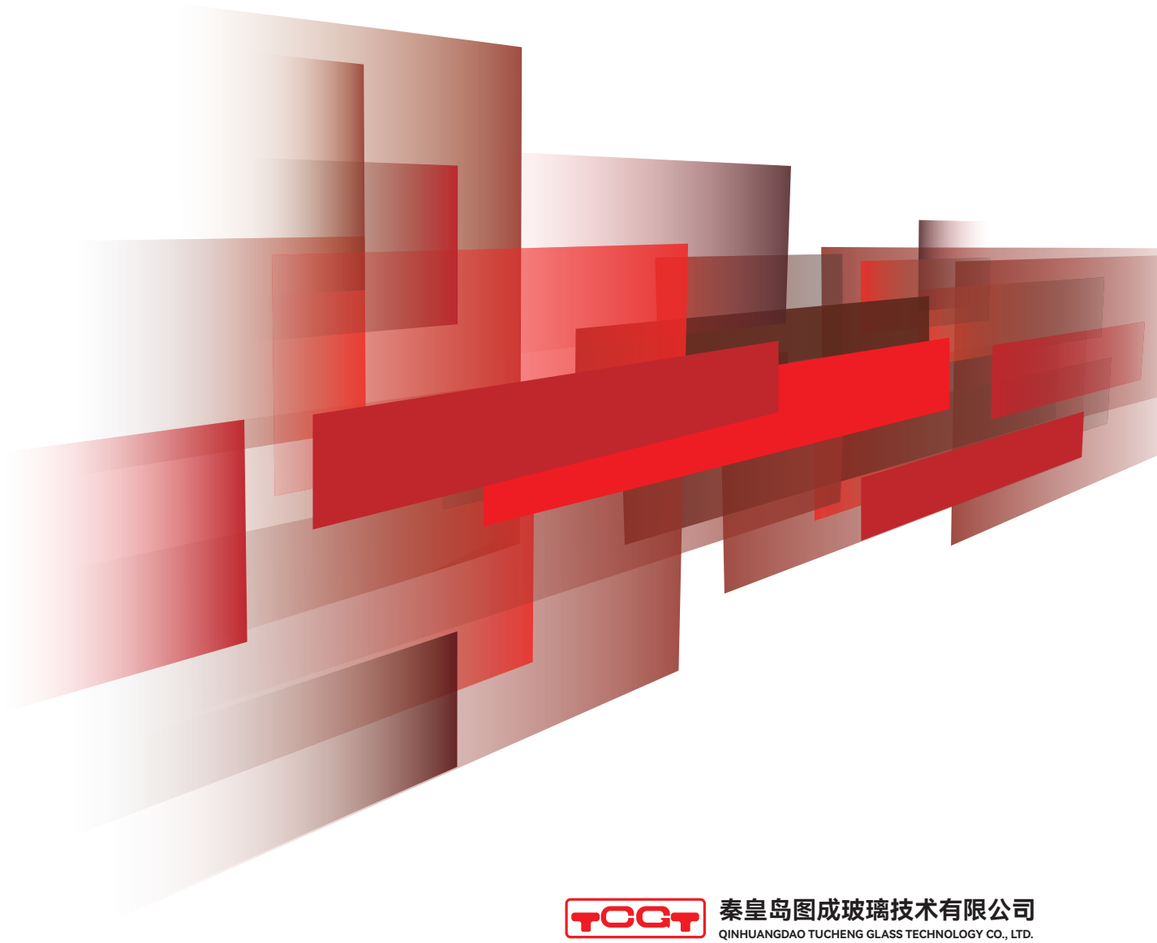
GLASS TEMPERING EQUIPMENT



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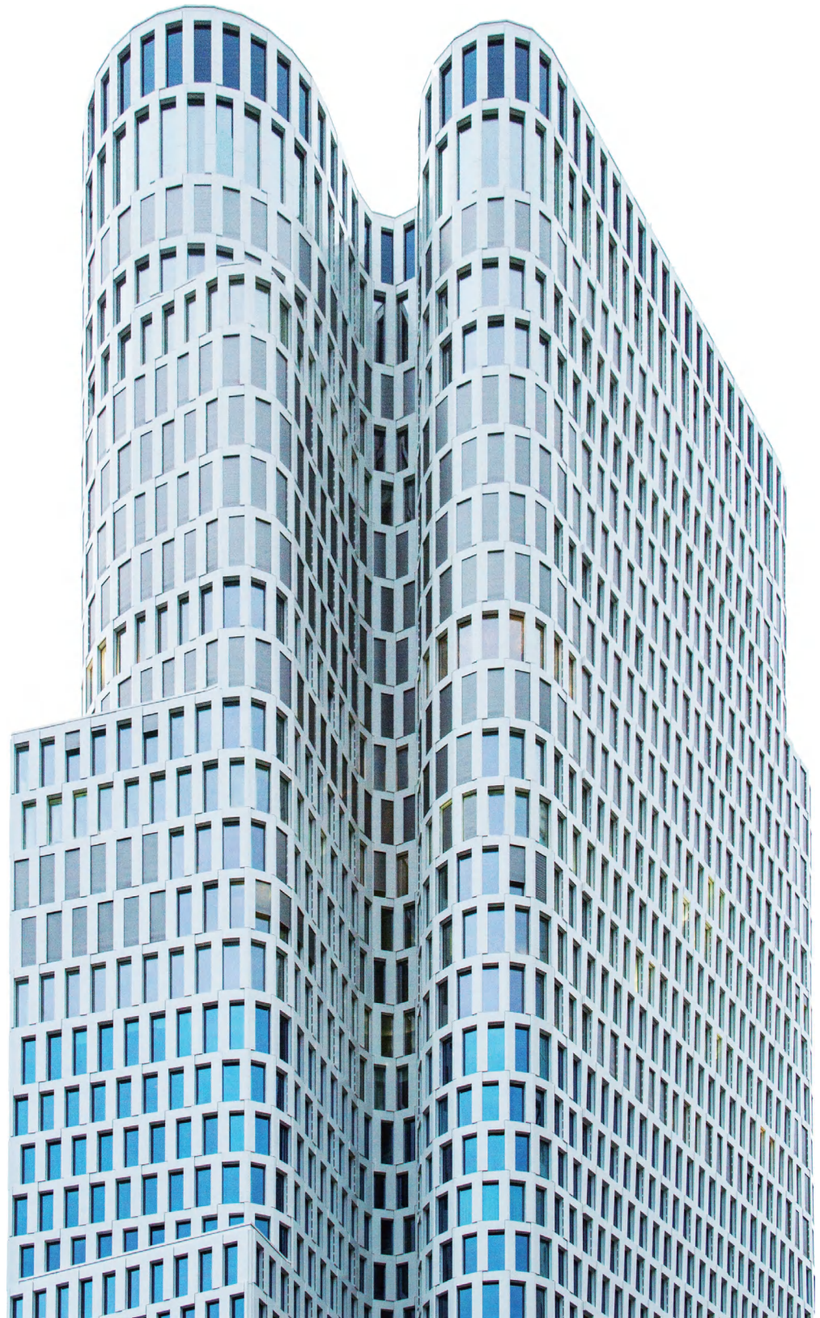
QINHUANGDAO TUCHENG GLASS TECHNOLOGY CO., LTD.

ABOUT US

Qinhuangdao TUCHENG Glass Technology Co., Ltd. (TCGT) is an experienced high-tech company specializing in the design, development, and manufacturing of glass production and processing equipment, as well as control system, such as full cold end of glass production line, tempering furnace and processing line integration, etc. Our products have been installed in more than 30 countries including Albania, Austria, Brazil, Canada, Columbia, Finland, Germany, Greece, India, Italy, Malaysia, Pakistan, Poland, Puerto Rico, Romania, Serbia, South Korea, Spain, Türkiye, Ukraine, USA, etc. Our deep understanding of clients' requirements and expectations makes us a reliable partner. We look forward to your visit to our company and to creating a win-win partnership. Chase your goals with TCGT!



CONTENTS

GT Series Flat Glass Tempering Equipment

Curtain walls　Home appliances　High-grade furniture

Specification　　Glass Thickness: 4mm −19mm

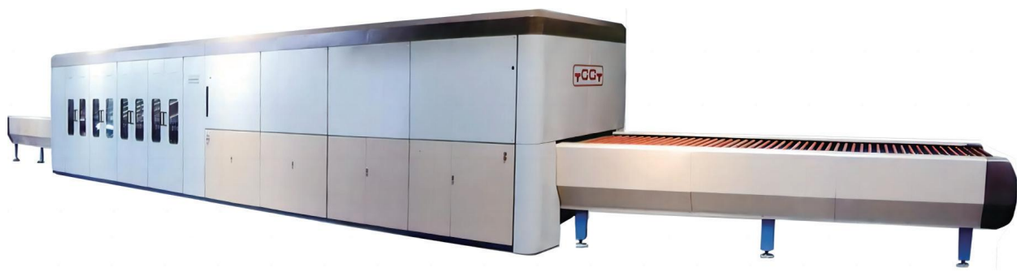
Type	Max.Size(mm)	Output(m^2/h)	Dimension(m)(L×W×H)	Installed Power(KW)	
				Heat & Drive	Blower
GT3017	3000×1700	76	17.84×4.65×2.11	330	265
GT3621	3660×2150	110	19.54×5.05×2.11	500	265
GT3624	3660×2440	130	19.54×5.36×2.11	640	295
GT4015	4000×1500	90	21.72×4.42×2.11	396	245
GT4224	4200×2440	151	22.56×5.36×2.11	670	325
GT5024	5000×2440	180	23.99×5.36×2.11	880	325
GT6024	6000×2440	216	29.63×5.36×2.11	1060	360
GT6030	6000×3000	270	29.63×5.86×2.11	1315	400
GT8024	8000×2440	290	37.81×5.86×2.11	1400	400
GT8033	8000×3300	396	37.81×7.00×2.30	1900	452
GT10033	10000×3300	495	46.75×7.00×2.30	2170	640
GT12033	12000×3300	594	55.84×7.00×2.30	2610	640

General Energy Consumption

Glass thickness(mm)	4　5　6　8　10　12　15　19
Unit Consumption(kw·h/m^2)	< 6　< 5　< 5.5 < 5.7　< 6　< 7.2　< 9　< 11
Working power consumption	≤60% of installed power
Discharge temperature	40℃ - 60℃
Rate of finished product	>95%

GTB Series Thin Glass Tempering Equipment

Automobiles　Home appliances　High-grade furniture　Bathrooms　Doors & windows　Inlay decorations　Indoor partition walls



Specification　　Glass Thickness: 3.2mm −19mm

Type	Max.Size(mm)	Output(m^2/h)	Dimension(m)(L×W×H)	Installed Power(KW)	
				Heat & Drive	Blower
GTB1307	1300×700	14	7.60×3.0×1.75	80	147
GTB1610	1600×1000	24	8.68×3.5×1.90	130	265
GTB1807	1800×700	19	9.95×3.0×2.00	105	215
GTB2110	2100×1000	31	11.90×3.8×2.00	160	245
GTB2212	2200×1200	40	12.30×4.0×2.00	200	294
GTB2415	2400×1500	54	13.86×4.2×2.00	265	350
GTB3015	3000×1500	68	18.46×4.2×2.00	330	350
GTB3017	3000×1700	76	18.46×5.3×2.00	370	425
GTB3320	3300×2000	99	19.54×5.8×2.00	470	475
GTB3612	3660×1200	65	20.05×4.0×2.00	330	394
GTB4012	4000×1200	72	21.72×4.0×2.00	365	309
GTB4015	4000×1500	90	21.72×4.2×2.00	450	395

Note:

1. The output is calculated according to glass of 5mm based on 100% of the loading rate and100% of rate of finished products;
2. The actual output is ≤85% of the theoretical output. It is in connection with the hapes, dimensions and edge quality of the glass as well as glass loading rate;
3. The Min.distance between two sheets of glass is 50mm.

GTW-H Series Flat & Lateral Bending Glass Tempering Equipment

Specification

Type	Max Glass Size(mm)		Range of Thickness(mm)	
	Flat	Bending	Flat	Bending
GTW1612H	1600×1200	1600×1200	4~19	5~12
GTW2415H	2440×1500	1550×1500	4~19	5~12
GTW3621H	3660×2150	2150×1500	4~19	5~12
GTW3624H	3660×2440	2440×1500	4~19	5~12
GTW5024H	5000×2440	2440×1500	4~19	5~12
GTW6024H	6000×2440	2440×1500	4~19	5~12
GTW8024H	8000×2440	2440×1500	4~19	5~12

GTW-Z Series Flat & Longitudinal Bending Glass Tempering Equipment

Features:

It's capable of tempering equal curvature bending glass, and parabolic bending glass.

Specification

Type	Max Glass Size(mm)		Range of Thickness(mm)	
	Flat	Bending	Flat	Bending
GTW3621Z	3660×2150	3660×2150	4~19	6~19
GTW3624Z	3660×2440	3660×2440	4~19	6~19
GTW5024Z	5000×2440	4000×2440	4~19	6~19
GTW6024Z	6000×2440	4000×2440	4~19	6~19
GTW8024Z	8000×2440	5000×2440	4~19	6~19
GTW6030Z	6000×3000	5000×3000	5~19	6~19
GTW6033Z	6000×3300	5000×3300	5~19	6~19
GTW8033Z	8000×3300	5000×3300	5~19	6~19
GTW9033Z	9000×3300	5000×3300	5~19	6~19

GTD Series Forced Convection Heating Glass Tempering Equipment

Features:

It keeps the glass to be heated more homogenously and rationally as well as shortens the time for glass heating.

Application:

Specially suitable for production of tempering Low-E glass, various coated glass, screen printed glass and high quality of flat and/or bent glass.

Specification

Type	Max.Size(mm)	Output(m^2/h)	Dimension(m)(L×W×H)	Installed Power(KW)	
				Heat & Drive	Blower
GT3624D	3660×2440	130	19.54×5.36×2.11	640	295
GT4224D	4200×2440	151	22.56×5.36×2.11	670	325
GT5024D	5000×2440	180	23.99×5.36×2.11	880	325
GT6024D	6000×2440	216	29.63×5.36×2.11	1060	360
GT6030D	6000×3000	270	29.63×5.86×2.11	1315	400

GTS Series Two-Chamber Glass Tempering Equipment

Features:

One (1) preheating chamber is installed in front of the heating chamber. The glass waiting time in the furnace can be shortened, quality of glass surface and productivity are thus boosted by a great deal. Heating by means of convection at low temperature preheating chamber keeps the glass to be heated more homogeneously and to avoid any initial warping when entering into the furnace at the beginning. And surface quality of the tempered glass is thus improved.

Application:

This type of furnace is particularly suitable for production of soft Low-E glass and thicker glass. It is also suitable for production of orders with big quantity and /or mono-sized products of singularity.

Specification

Type	Glass Size(mm)		Thickness(mm)	Outpute(m^2/h)	Installed power(KW)	
	Max.	Min.			Heating & driving	Blower
GTB3612S	3660×1200	180×100	3~12	130	690	405
GTB3616S	3660×1600	180×100	3~12	173	920	480
GTB5012S	5000×1200	180×100	3~12	180	960	425
GT3624S	3660×2440	300×150	4~19	195	1270	295
GT4224S	4200×2440	300×150	4~19	230	1330	325
GT5024S	5000×2440	300×150	4~19	270	1750	360
GT6024S	6000×2440	300×150	4~19	324	2110	410
GT6030S	6000×3000	300×150	5~19	405	2610	345

GTL Series Continuous Heating Glass Tempering Equipment

Features:

This equipment adopts increment heating mode of unidirectional running to enable the glass uniformly heated and enhances production efficiency. It has characteristics of good flatness and high surface quality of glass, low energy consumption and good stability of product etc.

Application :

It is particularly suitable for making products with big quantity of orders or little variation in glass thickness, which is specially used for tempering ultra-clear figured glass and thin glass.

Note:

1. The calculation is based on photovoltaic glass in thickness of 3.2mm;
2. The equipment can be fabricated as per customer's requirement;
3. The equipment can be connected with automatic loader, edge grinder and washing machine to form a fully automatic glass tempering production line.

Specification　　Glass Thickness: 3mm ~ 6mm

Type	Max.Size(mm)	Output(m^2/h)	Required power supply(KVA)
GTL2010-24	2000×1000	300	1250
GTL2212-24	2200×1200	340	1600
GTL2212-30	2200×1200	420	2000
GTL2215-24	2210×1500	380	2000
GTL2217-24	2200×1700	450	2000
GTL2217-30	2200×1700	625	2500
GTL2514-50	2500×1400	1120	5000
GTL2514-60	2500×1400	1300	6300

Deep Processing Line Integration

Features:

1 . Intelligent integration of various process equipment on deep processing line, reducing labor cost, shortening production cycle, improving product quality, and achieving digital production management in factory;

2 . Customized as per customer requirements.

Solar Glass Automatic Paper Interleaving & Stacking System

Features:

Its main advantage is that the glass after tempering is sucked and taken from its lower surface to avoid anysucking marks on its top surface.

Application:

The equipment is particularly suitable for various type of continuous heating glass tempering equipment with different sizes. It is designed to stack the glass onto container racks, or naked package, glass thickness ranging from 2mm to19mm. Production of orders with big quantity and /or mono-sized products of singularity.

Specification

Glass size of stacking	Same as the glass to be tempered
Glass positioning accuracy & deflection detect accuracy	±1mm
Max.stacking thickness	500mm
General positioning accuracy	3mm
Stacking cycle time	Adjustable

EQUIPMENT FOR VARIOUS GLASS PRODUCTION LINES

(FLOAT, FIGURED & SHEET GLASS)

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CONTENTS

Fully Automatic & High-Precision On-Line Longitudinal Cutting Machine

Main Features

1. Several cutters on either side of the bridge, and they are stand-by each other
2. The cutter head location is automatically positioned through touch screen;
3.Automatic offset for each side;
4.Seamless switching of cutting heads on lateral cuts;
5. Cutting heads automatically raise and lower when glass breakage is detected;
6. High accuracy servo motor and gear box, high speed & high accuracy positioning and automatc zero-resetting;
7. Raising & lowering of cutting head is electrically controlled. Switching of cutting heads is by electro-magnets to ensure the accuracy;
8. The system remains network linking. The snapping device on the edge of the ribbon will automatically allocate the cut made on the glass and suitable position itself;
9. Facilitating an interface with external quality inspection and optimizing systems to realize functions of automatic optimizing & cutting.

Specification

Cutting accuracy	±0.3mm
Thickness of cutting	1.0 ~ 19mm
Automatic positioning accuracy	±0.3mm
Range of pressure adjustment	0 ~ 100N

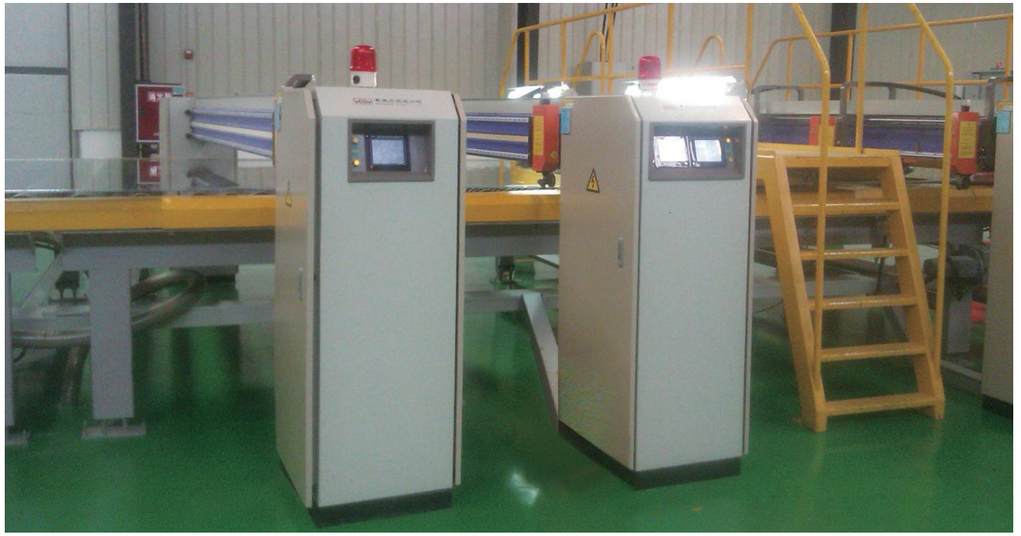
High-Precision On-line Lateral Glass Cutting Machine

Main Features

1. It can be connected to the cold end control system and stacking machine etc. by means of convenient network:
2. The computer control system enables the lateral cutting machine to have the function of alternative cutting with four different lengths (size wise) of glass sheets;
3. The two cutters can be as standby or working simultaneously and altematively;
4. Facilitating an interface with external quality inspection and optimizing systems to realize functions of automatic optimizing & cutting.

Specification

Cutting accuracy	±0.2mm/m
Cutting straightness	0.5mm
Thickness of cutting	1.0 ~ 19mm
Diagonal dimensional tolerance	±0.75mm
Max.cutting width	5600mm
Ribbon length cutting range	200~10000mm



Glass Stacking Robot

Main Features & Specification

1. Using German KUKA or Sweden ABB robot body;
2. The robot's characteristic of rapidness and flexibility is shown fully during stacking process;
3. Two sheets of glass can be taken synchronously and stacked respectively;
4. Capable of meeting the requirement of glass sheet taking from both the top and bottom;
5. Automatic warm-up function can meet the requirement of application in a low temperature;
6. Stacking positions: 2 Nos.;
7. Stacking cycle: 9s;
8. Stacking accuracy: +3mm

Vertical Glass Stacking Machine by Means of Under-Ribbon Taking

Features:

The equipment is particularly suitable for float or figured glass production lines with different tonnage. It is designed to stack the glass onto either container racks or naked package, glass thickness ranging from 2mm to 19mm.

Application :

Its main advantage is that the glass is sucked and taken from its lower surface to avoid any sucking marks on its top surface.

Specification

Stacking positions	2 pcs
Glass size of stacking	3660×3000mm~2000×1500mm
Glass positioning accuracy & deflection detect accuracy	±2mm
Max.stacking thickness	400mm
General positioning accuracy	5mm
Stacking cycle time	15s ~ 20s （Adjustable）

Horizontal Glass Stacking Machine

Horizontal Stacking Machine for Glass with Small & Medium Size

Features:
Four (4) to six (6) stackers can be installed on a 1000T/D float glass production line to fully satisfy the demand for mechanized stacking

Application :
The equipment is particularly suitable for foat or figured glass production lines with different tonnage. It is designed to stack the glass onto either container racks, or wooden crates, or naked package. Glass size ranges from 4200x3660mm to 2000x1500mm with a thickness ranging from 2mm to 19mm.

Specification	
Stacking positions	4 pcs.
Glass size of stacking	5200×3660mm ~ 2000×1500mm
Glass positioning accuracy & deflection detect accuracy	±2mm
Max. stacking thickness	500mm
General positioning accuracy	5mm
Stacking cycle time	14s ~ 16s （Adjustable）

Horizontal Stacking Machine for Glass with Jumbo Size

Features:
One (1) stacker can be installed on a 1000T/D float glass production line to fully satisfy the demand for mechanized stacking

Application :
The equipment is particularly suitable for float alass production lines with diferent tonnage. it is designed for naked packing. Glass size ranges from 12000x4000mm to 2000x3000mm with a thickness ranging from 2mm to 19mm.

Specification	
Stacking positions	2 pcs.
Glass size of stacking	18000×4000mm ~ 2000×3000mm
Glass positioning accuracy & deflection detect accuracy	±2mm
Max. stacking thickness	400mm
General positioning accuracy	5mm
Stacking cycle time	15s ~ 20s （Adjustable）

Glass Packing Equipment

Paper Interleaving Machine

Main Features & Specification

1. Using drum type paper for interleaving, and solving the problem of paper adsorptions;
2. Function of automatic paper correction/adjustment during the process of paper conveying;
3. The servo paper conveying system ensures the paper interleaving accuracy;
4. Adaptive glass lateral swing;
5. Electrostatic equipment ensures a firm paper adsorption;
6. The unique and original paper cutting technology;
7. To realize a selective paper interleaving by means of network with conveying system;
8. Max. paper drum weight:1T

Marking Machine

Specification

1. Marking accuracy	±10mm
2. Max.speed of movement	4m/s
3. Suitable speed of glass ribbon	50 ~ 1200m/h

Main Features

1. It can be connected to a glass defect detecting system and glass cutting system etc. by means of convenient network;
2. Gemman imported marking head;
3. The marking heads located at the either end can work by means of divided zone marking and also can be as standby;
4. Two functions of marking of glass defects tracking and glass quality grading & marking;
5.Spray gun automatic maintenance function.

Powder Spraying Machine

Specification

Powder spraying accuracy	0.1-1G/m^2
Max. suitable ribbon speed	5000m/h

Main Features

1. Powder spraying uniformity is improved by means of multinozzle structure;
2. Using frequency conversion technology to adjust the amount of powder spray with powder taking box, and mold powder consumption is saved;
3. Imported equipment is used for some key parts to ensure a stable running with the equipment and easy maintenance & operation;
4. With the cold end system networking function, automation is thus realized.

Cold End Roller Conveyor

Main Equipment Constitution & Specification

1. Roller Conveyor(Max.speed of 5400m/h);
2. Emergency devices of knocking down, ribbon taking and crushing;
3. Purging and cleaning; cleaning by air blowing;
4. Lateral break-off device;
5. Accelerating and separating roller conveyor;
6. Edger rolling mill;
7. Ordinary type and full-seal dust-free edge trimming devices;
8. Chevron device of ordinary and friction-free types;
9. Main knocking down device (Double knocking down and key-type knocking down) and ribbon taking as well as crushing devices;
10. Glass sheet transferring machine (one-way, two-way or interchange);
11. Air cushion table.

Automatic Process Control & Management for Flat Glass Production

DCS for Hot End

Features:

The system adopts a structure of distribution and realizes an automatic control integrated management for processes of melting, forming and annealing by collecting, analyzing and processing parameters of temperature, pressure and flowrate, etc. during production. The energy consumption is thus reduced, and quality and rate of finished products of glass are also thus improved.

Application:

The system is suitable for the control and management of production process of float, horizontal drawing and figured glass production lines with fumace of cross fire, end fre and unit melter:

Specification	
Fumace pressure	±1Pa (No negative pressure occurs during the commutation period)
Glass level	±0.1mm
Single point temperature of breast wall at working end	±3 ~5℃
Temperature of glass metal at the canal	±1℃
Duration for flame reversal	<45s
Temp. of glass ribbon at exit of tin bath	±1℃
Lateral temp. difference at tin bath	±10℃
Speed of top roller	±1m/h
Lateral temperature difference at annealing lehr	±5℃
Single point temperature at annealing lehr	±3℃
Speed of roller conveyor at annealing lehr	±1m/h

Control System for Cold End

Main Control Functions

1. Detecting and tracking of speed of A/L roller conveyor,
2. Realizing controls of lateral breaking off and accelerating & separation:
3. Receiving data from cutting system and performing, snapping,longitudinal snapping and separating, for the disqualified glass & automatic knocking down of the qualified glass;
4. Receiving data from cutting machine, tracking of the location and assigning to the designed stacking machine,
5. Reading and accessing the data of the size and pieces of stackable glass for integrated control;
6. Control of conveying speed at various section and/or positioning,
7. Monitoring the status of equipment running and alarm of various malfunction and historical record.

Other Equipment/Facility for Glass Production Line

Power Regulating Cabinet for Tin Bath

Main Features & Specification

1. Synchronization is achieved by taking data from both ends of the Silica Control Rectifier without phase testing;
2. Serial port connection built in for communication with Distribution Control System without drift and anti-interference;
3. Each loop is equipped with protection and alarm facility;
4. It can be switched from automatic to manual operation on each loop; Each loop has an independent manual operation device;
5. Transformer of dry type has “star" or “delta” connection;
6. Power ranging from 0 ~ 200kw.

Image Analysis & Glass Level Control System

A Image Glass Level Control Device

Specification

Detecting Accuracy	±0.1mm
Control Accuracy	±0.5mm

Main Features

1.Using computer operating (control) system for easy operation and maintenance;
2. Using advanced PiD automatic control with stability of the system;
3. With both functions of automatic and manual adjusting for easy manual regulation;
4. Consultation of historical curve;
5. Function of over limit alarm;
6. Without rubbing the lens all the year round;
7. Visual transmission is of optical fiber transmission, without the harsh industrial environment interference.

B Image Glass Ribbon Width Flow Control Device

Specification

Detecting Accuracy	±1mm
Control Accuracy	±5mm

C Detecting System of Image-Analysis for Glass Integrity

Specification

Detecting accuracy	0.5mm
Suitable for max. glass speed	4800m/h

Main Equipment Constitution & Specification

1. The system is of visual inspection system for float glass;
2. With this system, data (including size/specification, angle, grade, any breakage etc.) of the glass can be automatically detected;
3. Retains the function of on-line communication sending glass data;
4. Specification for this detecting is set as per the requirement;
5. The detected data can be saved and stored for easy access.

High Temperature Utiliscope Monitoring System

Utiliscope Monitoring System for Furnace

The system is used for monitoring the working conditions inside the furnace, it can clearly observe the bubble line, location of batch pile and working conditionn of combus-tion flame at the port orifice as well as the status/states of corrosion of the tank wall. The system is equipped with imported advanced CCD pickup camera and special utiliscope monitor to ensure the images legible, clear and stable. The pickup camera is capable of working in a furnace at a high temperature and serious dust pollution for a long period. A clear image can be secured provided the conditions for water and air/gas supply reaches its requirement without cleaning the lens regularly.

Utiliscope Monitoring System for Tin Bath

The system is used for monitoring the working conditions of tin bath during glass production, particularly the working condition of top roller and glass ribbon running inside the tin bath. The system is equipped with imported advanced CCD pickup camera and special utiliscope monitor to ensure the images legible, clear and stable. The pickup camera is capable of safely working in the tin bath for a long period by using of ball-type adjusting gas/water double cooling protective housing/sleeve, easy mounting for installation and commissioning.