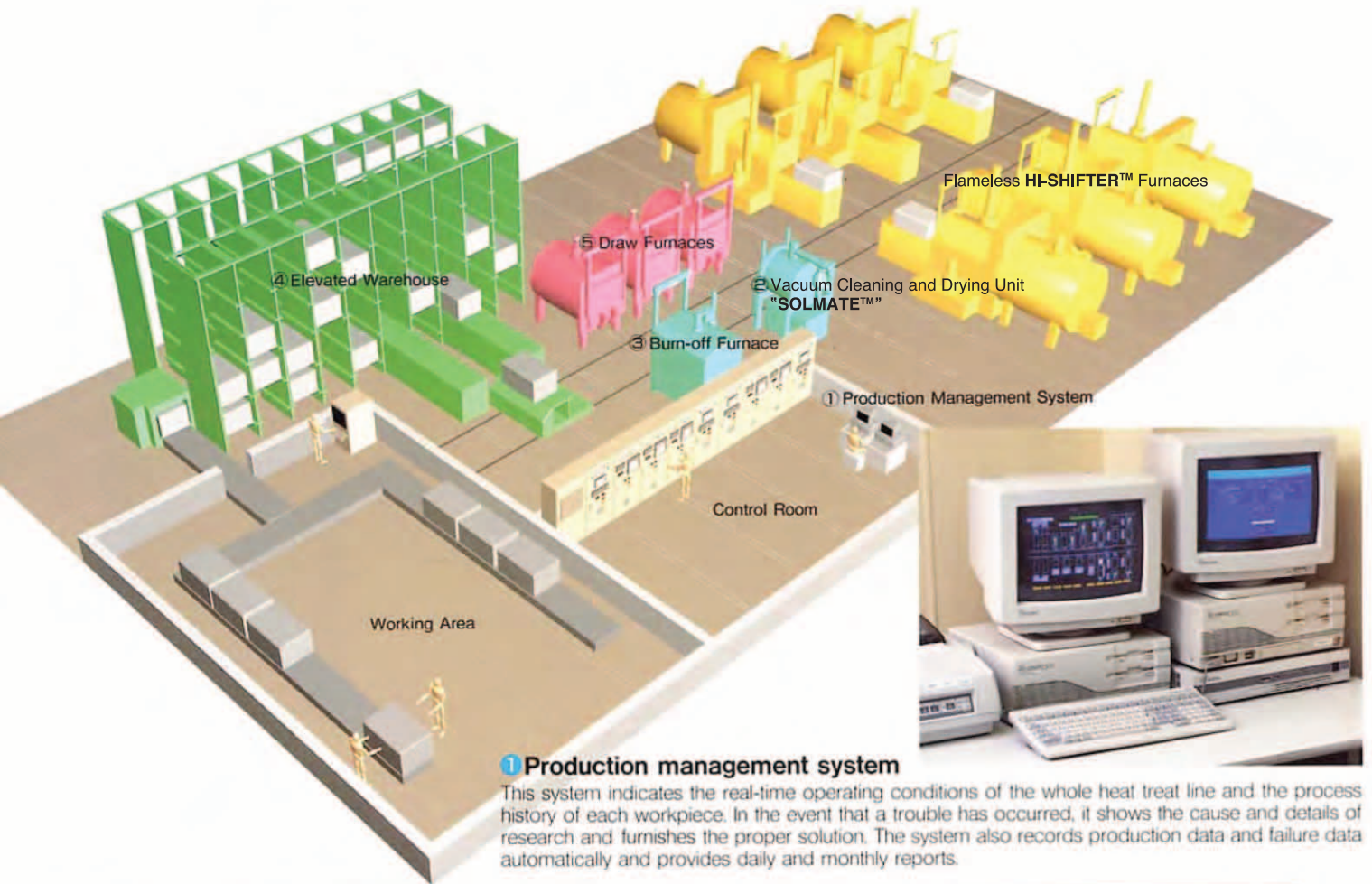
Temperature and atmosphere control panel incorporating a two-channel program controller



Carb Master® AI Series

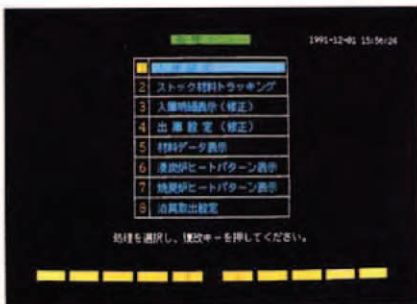


# The State-of-the-art Heat Treat Line Incorporating HI-SHIFTER™ Furnaces



## 1 Production management system

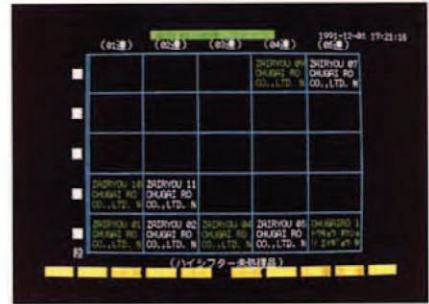
This system indicates the real-time operating conditions of the whole heat treat line and the process history of each workpiece. In the event that a trouble has occurred, it shows the cause and details of research and furnishes the proper solution. The system also records production data and failure data automatically and provides daily and monthly reports.



Personal computer menu for elevated warehouse



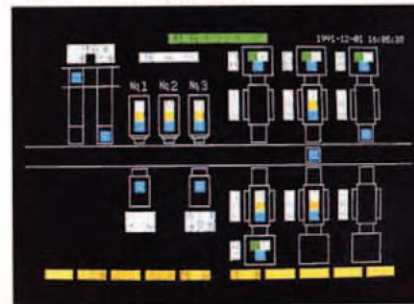
Incoming workpiece information  
If the name and quantity of workpieces are input when they are transferred into the warehouse, the transfer route, heating pattern, etc. are displayed.



Stock tracking  
This displays the conditions of the workpieces, jigs and trays stocked in the warehouse.



Personal computer menu for production management



Workpiece tracking  
This displays, on realtime, the position of workpieces and the treating conditions of each facility in the whole heat treat line.

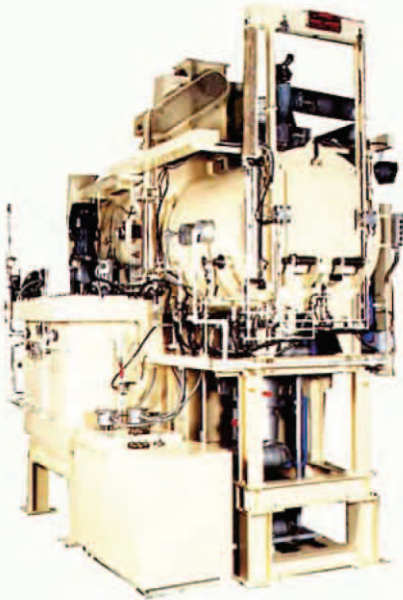


Detailed daily report  
Detailed production data of processed workpieces are displayed in order of treatment or for every furnace.



#### **e Vacuum cleaning and drying unit "SOLMATE™"**

This unit uses a detergent of which a flash point is as high as cold quench oil. A high cleaning effect is ensured with the combination of condensate spray cleaning and vapor cleaning. The detergent flows in a closed circuit and drying is carried out in vacuum, for increased safety in operation.



#### **e Burn-off furnace**

The burn-off furnace heats workpieces to 550°C in order to evaporate and remove the cutting oil or lubricating oil and to preheat the workpieces. Since no harmful solvent is used, the working environment remains clean. Operating costs are reduced by 50% compared to cleaning equipment using solvents.



#### **4 Elevated warehouse**

Stockyard area can be greatly reduced since workpieces are stored on multilevel shelves. The workpieces can be transferred into or from the warehouse only in 30 seconds or less. They can be put onto any shelf. Jigs and trays which are not used immediately can also be stored.



#### **e Draw furnace**

The draw furnace has a powerful recirculating fan to ensure excellent temperature distribution. Draw furnaces for high or low-temperature use are available. Electrically heated or gas fired furnaces are available.



## Standard Specifications

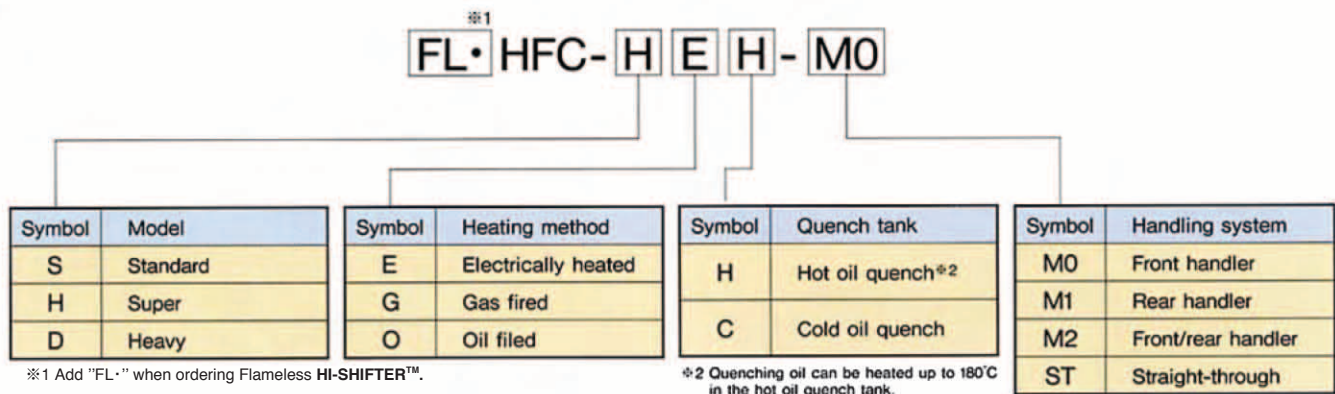
Model	Effective furnace dimensions (W×L×H) mm	Gross charge kg	Heating rate, gross kg/h		Fuel/power consumption			Atmosphere gas consumption, m <sup>3</sup> /h
Standard	610×920×550	500	Gas/oil fired	350	Fuel, MJ/h	Soaking	209*	12
						Heating-up	627*	
			Electrically heated	320	Power kW	Soaking	20	
						Heating-up	65	
Super	760×1220×610	900	Gas/oil fired	590	Fuel, MJ/h	Soaking	293*	18
						Heating-up	836*	
			Electrically heated	415	Power kW	Soaking	35	
						Heating-up	100	
Heavy	760×1520×710	1400	Gas/oil fired	730	Fuel, MJ/h	Soaking	377*	25
						Heating-up	1130*	
			Electrically heated	600	Power kW	Soaking	45	
						Heating-up	140	

※The above fuel consumption is indicated in SI units which can be calculated from the following formulae:

● 1KJ=0.239kcal(1MJ=239kcal), 1kcal=4.18KJ(10000kcal=41.8MJ)

## Coding

All HI-SHIFTER™ furnaces are coded as follows:



**SAFETY PRECAUTIONS** : Read the instruction manual carefully before using the equipment.



**CHUGAI RO CO., LTD.**

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