APPENDIX 1

THE EQUIPMENT AND SERVICES

1. **Heat Treatment**

Product	Product Description
FC500 - 2848	Glaston flat tempering furnace
380 2848	Blower system for tempering down to 3.8mm acc. to EN 12150 and ANSI Z97.1
HS10 2848	Heat strengthening system for clear glass up to 10 mm acc. to EN 1863 (N8x required)
N85 2848	Noise reduction cabin around the chiller LpA = 85 dB(A)
TURNKEY	Turnkey installation (off-loading of equipment at site including all handling equipment and manpower, supply of all labour and tools required to mechanically/electrically install and commission equipment).
CARE3	Service Agreement for three years
iControL Intelligence	Extensive production and maintenance reporting system, includes IR scanner (SCA) and energy consumption measurement system
Spares 2	Spare part package 10,000 GBP

1.1. INSTALLATION SUPERVISION AND TRAINING AT SITE

1.2. 6/7 weeks installation
1.3. 2 weeks start-up including acceptance testing
1.4. 1 week training

MANUFACTURING STANDARDS

The standards used in manufacturing of the Equipment are SFS and DIN.
Metric system is used.

SAFETY REGULATIONS

The machinery complies with the essential health and safety requirements of the Machinery Directive (2006/42/EC). The final technical documents to be supplied by the Seller will be delivered in digital format (CD-Rom or equivalent) in addition with one set of paper copies.

All weights, dimensions, and specifications set forth in this Agreement are guidelines only and should be understood to be estimates. The Seller reserves the right to alter the foregoing, except that no specifications relating to glass length, width, thickness or production rate may be altered without Buyer's written consent.

TAMGLASS HORIZONTAL TEMPERING FURNACE
FC500-2848-380 with CGSB

Type of Operation	1-stage

	Glass thickness range:	
	3.8..19 mm tempering	EN 12150-1 – 2000, ANSI Z97.1 - 2009 GB 15763.2.
	2.8..10 mm heat strengthening	EN 1863
	2.8..8 mm heat strengthening	ASTM 1048

	Loading area:	
 **MIN**	3.8 mm and over	2800 x 4800 mm

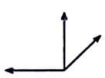
	Maximum glass sizes with clear float glass:	**EN 12150-1 – 2000, ANSI Z97.1 - 2009 GB 15763.2.**
 **MAX**	3.8 mm and over	1700 x 2500 mm
	4.7 mm and over	2000 x 3000 mm
	5.7 mm and over	2800 x 4800 mm

	Maximum glass sizes With soft coated lowE glass :	**EN 12150-1 - 2000 ANSI Z97.1 – 2009 GB 15763.2.**
 **MAX** **LOWE**	3.8 mm and over	1700 x 2500 mm
	4.7 mm and over	1700 x 2500 mm
	5.7 mm and over	2800 x 4800 mm

	Minimum glass size	**EN 12150-1 - 2000 ANSI Z97.1 – 2009 GB 15763.2.**	**EN 1863 ASTM 1048**
 **MIN**	3.8 mm and over	100 x 250 mm	200 x 450 mm

	Production rates per thickness Loads per hour per glass type	**Clear float glass tempering**	**Low-E (0,04) tempering**	**Clear float glass heat strengthening**
	4 mm	25	20	25
	5 mm	20	16	20
	6 mm 225	16	13	15
	8 mm 300	12	10	10
	10 mm 360	10	8	7
	12 mm 450	8	-	-
	15 mm	5	-	-
	19 mm	4	-	-

Above capacities are based on a batch or continuous 65% furnace loading efficiency and with glass size 865mm x 1930mm according to standards mentioned in the beginning of this document. Final capacity depends on glass size, shape and edgework quality.

	Dimensions of the plant:	
	Roller diameter	95 mm
	Roller distance	120 mm
	Total length	23.3 m
	Total height	3.1 m
	Working height	900 mm
	Total width	5.5 m
	Floor flatness	+/- 15 mm

The plant can be installed on a flat floor. Dimensions are indicative and final plant dimensions are given in machine layout.

Installed power at sea level:		
Heating and drives		1340 kW
Quench blowers	1 x 315 kW with inverter 1 x 315 kW with inverter	630 kW
Total		1830 kW

Environmental conditions:	
Temperature	20...40 °C
Relative humidity	< 80%

Minimum distance of sheets from each other is 50 mm.
Glass exit temperature over factory temperature + (20 ... 60)°C.

ACCEPTANCE PROTOCOL, ACCEPTANCE TEST PROCEDURES

1. After installation and commissioning, the acceptance test shall then be arranged with the present of the representative of both Buyer and Seller. The test procedures are the following.

2. Test clear float glass pieces
For the purpose of testing, the following pieces of glass shall be prepared:

Quantity	Thickness	Size
Clear Float Glass		
10	4 mm	865 x 1930 mm
10	6 mm	865 x 1930 mm
10	8 mm	865 x 1930 mm
10	10 mm	865 x 1930 mm
10	12 mm	865 x 1930 mm
10	15 mm	865 x 1930 mm
10	19 mm	865 x 1930 mm
Test of Low-E glass (e=0.04)		
10	4 mm	865 x 1930 mm
10	6 mm	865 x 1930 mm
10	8 mm	865 x 1930 mm
10	10 mm	865 x 1930 mm

The Buyer will provide glass in each thickness and type of 865 x 1930 mm before the actual test runs. The quantity needed will be stated by the Seller's engineer.

3. Inspection of Test Pieces after Tempering

A continuous visual inspection of the Equipment for a duration not longer than 2 shifts shall be conducted by both parties during commissioning. The Equipment shall be in stable operational condition and test pieces as stipulated herein.

Parties present at the test will inspect and ensure appropriate fragmentation by breaking 2 - 5 pcs out of each test run of 10 pcs. The fragmentation must meet the requirements as set out in Point 4 of this Appendix. In case of dispute out of the remaining 5 - 8 tempered pieces, 3 - 6 pcs can be sent to a neutral official testing laboratory and the remainder will be handed over to Buyer's disposal. The costs for transports and testing will be covered by the Buyer.

Test of other criteria according to the standards listed in Clause 4 below.

4. The quality to be reached according to the latest released standard:
Tempered glass according to EN 12150 and ANSI Z97.1.

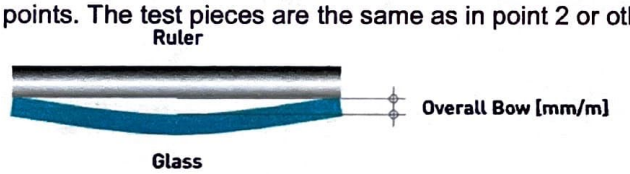
5. Inspection of capacity and output

During the testing, a detailed log book is kept on the cycle time for each batch, and it is agreed by both parties that the capacity and output of the Equipment are acceptable and satisfactory if the following batch cycle times are reached:

Thickness	Cycle time	Tolerance
Clear Float Glass		
4 mm	150 sec./ea	+/- 10%
5 mm	190 sec./ea	+/- 10%
6 mm	230 sec./ea	+/- 10%
8 mm	320 sec./ea	+/- 10%
10 mm	380 sec./ea	+/- 10%
12 mm	490 sec./ea	+/- 10%
(15 mm	700 sec./ea	+/- 10%)
(19 mm	900 sec./ea	+/- 10%)
Low-E Glass (e=0.04)		
4 mm	180 sec./ea	+/- 10%
5 mm	225 sec./ea	+/- 10%
6 mm	270 sec./ea	+/- 10%
8 mm	360 sec./ea	+/- 10%
10 mm	450 sec./ea	+/- 10%

6. Flatness

Overall Bow is measured along the edges of the glass and along the diagonals, as the maximum distance between a straight metal ruler, or a stretched wire and the concave surface of the glass. The pane of glass shall be place in a vertical position and supported on its longer side by two load bearing blocks at the quarter points. The test pieces are the same as in point 2 or otherwise specified separately.



Clear Float Glass

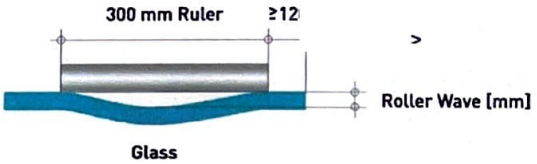
Thickness	Overall bow
4 mm	≤2.0‰
5 – 8 mm	≤1.5‰
10 - 12 mm	≤1.5‰
15 - 19 mm	≤1.5 ‰

Low-E Glass (e=0.04)

Thickness	Overall bow
4 mm	≤2.5 ‰
5 mm	≤2.0 ‰
6 – 10 mm	≤1.5 ‰

7. Roller Wave Tolerance

Roller wave is measured with a straight edge and feeler gauge over 300 mm span, excluding 150 mm rims. Glass is placed horizontally on flat support.



Clear Float Glass

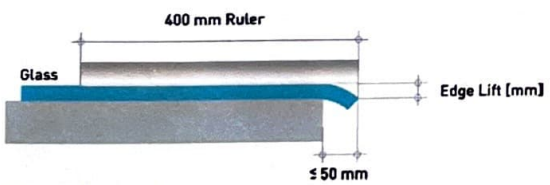
Thickness	Roller wave
4 – 5 mm	≤0.10 mm
6 – 12 mm	≤0.08 mm

Low-E Glass (e=0.04)

Thickness	Roller wave
4 – 10 mm	≤0.10 mm

8. Edge Lift

The gap between 400 mm ruler and a glass edge is measured with a feeler gauge. Glass is placed horizontally on flat support with the edge lift overhanging the edge of the support by 50 mm.



Clear Float Glass

Thickness	Edge lift
4 mm	≤0.25 mm
5 – 6 mm	≤0.2 mm
8 - 10 mm	≤0.15 mm
12 – 19 mm	≤0.10 mm

Low-E Glass (e=0.04)

Thickness	Edge lift
4 – 5 mm	≤0.3 mm
6 - 10 mm	≤0.2 mm

8. Handling if the test is failed
In case the test is failed due to Seller's reasons, Seller shall fix the problems within four weeks and run another test for the failure parts. If the second test still fails, Seller shall continue to fix the problem and arrange the third test and bear the cost of the glass used.

v4.1.0.3

GLASTON HORIZONTAL TEMPERING FURNACE

FC Series™ 2848-380-HS10

Glass thickness range

Thickness	Standard
3,8..19 mm tempering	EN 12150-1 - 2015, ANSI Z97.1 - 2015
3,8..10 mm heat strengthening	EN 1863
3,8..8 mm heat strengthening	ASTM C1048

Loading area

Thickness	Area
3,8 mm and over	2800 x 4800 mm

Maximum glass sizes for tempering with clear float glass

Thickness	Size (EN 12150-1 - 2015, ANSI Z97.1 - 2015)
3,8 mm and over	1800 x 2800 mm
4,7 mm and over	2800 x 4800 mm

Maximum glass sizes for heat strengthening with clear float glass.

Thickness	Size (EN 12150-1 - 2015, ANSI Z97.1 - 2015)
3,8 mm and over	1800 x 2800 mm
4,7 mm and over	2800 x 4800 mm
9,7 mm and over	2500 x 4000 mm

Maximum glass sizes for tempering with soft coated Low-E (0,04) glass

Thickness	Size (EN 12150-1 - 2015, ANSI Z97.1 - 2015)
3,8 mm and over	1800 x 2800 mm
4,7 mm and over	2300 x 3800 mm
5,7 mm and over	2800 x 4800 mm

Maximum glass sizes for heat strengthening with soft coated Low-E (0,04) glass

Thickness	Size (EN 12150-1 - 2015, ANSI Z97.1 - 2015)
3,8 mm and over	1800 x 2800 mm
4,7 mm and over	2300 x 3800 mm
5,7 mm and over	2800 x 4800 mm
7,7 mm and over	2500 x 4000 mm

MIN
UNDERNEATH

Minimum glass size

Thickness	Size (EN 12150-1 - 2015, ANSI Z97.1 - 2015)	Size (EN 1863, ASTM C1048)
3,8 mm and over	100 x 250 mm	200 x 450 mm

Capacity [Loads/hour]

Thickness	Clear	Low-E 0,04	HS Clear
4 mm	24	20	24
5 mm	19	16	19
6 mm	16	13	16
8 mm	12	10	10
10 mm	9	8	6
12 mm	6	-	-
15 mm	5	-	-
19 mm	3	-	-

Above capacities are based on 65% loading efficiency and with glass size 865mm x 1930mm according to standards mentioned in the beginning of this document. Final capacity depends on glass size, shape and edgework quality.

Dimensions of the plant

Dimension	Value
Roller diameter	95 mm
Roller distance	120 mm
Total length	23,0 m
Total height	3,4 m
Working height	900 mm
Total width	7,0 m
Floor flatness	± 10 mm

The plant can be installed on a flat floor. Dimensions are indicative and final plant dimensions are given in machine layout.

Installed power at sea level

Unit	Type	Power
Heating and drives		1161 kW
Quench blowers	2 x 315 kW with 2 x inverters	630 kW
Total		1791 kW
Convection demand	[8bar]	6,2 m³/min

Compressor for convection heating system, to be provided by the Buyer

Environmental conditions

Condition	Value
Temperature	20..40°C
Relative humidity	< 80%

Minimum distance of sheets from each other is 50 mm.
Glass exit temperature over factory temperature + (20 ... 60)°C.