



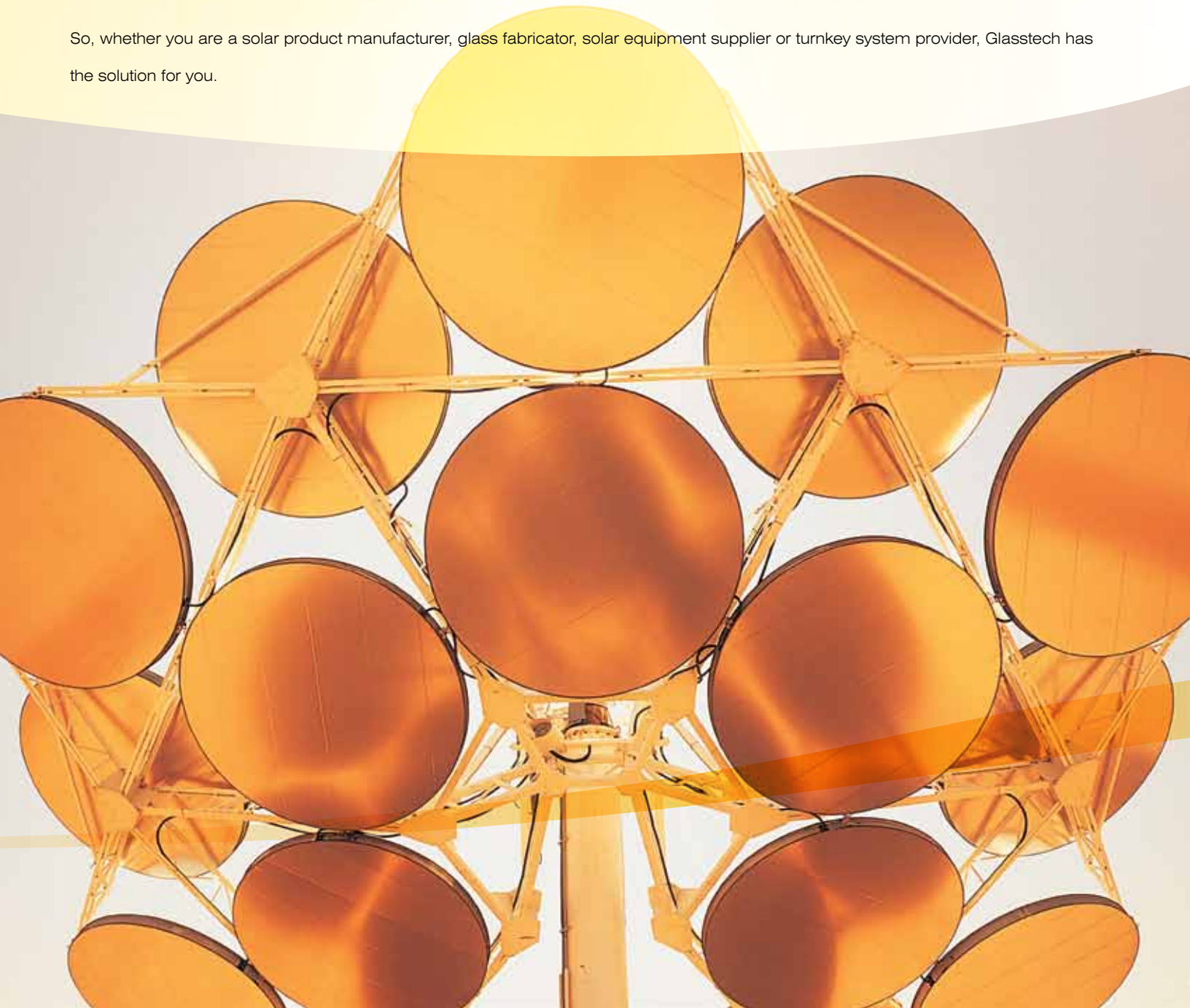
**glasstech**<sup>®</sup>  
WHERE INNOVATION CONTINUES  
Solar Glass Systems



# Solar glass heat-treating systems designed with our collective future in mind.

Solar technology is a rapidly expanding market requiring repeatability, tight specifications, innovation and cost effectiveness to help propel mankind into a “sustainable energy” future. With over 35 years of experience as the global leader in glass bending and heat-treating technology, Glasstech has provided innovative solutions for the automotive industry’s greatest challenges. Now, to meet the specific needs of solar industry customers for tightly specified glass shapes, Glasstech has once again taken the knowledge and ingenuity acquired across the globe to develop and refine glass bending and heat-treating processes to meet the challenges of the solar industry.

So, whether you are a solar product manufacturer, glass fabricator, solar equipment supplier or turnkey system provider, Glasstech has the solution for you.



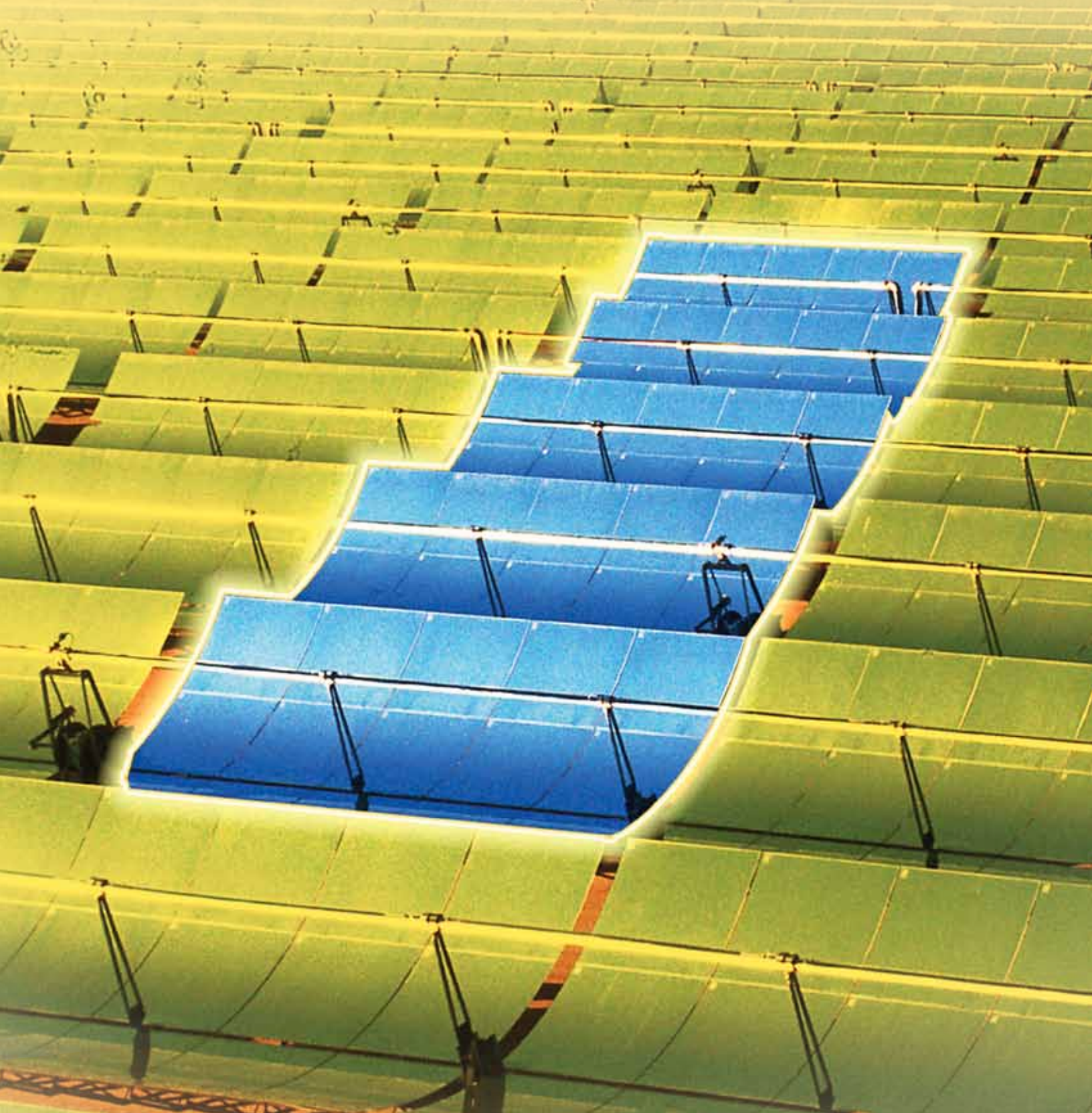


## | Systems Overview |

Most solar technologies use specialized glass substrates in some way. The glass must meet the rigid specifications needed by solar product manufacturers for strength, to enable their processes and fabrication equipment to work properly, as well as ensure that finished products perform as specified. Glasstech provides precisely bent or curved glass equipment solutions for concentrating solar power (CSP) and concentrating photovoltaic (CPV) markets, as well as equipment solutions for fabrication of extremely flat glass for the photovoltaic (PV) market.

# | Bent Glass Fabricating Equipment |

For use in fabricating glass reflectors for CSP or CPV, including trough, tower and dish technologies for thermal or direct CPV electricity production. In most cases, the glass substrate is low-iron and the bent product is silvered or coated by the customer to create a highly reflective mirror. The glass can be bent to form sections up to 1651mm x 1700mm (65" x 67") for parabolic troughs (four sections) or down to 228mm x 254mm (9" x 10") to create small paraboloids, depending on the system.



# CRB-S™

**Cylindrical Radius Bender – Solar Features:** Tempering/heat strengthening/low-stress glass system for producing large (low-iron) glass for parabolic solar reflectors. CRB-S can process glass up to 1651mm x 1700mm (65" x 67") in size and is also capable of producing glass suitable for laminating.



## CRB-S Production Capability\*

Glass Thickness**		48' Oscillator Loads/Hr	72' Continuous Loads/Hr
(mm)	(in)	Part Length 1700mm	Part Length 1700mm
1.6	.063	109	150
2.2	.087	109	150
3.0	.118	109	150
4.0	5/32	81	150
5.0	3/16	65	120

Minimum Radius: 1500mm (59")

\* Production rates for coated panels or different glass compositions will vary depending on part size, thickness and specific type of coating used, and the consistency of the coating. Low stress is defined as < 3,500 psi.

Full temper is defined as > 10,000 psi.

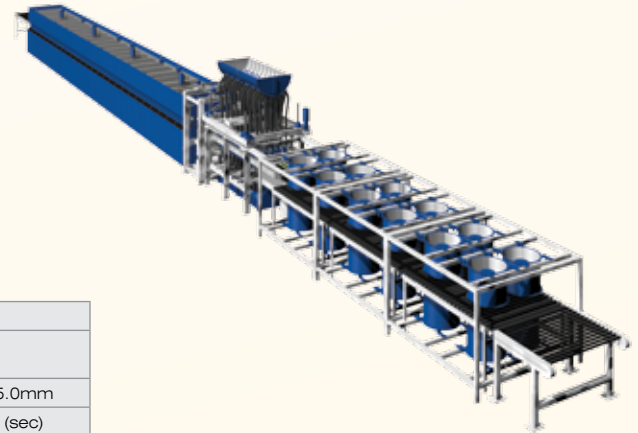
\*\* 1.6mm (.063") and 2.2mm (.087") are low stress.

3mm (.118") is heat strengthened only for that size.

4mm (5/32") and 5mm (3/16") can be heat strengthened or fully tempered.

# EPB-S™

**External Press Bender – Solar Features:** Tempering/heat strengthening system ideal for smaller, high volume spherical and parabolic shapes. Ideal for CSP and CPV that utilize many smaller parts to achieve similar field efficiencies. EPB features fast cycle times and highly accurate perimeter and surface tolerances. Minimum size is 228mm x 254mm (9" x 10") with small part option. Maximum size capacity is 1220mm x 864mm (48" x 34"). The most productive EPB is able to produce 900 parts per hour.



## EPB Production Capability - Based on 1m Part\*

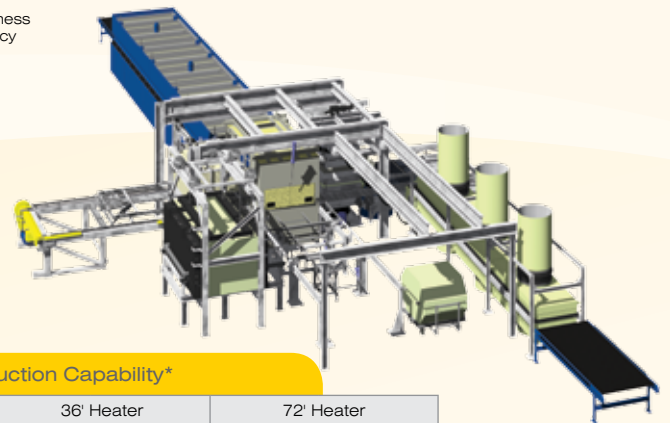
EPB Product Size and Forming Capability						
	Example System Configurations		Glass Thickness			
	Heater Length		3.0mm	3.5mm	4.0mm	5.0mm
	(m)	(ft)	(sec)	(sec)	(sec)	(sec)
EPB-SS Low Capacity	21.3	70	11.9	13.2	15	17.5
EPB-SS High Capacity	39.6	130	8.75	9.1	9.4	9.7
EPB-DS Low Capacity	21	69	11.9	13.2	15	17.5
EPB-DS High Capacity	37.8	124	8.75	9.1	9.4	9.7

Depth of Bend:  
Major Axis 84mm (3.3"), Minor Axis 31mm (1.22")  
Minimum Radius of Curvature:  
Major Axis 1143mm (45"), Minor Axis 6000mm (20")

\* Production rates for coated panels or different glass compositions will vary depending on part size, thickness and specific type of coating used, and the consistency of the coating.

# DB4-S™

**Deep Bend 4 – Solar Features:** Tempering/annealing system for producing smaller/high volume spherical and parabolic solar collector deep bend parts for CSP and CPV. Glasstech has numerous DB4 systems around the world which offer solar customers the flexibility for global short- and long-term supply.



## DB4-S Quick Change Production Capability\*

Glass Thickness		36' Heater Cycle Time – Loads/Hr		72' Heater Cycle Time – Loads/Hr	
(mm)	(in)	(sec)	(L/H)	(sec)	(L/H)
3.0	.118	24	150†	17-24	212-150††
4.0	5/32	32	112†	17-24	212-150††
5.0	3/16	40	90†	20-26	180-140†††
6.0	1/4	Conveyor Limit		24-26	150-140†††

Min. Radius of Curvature for 3mm (.118") Glass: 75mm (3")  
Max. Depth of Bend: 305mm (12")

† Heater limited

†† Shape dependent (press time)

††† Heater limited, shape dependent (press time) and quench time limited

## Quick Sag Production Capability\*

Glass Thickness		36' Heater Cycle Time – Loads/Hr		72' Heater Cycle Time – Loads/Hr	
(mm)	(in)	(sec)	(L/H)	(sec)	(L/H)
3.0	.118	24	150†	12	300††
4.0	5/32	32	112†	16	226††
5.0	3/16	40	90†	20	180†††
6.0	1/4	Conveyor Limit		24	150†††

Max. Depth: 100mm (4")

Min. Radius of Curvature: 1000mm (40")

Max. Radius of Curvature: 2540mm (100")

† Heater limited

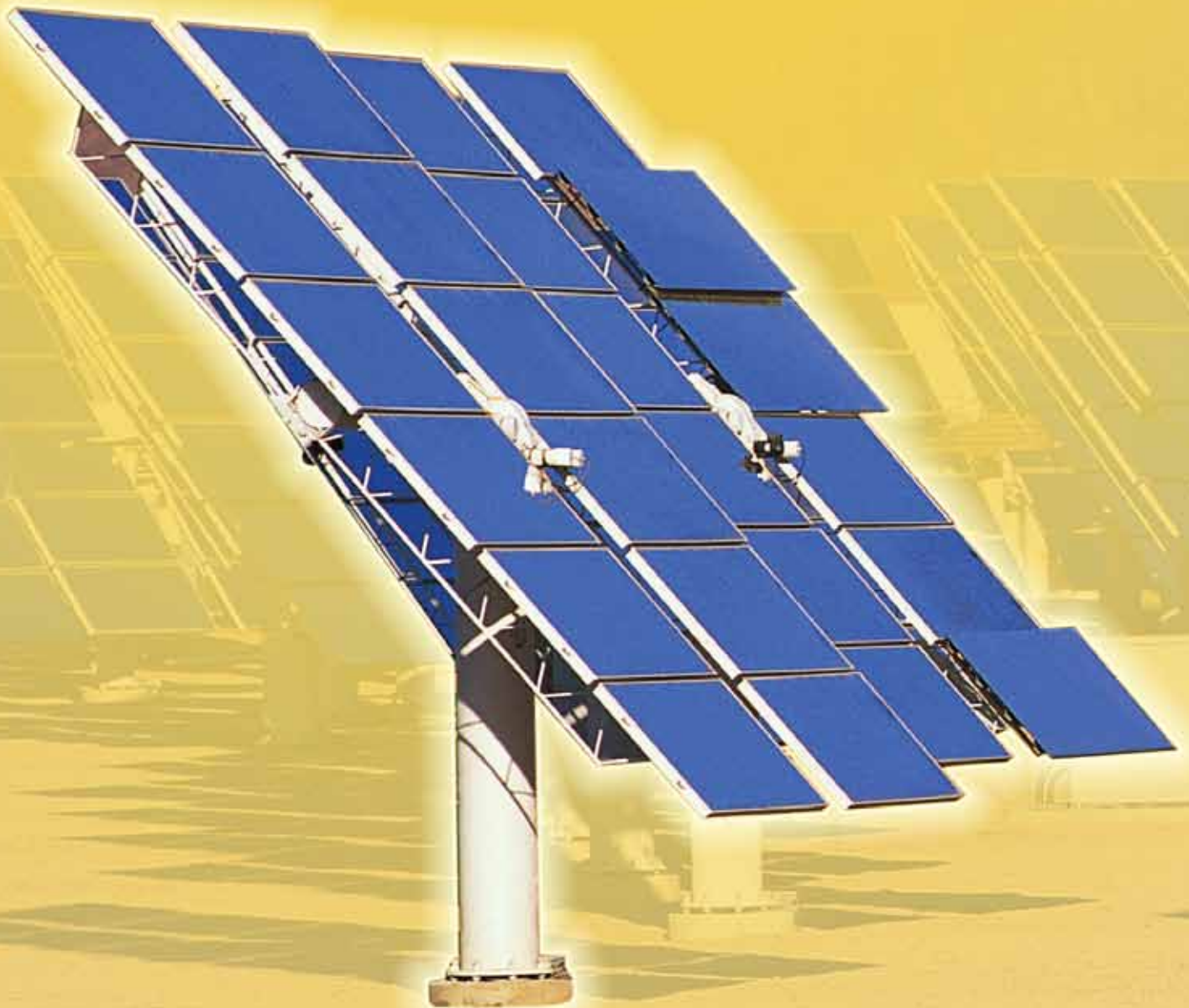
† Quench time limited

†† Min. cycle (sag time will increase cycle time)

\* Production rates for coated panels or different glass compositions will vary depending on part size, thickness and specific type of coating used, and the consistency of the coating.

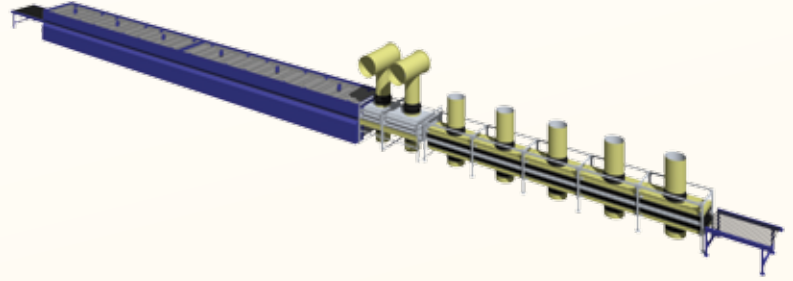
# | Flat Glass Fabricating Equipment Solutions |

For fabricating glass specified for either silicon wafer-based PV panels or thin film photovoltaic (TFPV) solar panels. Whether you need to heat-treat active (coated) glass panels, high light transmission (low-iron) smooth or textured cover panels, or rigid back panels, Glasstech equipment provides reliable, repeatable results at the high throughput you need.



# ERH-S™

**Electric Radiant Heater – Solar Features:** Continuous flat glass tempering system for processing high transmission (low-iron) cover panel and active (coated) glass, as well as clear glass for PV panels. ERH processes these products at fast cycle times with highly accurate perimeter and surface tolerances. The system is highly efficient and its rugged Glasstech design is engineered for years of trouble-free service with minimal manufacturing costs. Additional options incorporate Glasstech’s patented Profiled Convection™ heating system to assist in processing coated/Low-E glass at greater efficiencies.



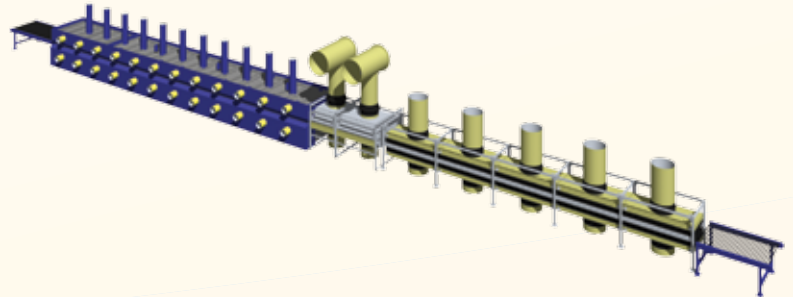
## ERH-S Production Capability\*

Glass Thickness		Standard 120' Length						Extended 144' Length					
		Production at Line Speed						Production at Line Speed					
		Meters/Minute			Feet/Minute			Meters/Minute			Feet/Minute		
(mm)	(in)	Most Glass Types	Low-Iron	TCO Coated**	Most Glass Types	Low-Iron	TCO Coated**	Most Glass Types	Low-Iron	TCO Coated**	Most Glass Types	Low-Iron	TCO Coated**
3.0	.118	18.3	15.9	12.2	60.0	52.2	40.0	21.9	19.1	14.6	72.0	62.6	48.0
4.0	5/32	13.7	11.9	9.1	45.0	39.1	30.0	16.5	14.3	11.0	54.0	47.0	36.0
5.0	3/16	11.0	9.5	7.3	36.0	31.3	24.0	13.2	11.4	8.8	43.2	37.6	28.8
6.0	1/4	9.1	8.0	6.1	30.0	26.1	20.0	11.0	9.5	7.3	36.0	31.3	24.0

\* Production rates for coated panels or different glass compositions will vary depending on part size, thickness and specific type of coating used, and the consistency of the coating.  
 \*\* TCO coating refers to Low-E type pyrolytic tin oxide coatings.  
 Systems Available in 48" (1220mm) and 60" (1520mm) Widths  
 Minimum Glass Size: 380mm (15") in Direction of Travel

# FCH-S™

**Forced Convection Heater – Solar Features:** Flat glass tempering system is the natural gas fuel alternative for flat solar panel glass. This technology requires less facility space for productivity equivalent to the ERH and can yield significant processing cost savings in most locations due to efficiency of natural gas heating versus electrical heating.



## FCH-S Production Capability\*

Glass Thickness		Standard 90' Length						Extended 120' Length					
		Production at Line Speed						Production at Line Speed					
		Meters/Minute			Feet/Minute			Meters/Minute			Feet/Minute		
(mm)	(in)	Most Glass Types	Low-Iron	TCO Coated**	Most Glass Types	Low-Iron	TCO Coated**	Most Glass Types	Low-Iron	TCO Coated**	Most Glass Types	Low-Iron	TCO Coated**
3.0	.118	18.3	15.7	15.7	60.0	51.4	51.4	24.4	20.9	20.9	80.0	68.6	68.6
4.0	5/32	13.7	11.8	11.8	45.0	38.6	38.6	18.3	15.7	15.7	60.0	51.4	51.4
5.0	3/16	11.0	9.4	9.4	36.0	30.9	30.9	14.6	12.5	12.5	48.0	41.1	41.1
6.0	1/4	9.1	7.8	7.8	30.0	25.7	25.7	12.2	10.5	10.5	40.0	34.3	34.3

\* Production rates for coated panels or different glass compositions will vary depending on part size, thickness and specific type of coating used, and the consistency of the coating.  
 \*\* TCO coating refers to Low-E type pyrolytic tin oxide coatings.  
 Systems Available in 48" (1220mm) and 60" (1520mm) Widths  
 Minimum Glass Size: 380mm (15") in Direction of Travel

# Innovation Continues

Glasstech systems are the product of inventive minds, creative thinking and innovative problem solving. Time and production have proven, beyond a doubt, that Glasstech equipment is the most rugged, dependable and versatile. Since 1971, Glasstech has been the leader in advancing glass bending and tempering technology with developments such as:

- Computer-controlled process and heat control
- Roller hearth transport
- Bending in the heat
- Horizontal processing without tong marks
- Precision, easily changed tooling
- Modular construction
- Diagnostic monitoring
- Advanced quenches, minimizing iridescence and reducing energy
- Forced convection and electric radiant heating
- Shape modeling proprietary software which corrects glass designs, minimizes distortion, maximizes optical quality and increases production efficiency
- Prototype production
- Auto Glass Inspector
- Sample/pilot production run capabilities

## Glasstech supports its systems with:

- A one-year warranty
- Retrofits
- Tooling
- Replacement parts
- Ceramic rollers
- Service audits
- Refresher operator training
- Custom service/support packages
- 24-hour phone, fax and E-mail service inquiries

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