FORCED CONVECTION FLAT-BEND BI-DIRECTIONAL TEMPERING FURNACE

4-19mm with passing section

Brand: SHENCHENG (CHINA) SC-E-2850-25

TECHNICAL DESCRIPTION

1. Equipment Description

SC-E-2850-25 series of forced convection flat-bend bi-directional tempering furnace is a new generation of tempered glass production equipment, mainly used for flat and bend tempered glass production. Compared with similar products at home and abroad, the equipment has the advantages of reasonable technology, powerful system control software, high reliability, excellent thermal insulation performance, low production energy consumption, computer automatic control and high production efficiency. Especially suitable for deep processing of low-E glass,coated glass and other high-grade glass. The furnace includes loading section, heating section, flat tempered passing section, flat tempered quenching and cooling section, bent tempered quenching and cooling section, unloading section, blower system and control system. The flat raw glass sheet enters the heating furnace from the loading table, and after heating up in the furnace, it is tempered and cooled in the quenching section, finally the final product reaches the unloading table.

a)Loading Section:

The loading section is composed of driving rubber rollers, loading drive motor, encoder, dual photoelectric sensor, universal wheel lifting platform, lighting device and tools table. The driving motor of loading section is driven by frequency converter, and the rubber roller is driven by the chain to transfer the placed glass to the photoelectric sensor of front furnace door, so as in ready-to-enter-furnace position. During loading process, the motor drives the rubber roller to move at low speed, and the encoder accurately records the glass total length in the furnace. During glass entering, the inverter drives the loading motor to make the loading section rollers and heating section ceramic rollers to move synchronously at high speed, then the glass will be transmitted into the furnace for heating.

b)Heating Section:

The heating section structure is double-layer box type. It consists of top lifting mechanism, heating system, forced convection blowing system, emergency cooling device, ceramic rollers, drive system, length and temperature measuring device.

Heating furnace is upper and lower disconnected type. The upper furnace body can be free lift through top lifting mechanism to facilitate maintenance. Top lifting mechanism is composed of a set of screw, bevel gear, reduction mechanism, motor, upper and lower limit and safety protection device.

The heating method is upper and lower zones heating. The upper and lower heating zones are divided into several small areas according to the furnace body size, and each area is equipped with a thermocouple to form an independent control loop. The heating element is made of high quality alloy material for longer life. The forced convection system composed of 8 sets convection blowers (with split design for high efficiency and energy saving, also easy maintenance), inlet and outlet pipes. Above system makes the heating mode of glass upper surface in heating section is changed from only radiation type to radiation and convection together, while convection is the main type. In this way, the heat absorption rate of glass surface is improved, which makes the glass upper and lower surfaces are quickly heated to balance. The heat balance system can be adjusted automatically according to glass thickness and types to ensure the furnace temperature uniformity and the tempered glass flatness. It is especially suitable for tempering low-E glass and coated glass with different heat absorption rates on both sides. Ceramic roller adopts high quality brands. The belt driving and frequency control are adopted to ensure the

synchronization and stability of ceramic roller movement. During entering furnace, loading section rollers move synchronously with heating section rollers to enter the glass into furnace. In the heating process, the main drive motor drives the ceramic rollers to do reciprocating movement, so that the glass will be heated evenly. When the glass is out of furnace, the quenching section rollers move synchronously with the heating section rollers to transmit the glass into quenching section for tempering. The furnace rear door is equipped with automatic opening function when power and gas is off, so as to prevent heavy losses caused by glass being left longer time in the furnace in accidents.

c) Flat Tempering Passing Section:

The passing section is composed of transmission roller, upper and lower quenches, quench lifting mechanism and air inlet. The quench is trapezoidal combined shape, and the air nozzle is made of aluminum alloy. The transfer roller is a kind of steel roller twined with imported kevler belt. When the glass is about to come out of the furnace, the upper and lower quenches are close to form a gap. The rollers move synchronously with the heating furnace ceramic rollers to transmit the heated glass into quenching section for tempering.

d)Flat Tempering Cooling Section:

The cooling section is composed of transmission rollers, upper and lower quenches; quench open & close mechanism, air inlet, etc. The quench is trapezoidal combined shape, and air nozzle is made of aluminum alloy. The transfer roller is a kind of steel roller twined with imported kevler belt. When the glass is about to come out of furnace, the upper and lower quenches are closed automatically to form a gap. The rollers move synchronously with the heating furnace ceramic rollers to transmit the heated glass into quenching section for tempering. In cooling process, the glass will be moved back and forth on the rollers, so as to ensure smooth blowing.

e) Hard Shaft Bend Tempered Quenching And Cooling Section

It adopts deformable roller forming technology; Hard shaft forming roller table and transverse arcing; the arc adjusting mechanism composed of multiple arc-changing devices can adjust arc automatically; furthermore, the single arc changing device is provided with a separate fine-tuning mechanism, which makes the molding accurate and glass arc smooth; long life structure design and reliable repeatability make converting products easy and fast; larger piece size while more space.

It includes steel structure frame, transmission system, quench, upper quench lifting mechanism, upper quench roller arc adjusting mechanism, lower roller lifting mechanism, lower quench roller arc adjusting mechanism, upper and lower inlet box and soft air pipe. The upper and lower quenches of aluminum alloy are respectively connected with the upper and lower inlet boxes through soft air pipes. Roller adopts wire soft shaft and roller rope adopts soft heat-resistant fiber rope.

The PC pre-automatically adjusts the roller (quench) to the required radian (storage, accumulation, easy to invoke). When the glass is out from the heating furnace, the roller and the ceramic roller in the heating furnace run synchronously, and the heated glass is transmitted from the heating furnace to the bend tempered cooling section, which is formed firstly and then cooled and tempered. In this process, the glass swings back and forth on the roller to ensure the glass arc smooth and the cooling uniform. To produce different thickness glasses, PC automatically adjusts the blower frequency converter and gives the corresponding air pressure and volume.

f) Unloading Section :

Unloading section structure is basically same as that of loading section. When cooling glass is completed, it is automatically transmitted to unloading section, and glass will be stopped automatically on reaching unloading section end. The tempered glass is manually removed from unloading section.

g)Blower System:

Blower system includes blower, blower control cabinet, air door control mechanism, bellows collector, upper and lower quench air volume regulation mechanism, etc. The blower starting mode is frequency converter starting mode. The bellows collector is set up to ensure the air pressure of quench each part is consistent. The air volume and distance of upper-lower quench can be adjusted separately according to specific production, so as to make tempering glass quality reach the best state.

h)Control System:

Control system includes temperature control, transmission control, air path control and emergency fault alarm system.

The upper computer adopts the industrial computer of Advantech company, display screen adopts 19-inch LCD color display. Display screen, keyboard and mouse are placed on operating table, while the host is installed in electric control cabinet. The manual operation interfaces include home page, operator page, engineer page, administrator page, device debugging page, parameter saving page, parameter uploading page and system status page.

Work main page: the production line simulation drawing and various process parameters (such as: temperature at each point of heating furnace, automatic temperature rise, automatic timing temperature rise, temperature curve, heating time, blowing time, rapid cooling air pressure, cooling air pressure, etc.) are fully displayed and can be fine-tuned and modified.

Operating parameters page: according to glass thickness, color, type and manufacturer, we can set the corresponding process parameters, such as the temperature at each point of heating furnace, heating time, blowing time, rapid cooling air pressure, cooling air pressure, furnace entering speed, swing speed and quench height. And the parameters can be saved in database in the form of a file for easy invocation.

Automatic timing heating up page: as long as the parameters as heating time, temperature, heating power and planned heating time are set up, the computer system will automatically raise the furnace temperature to the required value in the set time.

Equipment debugging page: maintenance personnel can conveniently check each input and output points in the control system is normal or not. Greatly improve the maintenance speed.

The lower computer adopts Omron PLC. Peripheral components (including electrical measurement, executive components and pneumatic measurement) are imported products and high-quality products produced by joint ventures. The hardware configuration is reasonable and technology level is advanced. System control software is powerful and highly reliable. The comfortable man-machine dialogue interface makes the operator work with ease. Input and output test pages make equipment maintenance and debugging convenient. The function of equipment fault detection and recording provides sufficient basis for equipment maintenance personnel.

2. EQUIPMENT TECHNICAL FEATURES

Specially designed convection blower makes high temperature performance more stable and reliable, also excellent convection effect.

- The most advanced convection circulation structure is designed to ensure faster and more uniform heating of the glass.
- The whole machine is controlled by industrial computer and PLC, and the main drive adopts imported control system. Frequency conversion stepless speed regulation is in higher precision and better stability. Automation higher degree ensures simple operation and higher production efficiency.
- The convection blower operating speed is controlled by frequency converter and given by the computer, so that the upper and lower surfaces of the glass are heated uniformly, which greatly improves the product quality.
- The design and layout of heating elements are unique and reasonable. With the most advanced remote temperature control module, the temperature control is extremely accurate and simple to adjust, which effectively ensures the highly uniform temperature in the furnace.

- Unionize control of glass heating in the furnace and cooling out of furnace can be realized by variable frequency speed control system, which has high synchronization and avoids scratches in the process of glass movement.
- The heating method adopts spiral staggered matrix structure to control furnace temperature in different zones. The heating element has reasonable design, unique structure and longer service life.
- The heating furnace is designed with automatic temperature homogenizing device, which can be adjusted according to different specifications and varieties to ensure the glass heating uniformity.
- Fully enclosed heating furnace body, using imported high quality heat preservation materials with good performance, the thickness of top insulation layer is 435mm, the surrounding insulation layer is 270mm, the full furnace adopts 25mm Nano insulation board sandwich layer. Temperature rise from 20℃ to 700℃ need 2h, while natural cooling temperature is less than 10-15℃ per hour. Low production energy consumption effectively control the generation of various particles and the impact on glass quality.
- Heating furnace is divided into upper and lower parts, the upper part can be freely lift for easy maintenance. The heating section transmission roller adopts high quality imported ceramic rollers with good surface finish and longer service life.
- The circulation formed by convection blower is completely processed in the furnace body, which will not cause heat loss while has good energy saving effect.
- Top emergency cooling device greatly facilitates the equipment maintenance.
- The air pressure proportional adjustment of upper and lower quench is automatically controlled by computer.
- Complete software configuration provides great convenience for production, maintenance and adjustment.
- Production process is controlled by computer with high degree of automation.
- Processing capacity is stronger with higher efficiency, which can process all kinds of float glass, embossed glass and low-E glass; minimum E value of Low-E glass is up to 0.05.
- The tempered glass optical quality is good, no pitting, roller mark, white lanes and other heating defects. The strength and granularity of glass are better.

With the increasing amount of tempered low-E glass, the original tempering equipment is far from meeting the requirements, so it is necessary to have special processing equipment and technology in line with low-E glass. Our newly developed upper forced convection control system can quickly improve tempering performance and realize tempering off-line low-E glass. Suitable for processing higher quality flat-bend tempered glass, especially for low-E glass, all kinds of coated glass and printing glass. The yield is 25% higher than that of ordinary radiation furnace. Glass upper and lower surface heating is more stable, which greatly improve the whole glass surface heating uniformity, then the phenomenon as white mist in the middle of glass and thick glass cracked in the furnace can be eliminated completely, also shorten the glass retention time inside the furnace, as well as reduce the reciprocating friction between glass and ceramic rollers, greatly reduce the scratch on glass lower surface, finally effectively improve the finished glass product rate.

3. GP SERIES TEMPERING EQUIPMENT MAIN TECHNICAL FEATURES

a) Heating Wires Configuration

Our heating wires have different staggered arrangement according to furnace sizes, which are characterized by simple structure, convenient installation and longer service life. Heating wires have single point control function, means each wire has a separate thermocouple temperature measurement, which can be separately set temperature and power, as far as possible to make the temperature uniformity in the furnace. The wire is made from Beijing Shougang, which has longer service life. Hanging installation mode is convenient for installation and maintenance. Wire installation is independent, then removing faulty ones will not damage other ones.

The lower part adopts our latest wing type radiation plate, which can effectively radiate the energy from the lower wires into the furnace, greatly improving the heating efficiency in the furnace. Upper wires without radiant panel, so the infrared energy from wires can be effectively radiated to glass upper surface, which makes quick heat absorption to reduce glass stagnant time in the furnace, finally improve glass surface quality, especially for coated glass, can effectively avoid the membrane phenomenon on glass surface. Meanwhile we added intelligent power-adjust control to the program, so that the operator can set the power when thick glass entering into the furnace, also the power can increase speed. The heating start time can be set in delay when thick glass entering the furnace, then the heating will be automatically started after glass passing the dangerous period, so as to avoid its blast probability. The lower radiation plates are reasonably distributed, which can effectively radiate energy and isolate broken glass.

b) Insulation Construction

Fully enclosed heating furnace body,using imported high quality heat preservation materials with good performance. Top insulation layer thickness is 435mm, the surrounding insulation layer is 290mm, the full furnace adopts 25mm nano insulation board sandwich layer. Temperature rise from 20℃ to 700℃ need 2h, while natural cooling temperature is less than 10-15 ℃ per hour. Production energy consumption is lower. The furnace inner surface is laid with high quality porcelain aluminum plate, which is light in weight, high in hardness and long in life. It effectively solves the problem of thermal insulation cotton pulverization and falling chip.

c) Variable Speed Technology

The curved "white spot" on glass lower surface is caused by longer unwarping time result in the fast and early heat absorption. Although forced convection can better change this state, the effect is not obvious in the early stage when the glass entering the heating furnace. On basis of above situations, we made a few small modifications in the control:

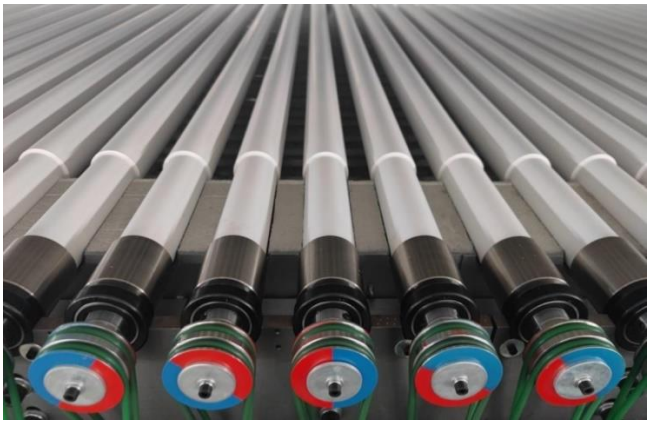
- ✓ Variable speed technology: when glass just entering into furnace, we let it swing at a very lower speed, which can minimize glass sliding on the rollers. At this time, it is impossible to cause roller marks because the glass is in hard state.

- ✓ After glass into the furnace, stop the lower part heating, and the stop time can be set from the computer. In this way, the heat absorption rate of glass lower surface can be delayed, the glass unwarping time and amount can be shortened and reduced respectively. Because the glass movement speed is very slow, the possibility of glass scratches is very small. Above method is good at eliminating "white spot".

d) Shift Technology

Because inherent principle of reciprocating tempering furnace determines that some defects of heating glass are unavoidable, such as the pause of glass reversing, while this pause has great damage to the glass quality. We adopts shift technology to reduce this damage. We can't get rid of glass pause when it changes direction, but we can make it stop in a different position when reversing. That is to say, the contact point of glass and ceramic roller is different at each pause, and it is in a cyclic state, namely more than ten cycles are repeated once. This method has a certain effect on reducing glass waveform bending.

e) Ceramic Roller



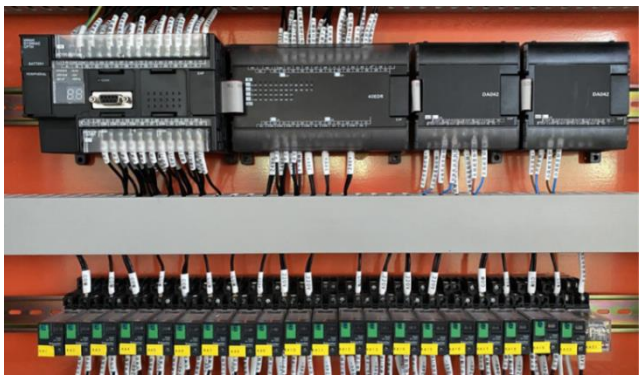
The heating section transmission roller adopts high-quality stair stepped ceramic roller, with good surface finish, better insulation effect and long service life.

f) Electrical Control Element

Our temperature control module uses a new control combination with higher stability and accuracy.

Temperature acquisition module adopts analog/digital conversion module. A temperature measurement control box is installed next to the furnace body. The thermocouples compensation wires are connected to the temperature measurement module in this control box. After conversion, digital temperature signals are transduced to the temperature control module only through a two-core shielded wire. In this way, avoid the interference of field equipment's (such as frequency converter and high-power equipment's) to the temperature collection signal. The temperature control module is a small computer. The temperature signal collected by the temperature collecting module is connected to the control module. Then the module controls the on-off of the heating wires according to the internal control requirements (include the temperature and power setting values), and the control accuracy is within 3 degrees. The upper computer adopts industrial control computer.

g) Control Program



According to our deep research of glass tempering technology, we self-developed our own control procedures, which are mainly provided with service for tempering operation process. When making programs, the parameters frequently adjusted by

operators are classified as operator parameters, the parameters affecting glass position and movement speed are classified as engineer parameters. A password is required to enter the device. High-end parameters are defined by the manufacturer as administrator parameters, also can be handed over to the user's management personnel for maintenance.

Features:

- The operation interface is closely combined with the tempering equipment, which is very convenient for monitoring the operation for each section on the control interface.
- Easy to use the parameters adjustment page, very convenient for operator to use.
- Fully independent upper and lower computers working mode.

  Our temperature control module is a small computer, in which stored temperature control procedures. As long as the temperature and power setting values of each heating wire are issued through the upper computer, this small computer can control the whole furnace temperature. At this time, even industrial computer crash or damage, there is not any effect on glass tempering process except of power outage. In other words, a laptop can finish the normal values setting, really achieve the aim that the upper computer only plays a role of parameter setting and monitoring while out of control totally, then greatly improve the control security.
- The program has reliable stability and friendly man-machine interface, also with a lot of abnormal alarm function and alarm log, very convenient for maintenance personnel to reference and view.
- Mass parameters storage. Because the program called ACCESS database software of Microsoft OFFICE, it can be arbitrarily deleted and called.

Passing Section Technology Introduction

A unique passing section technology is adapted to temper 5-6mm glass. For the general tempering furnace, the big blower work needs 30 to 40 seconds, while for this furnace with passing section, only need 10 seconds, which reduce the big blower working time, then save 40%-50% electricity power, at the same time, also avoid the equipment damaged caused by blower high speed operation for longer time, finally prolong the service life of the equipment.

The passing section is composed of quench grids with nozzles and a frame welded with section steel, as well as the roller through the middle of the upper and lower quenches. The nozzle hole on quench grid is specially designed, which can pass through enough high pressure air flow to evenly blow on glass surface from upper and lower directions, then tempering. The opening and closing movement of the upper and lower quenches is completed independently by the electric actuator, which ensures the requirements of cooling glass of different thickness. 4~ 5mm glass moves in one direction at the set speed on the rollers, and is tempered evenly within 3 ~ 8 seconds during passing through the passing section quench. The transmission of the rollers is synchronous with that of the furnace body.

4. Equipment Technical Features

SC-E-2850-25 (4-19mm with passing section)

HORIZONTAL FORCED CONVECION TEMPERING FURNACE CONFIGURATION LIST

Main Configuration (can be selected according to user's requirement)

Parts Description	Brand/Origin
Industrial Control Computer	Intel
Remote Communication Module	Helion
Computer CPU Cards	Celeron
Thermocouple Signal Input Module	Helion
Digital I/O Module	Helion
LCD	ifound
Programmable Controller PLC	OMRON
Programmable Controller Extension Unit	OMRON
Analog Output Unit	OMRON
Proximity Switch	OMRON
Correlation Switch	OMRON
Encoder	OMRON

PLC	OMRON
Transmission Frequency Converter	Schneider
Solid-state Relay	Siling Brand From Yangzhou
Thermocouple	SICHUAN INSTRUMENT
AC Contactor	SIEMENS
Fan Frequency Converter	Schneider
Optoelectronic switch	OMRON
Optoelectronic sensor	OMRON
Current transformer	CHNT
Breaker	CHNT
Voltmeter	YQAOB Digital Display
Ammeter	YOAOB Digital Display
AC variable frequency governor	Schneider
Travel switch	CHNT
Intermediate Relay	Schneider
Large Circuit Breaker	Chint Group
Miniature Circuit Breaker	Schneider
Wire, Heat-resisting Wire	Shanghai Brand
Shield cable	Shanghai Brand
Ceramic Roller	Comrola
Ceramic Roller Bearing	LYC
Kevlar Rope	Dongchuan
Thermal Insulation Material	Hengrui Brand From Zhumadian
Blower	Teli/Tianxin
Cycloidal Pinwheel Reduction Motor	Brand Xingguang
Worm Gear and Shaft Reduction Motor	Brand Zhujiang
Chain	Brand Ziqiang
Pneumatic Components	AirTAC
Gel-coated Roller	Hebei

SC-E-2850-25 Flat Glass Tempering Furnace Main Technical Specifications

Item	Description	Remarks
Equipment Type	**SC-E-2850**	**Convection**
Glass Thickness(mm)	**4~19mm**	
Max loading area (mm)	**2800×5000mm**	
Min loading area (mm)	**300×100mm**	
Max Glass Size (mm)	**1500×2200mm**	**4mm glass thickness**
	2000×2500mm	**5mm glass thickness**
	2800×3000mm	**6mm glass thickness**
	2800×4000mm	**8mm glass thickness**
	2800×5000mm	**10-19mm glass thickness**

Heating Power	1008Kw		
Blower Power	250Kw+160Kw (confirmed as final design)		With frequency converter
Practical Power	922Kw		
Installed Power	1418Kw		
Ceramic Roller Diameter	Φ95mm		
Min power supply capacity	1000KVA		
Roller Distance	120-135mm		
Production Capacity / Glass Thickness	(furnace/ hour)	comprehensive energy consumption (Kwh/m²)	Calculation according to 5mm white glass flat tempering
4mm	20-22	< = 2.5	Different output is caused by glass size, producing area and color, Size and dark color glass output is slightly larger.
5mm	16-18	< = 3	
6mm	12-14	< = 4	
8mm	8-10	< = 5	
10mm	6-8	< = 6	
12mm	4.5-6	< = 7.5	
15mm	4-5	< = 8.5	
19mm	3-3.5	< = 10	
Comprehensive yield	≥98%		
Glass original sheet requirements	No visible bubbles, inclusions, in line with the national standard of high quality float glass, Glass to be chamfered, fine edge grinding, dry cleaning		
Suitable Glass Type	•LOW-E Glass •Float clear glass •Colored float glass •Single side screen printing float glass		
Glass Quality	Meet requirements of Toughened glass national standard GB/T9963-2008		
5mm Granularity	≥40 (within the area of 50×50mm²)		
Arch deformation	≤0.05%		
Waveform distortion	≤0.03%		
Flatness	≤0.2%		
Comprehensive yield	Not less than 98%		

2825 Hard Shaft Bend Glass Tempering Furnace Main Technical Specifications

Item	Description	Remarks
Glass Thickness(mm)	5~19mm	Bend tempering
Max loading area (mm)	2800×⌒2500mm	When glass size ≤ minimum glass size, the small radius cannot be achieved
Min loading area (mm)	200×⌒500mm	
Bending radius	R≥1300mm	
Curvature Tolerance	±2.5mm	
Glass Quality	Superior to national standard	Non-curved edge＞2m, straightness accuracy≤2.5mm; Non-curved edge＜2m, straightness accuracy≤1.5mm;
Comprehensive yield	Not less than 98%	

Remarks：When all glass size is no more than the minimum glass size, the minimum radius cannot be reached.

SC-E-2850-25 Flat Glass Tempering Furnace Ground Condition:

Ground Surface	Smoothness	±20mm
	Concrete	Not less than 150mm
Compressed Air	Pressure	7kg/cm2
	Use level	0.3M3/Min
	Air Storage Tank	1.6-2M3

SC-E-2850-25 Flat Glass Tempering Furnace Scope of Supply

Item	No.	Description	Qty
Tempering equipment	1	Loading table and drive system	1 set
	2	Heating furnace convection system and drive system	1 set
	3	Flat chiller roller table and drive system	1 set
	4	Unloading table and drive system	1 set
	5	Quench and lifting drive system	1 set
	6	Air ducting and wind valve system	1 set
	7	High pressure Centrifuge Fan(passing section) (N=250KW)	1 set
	8	Low pressure Centrifuge Fan (N=160KW)	1 set
	9	Pneumatic control system (Excluding air supply)	1 set
	10	Electric control system	1 set
	11	Emergency power supply system	1 set
	12	Automatic ash removal system	1 set
	13	Commonly used spare parts	1 set
	14	User machine manual	1 set
Data document	15	Maintenance and process manual	1 set
	16	Total process diagram of the machine plane, basic data sheet and power supply system	1 set
Technical Service	17	On-site technical guidance for equipment installation	
	18	Technical training of operators and maintainers from the users	
	19	Machine system commissioning	
	20	Technology Services within quality guarantee period	

SC-E-2850-25 Flat Glass Tempering Furnace Main Configuration Of Each Part

Parts	No.	Item	Description	Remarks
Loading roller table	1	Drive device:	converter motor+ reducer(Schneider)	
	2	Speed adjustable	100~600 mm / S	
	3	Transmission Model	Chain drive	
	4	Roller installation	quick knock-down type supported by deep groove ball bearing	
Heating Furnace	1	Drive device	motor + reducer + emergency system + frequency converter	Schneider Inverter
	2	Transmission Model:	Round belt be arranged in perpendicular direction for driving	
	3	Roller installation	quick knock-down type supported by self-aligning bearing	
	4	Speed adjustable range of roller	100~600 mm / s	
	5	Furnace Door	Pneumatic open flexible Furnace Door	
	6	Furnace body lifting	Motor drive	
	7	Thermal insulation material	aluminium silicate board , felt	
	8	Thermal insulation thickness	Furnace top 320mm Side wall and furnace bottom 220mm	
	9	Electric heating element	Upper: Nickel chrome aluminum wire Lower: Fe-Cr-Al wire	
	10	Radiation plate	Heat-resisting stainless steel plate	1Cr18N9 Ti
	11	Space temperature display:	1 point	
	12	Quick cooling hole be settled on furnace top		
Passing section roller table	1	Drive device	Motor + reducer + emergency system + frequency converter	Schneider Inverter
	2	Speed adjustable range	100~600 mm / s	
	3	Transmission Model:	Naillesstape be arranged in perpendicular direction for driving	
	4	Roller installation	quick knock-down type supported by deep groove ball bearing	
Passing section quench	1	Lifting model	Electric lifting screw	
	2	Drive device	Motor+ worm gear reducer	
	3	Speed adjustable range	5~30mm/	
	4	Positional accuracy	+1mm	

Quench roller table	1	Drive device	Motor + reducer + emergency system + frequency converter	Schneider Inverter
	2	Speed adjustable range	100~600 mm / s	
	3	Transmission Model:	Nailless tape be arranged in perpendicular direc tion for driving	
	4	Roller installation	quick knock-down type supported by deep groove ball bearing	
Flat tempering Quench	1	Lifting mode	Electric lifting screw	
	2	Drive device:	Motor+ worm gear reducer	
	3	Speed adjustable range	100~600mm/s	
	4	Positional accuracy	+1mm	
	5	Transmission Model:	Chain arrangement drive	
	6	Roller installation:	Quick knock-down type supported by deep groove ball bearing	
Unloading roller table	1	Drive device		
	2	Other parts are as the same as that of loading roller table		
Air supply system	1	Static pressure equalizer		2 pcs
	2	High pressure centrifugal blower	With variable-frequency governor	1set
	3	Low pressure centrifugal blower	With variable-frequency governor	1set
	4	Air inducting system		1set
Pneumatic control system	1	Air-operated reversing valve:	AIRTAC products	several
	2	Various of air cylinders		several
	3	Various of joints, flanged pipe fittings and PU pipes		several