STRINGER AND LAYUP
THE WORLD´S FASTEST HIGH-SPEED STRINGER SYSTEMS
When it comes to innovative production technology, teamtechnik is the international leader. Our highly flexible and modular assembly and test systems can be easily reconfigured. Starting with processes and components that have been well-proven and field-tested, ensures a high level of system availability.

We develop and manufacture automation solutions for the new energy, automotive and medical industry.

**teamtechnik group: facts and figures**
- 1,000 Employees worldwide
- 800 STRINGER TT delivered
- 180 Mio EUR turnover
- 40 Years experience in production technology
- 7 Production sites
- 16 Service locations worldwide
- 25 GWp production capacity supplied worldwide

**Focused on your requirements**

We are the global market leader in solar technology: Our high throughput STRINGER TT systems are used by the world’s major solar module manufacturers in the production of solar cell strings.
teamtechnik has delivered more than 800 STRINGER systems worldwide – with highest process stability and equipment availability.

Made in Germany
All teamtechnik STRINGER are engineered, assembled and tested at teamtechnik’s headquarters in Freiberg/Germany. An extensive internal test program in combination with the ISO 9001 certified manufacturing site ensures high quality in combination with short lead terms.

Experts in high throughput STRINGER systems
Our focus is on high volume STRINGER and layup systems. Extensive practical experience with string soldering machines at teamtechnik led to the development of the STRINGER TT4200/GIGA – a proven high-speed system based on the teamtechnik technology.

25 GW CAPACITY
TRUST THE WORLD MARKET LEADER

RUNS 24/7
HANDLING AND PROCESS STEPS
The STRINGER TT4200 GIGA has a production capacity of 145 MWp requiring only a floorspace of 15 m². Non-contact IR light soldering technology is used in combination with a closed-loop control system for a gentle and uniform soldering process providing the best in class soldering result. teamtechnik uses hold-down devices in its systems to separate the soldering process from the cell handling process. This guarantees 4,200 cycles/hour.

The hold-down devices ensure safe and reliable process steps and minimal breakage rates as well as precise positioning and alignment of cells and ribbons. The resulting strings offer impressive geometrical quality with excellent cell and ribbon positioning.

STRINGER TT4200 GIGA – the benefits:

- High throughput at 0.85 seconds cycle time
- Low breakage rate ≤ 0.1 – 0.2 %
- High production capacity on a small footprint (145 MWp on 15 m²)
- Separation of handling steps from soldering process
- Non-contact IR light soldering process
- Homogeneous temperature distribution on cell
- Very precise ribbon handling and positioning
- Industry leading availability and uptime
- Cost-effective and economical production
- Compact footprint
- Ready for the future: 6 busbars possible (as an option)
- Full and half cell processing capability
Extensive practical experience with string soldering machines at teamtechnik led to the development of the STRINGER TT2100, a highly flexible production system with a compact footprint.

Teamtechnik uses hold-down devices in its systems to separate the soldering process from the cell handling process. This guarantees 2,100 cycles/hour on a single-track – a technology that is already being used successfully in over 800 systems throughout the world.

At the same time the devices ensure safe and reliable process steps and minimal breakage rates as well as precise positioning and alignment of cells and ribbons. The resulting strings offer impressive geometrical quality, linearity, length tolerance and cell gaps with excellent cell and ribbon positioning.

**STRINGER TT2100 – the benefits:**

- High throughput at 1.71 seconds cycle time
- Low breakage rate ≤ 0.1 – 0.3 %
- Separation of handling steps from soldering process
- Non-contact IR light soldering process
- Homogeneous temperature distribution on cell
- Very precise ribbon handling and positioning
- Industry leading availability and uptime
- Cost-effective and economical production
- Compact footprint
- Ready for the future: 6 busbars possible (as an option)
- Full and half cell processing capability
The system uses optimized automation, proven technology and processes. The integrated 6-axis robot allows the system to be adapted quickly to different applications or cell and glass sizes.

The complete system consists of proven and tested modules such as STRINGER, robot and positioning station. Very short installation times and a perfect start of production are the benefits for our customers.

**145 MW HIGH PERFORMANCE SYSTEMS WITH ONLY ONE 6-AXIS ROBOT**

The STRINGER TT1600ECA has been designed for the high-output production of solar cell strings using innovative adhesive technology. Electrically Conductive Adhesive (ECA) enables the production of high performance solar modules.

With the STRINGER TT1600ECA, a high performing and innovative development in high quality string production, teamtechnik reconfirms its role as the market leader in solar module production technology.

### STRINGER TT1600ECA – the benefits:

- Reliable process technology with a proven standard STRINGER
- Ideal for processing HJT high performance cells and busbarless cells
- Possibility to use light capturing ribbons, LCR™
- Lead-free adhesive technology
- Cost-effective and economical production

### STRINGER TT1600ECA Features and Options

- Buffer trays
- Rejected strings sorted into buffer trays, standard: 2 trays
- Optional buffer trays can be provided
- Infeeding of repaired strings via trays
- Additional infeed and outfeed conveyors for glass panels as an option
- Adapted Ribbon Length System: Cost reduction due to production of strings with defined and varied ribbon length of first and last cell (depending on string position in the module layup). This System will avoid the wastage of ribbons, since no additional cutting will be required.
Unique teamtechnik technology

With up to 4,200 cycles/hour, the teamtechnik STRINGER runs as the world’s fastest stringing machine in solar factories of market leaders worldwide. Our system minimizes mechanical and thermal stress to the cells.

Using teamtechnik technology means: higher throughput for each process step, less complex equipment, smaller system footprint, reduced amount of spare and wear parts.

01 Precise flux dosing

The application of flux is done by spray application. teamtechnik uses proven metered micro spraying technology. This ensures a precise dosing of flux onto the busbars on the front and back side.

02 Hold-down device system

ensures high speeds and breakage rates of less than 0.1 – 0.3 %

teamtechnik uses new X-BB hold-down devices to separate the soldering process from the cell handling process. This guarantees 2,100 cycles/hour on a single-track and 4,200 cycles/hour with the TT4200 GIGA – a technology that is already being used successfully in all new teamtechnik systems. The X-BB hold-down device can be used for 3, 4, 5 and 6 busbars. At the same time the devices ensure safe and reliable process steps. This results in minimal cell breakage rates. Cells and ribbons are positioned and aligned precisely. The manufactured strings are of impressive geometrical quality and linearity, combined with exact length tolerance and cell gaps with excellent cell and ribbon positioning.

03 Gentle non-contact soldering

All teamtechnik STRINGER feature non-contact, controlled soldering technology using IR light. The closed loop controlled process technology compensates for variations in cell material to minimize breakage while ensuring consistent string quality.

The proven concept uses pre-heating from top and bottom. A post-heating zone is located after the soldering station to ensure a controlled cool-down of the soldered string. This gentle processing guarantees the lowest possible breakage rate.

RELIABLE PROCESS TECHNOLOGY
NEW CELL TECHNOLOGIES

Experienced in cells with up to 6 busbars, half cells, PERC, HJT, BC and MWT technology

The distinguishing feature of the STRINGER TT is its modular and standardized design. New cell technologies such as cells with 6 busbars, half cells, PERC, bifacial, HJT, BC or MWT have initially been tested by teamtechnik specialists in the company’s center of excellence and have been successfully brought into series production.

Bifacial cells

Bifacial cells have an active area on both sides. The ribbon positioning has to be very precise on the front and backside to achieve the maximum efficiency and power output of the module. Due to its patented hold-down device, teamtechnik STRINGER systems are the most precise and advanced systems for the interconnection of bifacial solar cells.

Heterojunction cells

HJT solar cells do combine c-Si and a-Si technology in one solar cell design. Due to the a-Si coating the cells are sensitive to high temperatures and cannot be soldered in a conventional soldering stringer system. teamtechnik developed the STRINGER TT1600ECA for the high-volume production of HJT solar cell strings. The cells are interconnected using electrically conductive adhesive in combination with structured ribbons.

The center of excellence establishes the best soldering and connection options for standard and special cells. Our worldwide customers appreciate our optimization work and expertise. This provides our customers the best result in their production based on our know-how.

SERVICE WORLDWIDE

HIGH AVAILABILITY THROUGHOUT THE LIFE CYCLE

We are where our customers need us. The teamtechnik service centers throughout the world manage a network of local service stations and guarantee quick and effective support – day and night. Contact persons are carefully matched to their responsibilities. Our customers benefit from the rapid response of our service team, consistently high production quality and satisfied system operators.

For our customers in Asia we provide the fastest service support from our local subsidiaries – with a highly qualified and experienced team.

teamtechnik’s service structure offers system training either in Germany, in China or at customer sites.

Optional ramp-up assistance and production support can be provided.

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