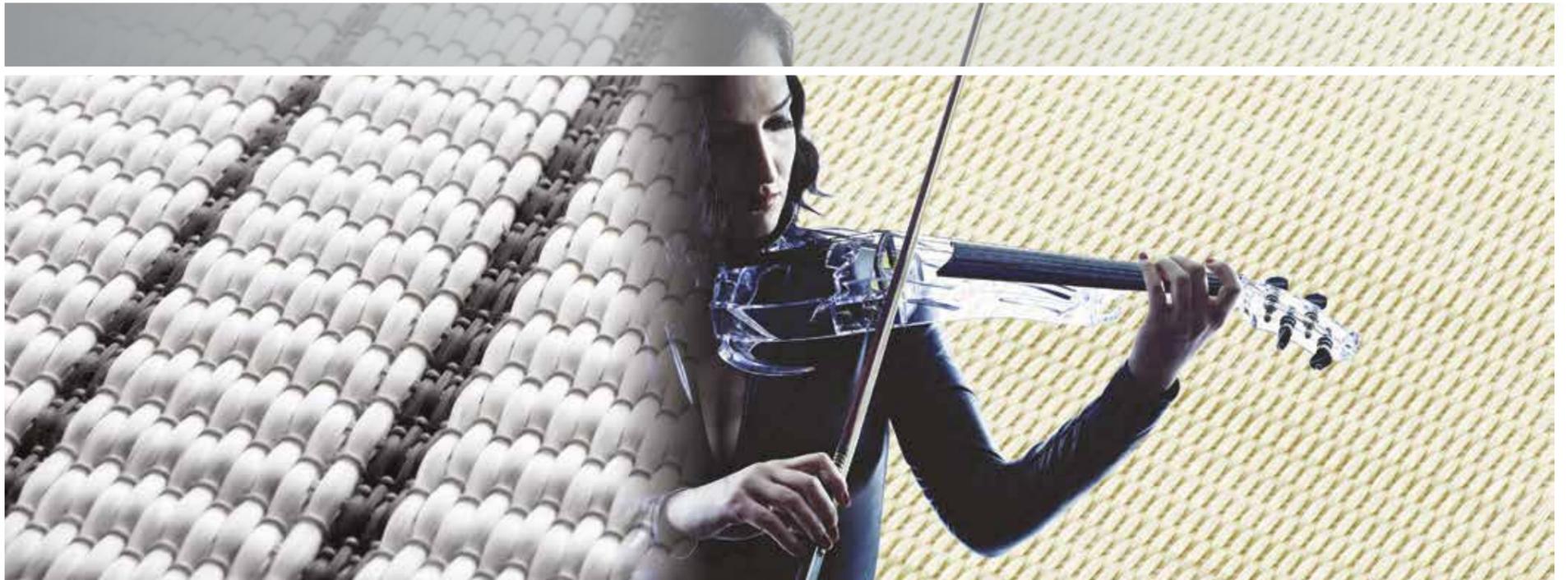


TECHNICAL FLASH



3D AND AIRBAG FABRICS

Technical Jacquard weaving solutions

SENSITIVE YARNS

Weaving preparation solutions for increased quality

SOPHISTICATED AND HEAVY FABRICS

Weaving solutions for reinforcement and heavy fabrics

ROBOTICS AND CONNECTORS

Fast moving technology from the Group

Stäubli solutions for technical textiles

Applications for technical textiles are progressively expanding into new and challenging areas. For some time now, textile surfaces have been used in the manufacturing of certain body parts for automobiles beyond the luxury class as well as in the interiors of practically all motor vehicles – from floor mats to seat covers to ceiling panels – and most automotive acoustical materials would be unimaginable without technical textiles.

It is now standard practice that aircraft fuselages, or nearly entire airplanes, are built with the aid of industrial textiles. In the health care field, specially treated textiles are used to support the healing of patients. The list of application possibilities can be extended almost ad infinitum, and new ideas arise every day as researchers and engineers find new areas in which technical advances, better materials, weight reduction, cost savings, and much more can be realized through the use of textiles.

When it comes to fabrics used in textile surfaces, one can safely assume that Stäubli machines have been used in the production of most materials produced worldwide. With core competencies in the areas of shed formation (dobbies, cam motions, and Jacquard machines) and weaving preparation (warp drawing-in and tying machines), Stäubli carries a significant share of the responsibility for the design and quality of the end products.

Key factors here are a full century of experience in the classical textile industry plus the continual development and perfecting of high-performance machines, including of course those for manufacturing technical textiles. Stäubli introduced the SAFIR S30, a unique drawing-in machine that redefines conventional drawing in.

Innovative in design and operation, this machine, which is specialised for drawing in filaments, boasts very high quality and productivity. With its mobile base, the SAFIR S30 can be used in the weaving mill precisely where it is needed: directly at the warp beam – from which feeds directly into steel or synthetic O-heads. Turn to page 4 of this issue of Flash to find out how the SAFIR S30 also masters the challenges of drawing in highly delicate glass yarns.

In close collaboration with its customers, Stäubli has optimized and perfected its machines for textiles production, and today manufacturers around the world use Stäubli machines for technical textiles. On the following pages you will find several examples of Stäubli machines being used to make such textiles. We hope you will find the reading informative and interesting.

High-tech in 3 activities

Founded as a small company in 1892, Stäubli quickly grew into an international manufacturer of textile machines. Over the years, this original business was expanded into additional business areas that gradually became parts of the Group's activities: The Connectors activity was established in the 1950s and the Robotics activity in 1980.

These three highly successful activities, which mutually support and cross-fertilize one another with their various technologies, today form the backbone of the globally active Stäubli Group.

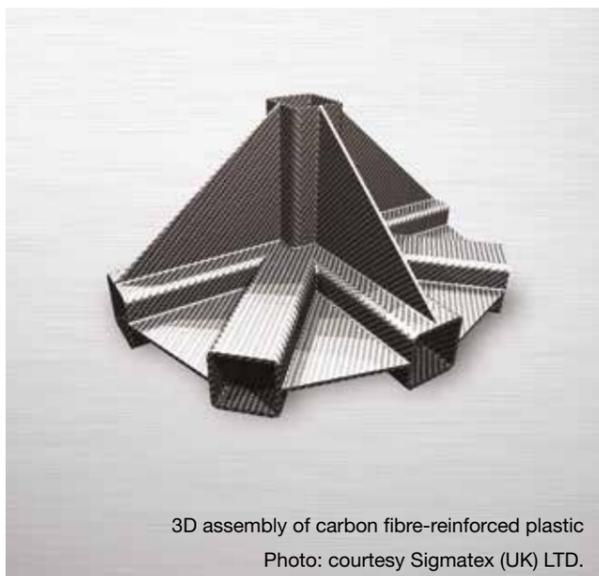
Scan to learn more about Stäubli's solutions for technical fabrics



COMPLEX FABRICS

Be innovative!

Numerous weaving mills have specialized in the creation of complex technical fabrics, e.g. those used for making composites. They are continually on the lookout for innovative technologies that allow them to make new fabrics the world has never seen before.



3D textiles for new applications

In recent years we have seen the appearance of a new type of technical multilayer fabric, so-called 3D textiles. Finished products incorporating these textiles are being used in applications with increasingly more stringent mechanical requirements. A special example is the aerospace industry, where traceability and reproducibility are central aspects of product specifications. Critical in the production of such industrial textiles is the ability to precisely control the arrangement of the warp threads within the shed of the various layers.

UNIVAL 100 – perfectly suited for technical fabrics

The compact UNIVAL, with its modular design, is perfectly suited for the production of all sorts of flat fabrics, and furthermore for applications in technical textiles, which require utmost reliability in shed formation and extremely high control accuracy.

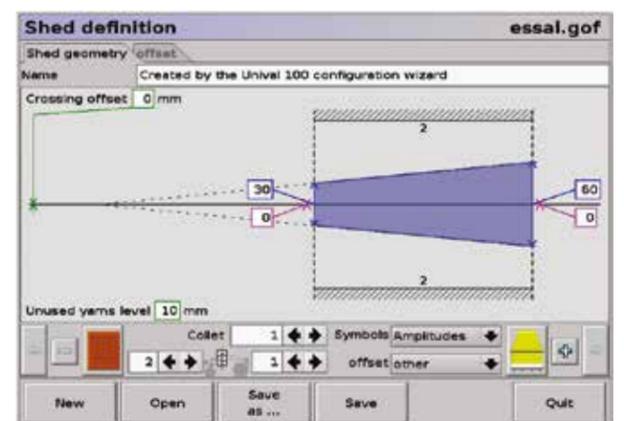
A wide range of formats

The UNIVAL 100 is available in several formats and a variety of configurations. It opens new possibilities and allows production of a great diversity of technical textiles and 3D multilayer fabrics. Depending on the configuration desired, the unit can be fitted with 512 to 15,360 actuators in various designs.

Powerful control unit serves as development tool

The high-performance JC7U control unit allows programming and storage of shedding parameters: control of shed geometry, opening profile, phase shift, and closed shed. An interface allows special programming functions to be imported from a CAD/CAM system in order to set the shed thread by thread and pick by pick.

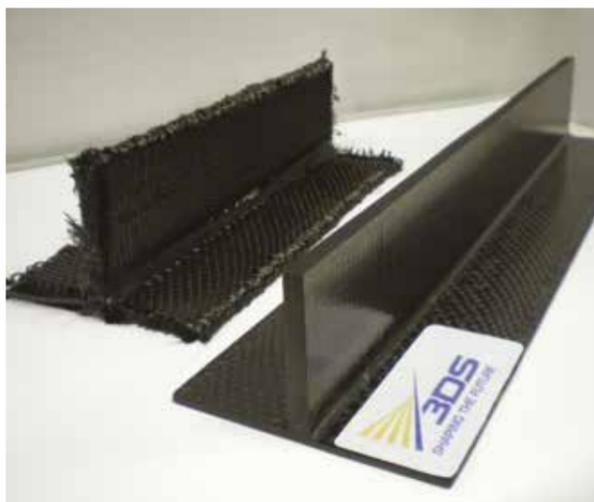
The knowledge and know-how of the user remains completely protected when using UNIVAL 100 as a development tool for all sorts of fabrics, including technical textiles. Even the traceability of the production process becomes a reality. Weaving events and condition logs can be downloaded for each part woven.



Monitor on control unit JC7U displaying weaving parameters

Unlimited possibilities

To remain highly competitive and derive full benefit from the machine, weaving mills use the unlimited possibilities of the UNIVAL 100 to develop and weave new types of textiles that until today were unimaginable.



T-shaped woven bar before and after moulding with plastic.
Photo: courtesy M. Wright & sons LTD.



2.7" multilayer fabric made of glass fibre yarns
Photo: courtesy T.E.A.M. Inc.

WEAVING FOR AUTOMOTIVE SAFETY

Modern production of sophisticated airbags

Airbags are standard in every car today. They are an indispensable safety feature that protects the driver and passengers in case of a collision. Because every car model is different, airbags are tailor made for every seat in the car, front and back.



Airbag fabric with woven seam



Advanced automotive safety

Advanced developments in automotive safety have led to the introduction of airbags mounted in the sides of the seats and in the roof above the doors. Depending on their complexity, airbags are made of flat-woven fabric, which is cut and seamed, or made in one piece with woven seams (OPW = one-piece woven).

New airbag manufacturing methods

The latest Jacquard technology has made it possible to manufacture complex airbag structures with woven seams. These OPW airbags give designers immense flexibility in creating patterns and designs. They also reduce the number of production steps, thereby reducing production time. Side-curtain airbags, activated by a lateral collision, are shaped according to the interior contour of the particular car they are fitted in. Their shape and structure are created at the weaving stage. As a result, no subsequent sewing operation is required. To effectively protect passengers in a rollover, OPW side-curtain airbags must remain inflated for several seconds. This is best accomplished by using a sealed cushion with woven seams.

OPW airbags are woven on modern high-speed weaving machines. The warp material, the variety of fabric patterns, and the importance of precisely shaped airbags require the use of a robust and reliable Jacquard machine. For maximum flexibility in the creation and design of airbags, weavers require a high number of hooks, which offers the possibility to control each individual warp end.

LXL meets the highest production requirements

The range of Stäubli Jacquard machines includes the perfect machine to meet the requirements of airbag weavers world-wide: the LXL, available in formats from 6,144 hooks to 18,432 hooks. Its lifting mechanism ensures accurate shed geometry and absolutely vibration-free operation even at high speeds. The extra-reinforced drive elements and the rigid structure of the LXL permit weaving very high-load fabrics such as airbags, because of the warp yarn used.

At the heart of the LXL are MX modules as the link between the lifting mechanism and the harness. For each weft insertion, each hook of the modules can be either up or down, corresponding to the individual pattern required for each type of airbag, and adapting to the complexity of the design. Each hook is driven independently, thanks to an operator-friendly JC7 controller in which all weaving data are stored and then transmitted to the Jacquard modules, pick by pick. All data can be easily transferred to and from the Jacquard controller via USB key or network.

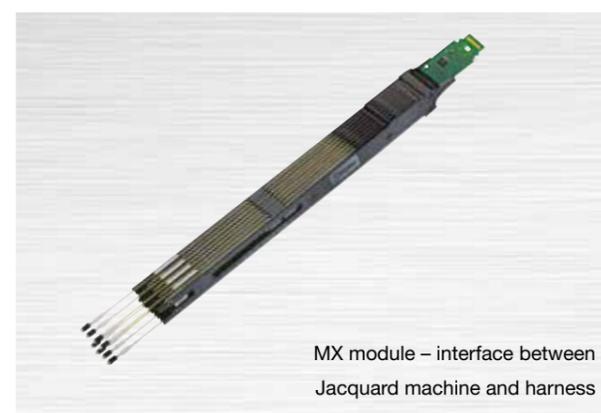
Just as all airbags are tailored to meet their functions and position in the car, the Jacquard harness – the link between the hooks of the Jacquard machine and the warp threads – is custom built. Stäubli harnesses are manufactured to exactly meet the customer's requirements, in particular, the fabric to be woven and the weaving machine. This ensures a perfect shed opening.

A Stäubli promise

Weaving for automotive safety means weaving airbags with the LXL. It's not a slogan, it's a proven solution.



Tailor-made Stäubli harness



MX module – interface between Jacquard machine and harness



LXL electronic Jacquard machine – ideal for airbags

SAFIR S30 masters the challenges of glass yarn

Sustainability

Continual industrialisation is forcing mankind to think more and more about sustainability and efficient use of resources. Industry is increasingly searching for alternative materials to replace natural resources. A good example is the use of glass-fibre fabrics in a wide range of applications. Glass fabrics provide intrinsic fire protection with no need for treatment with chemical flame retarders, and are thus environmentally safe.

Glass yarn requirements

Although the properties are very attractive, the production of glass-fibre fabrics is more elaborate.

The abrasive character of the glass fibres requires specific adaptation of the production machinery.

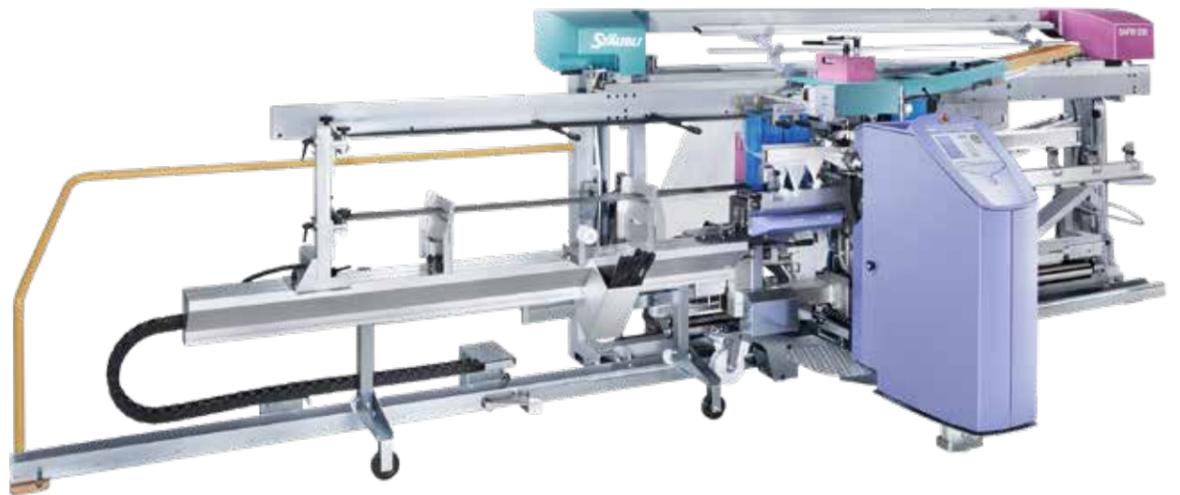
In addition, because of the lack of elongation capacity of the material, mechanical stress on the yarn must be reduced to a minimum.

Highly specialised weaving mills with appropriate machinery have the necessary know-how for handling and processing glass yarns. The weaving machines and the weaving preparation systems must be adapted to the special properties of these yarns.

Demanding weaving preparation

Special care is required when drawing a glass-yarn warp into the harness. For this process, which until a few years ago was always done by hand, Stäubli offers automatic drawing-in machines.

The sensitive and brittle glass filaments place extreme demands upon drawing the yarn into the drop wires, healds and reed and upon all machine components that come into contact with the glass yarn.



SAFIR S30 automatic drawing-in machine

Successful SAFIR S30

The SAFIR S30 automatic drawing-in machine, very successfully introduced on the market two years ago, can draw glass-yarn sheet layers into the weaving harness (healds, reed) with no problem. Sheet layers to be drawn usually have no lease.

Specialised optimisation of all yarn-handling components, including elimination of

- yarn deflection
- coarse surfaces
- sharp edges

is necessary to ensure problem-free and stable operation.

Certain elements designed for drawing in standard yarns can be unsuitable for drawing in glass yarns, depending on the specific properties of these yarns, and must therefore be removed.

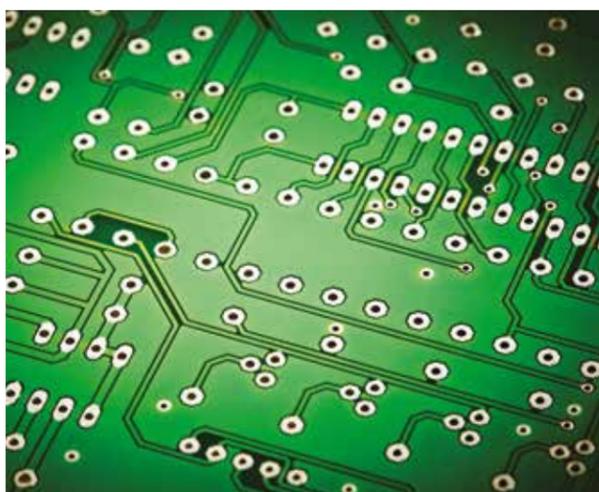
The timing of mechanical motions in the yarn separation process has also been reduced in synchronisation with the generally lower drawing-in rate.

With outstanding yarn-separation capabilities, the SAFIR S30 automatic drawing-in machine can draw glass yarn into the weaving harness without the slightest problem. State-of-the-art image processing technology makes it possible

to faultlessly separate individual glass threads, even with varying titre, from a warp sheet with varying density. Perfect separation of the warp threads to be drawn in and the exact placement in the healds and reed are basis for maximum efficiency in the production stages that follow.

Expanded application range

The SAFIR S30 automatic drawing-in machine has proven to be the specialist for processing filament yarns, and now the application range has been broadened. This represents a chance for our customers to expand their portfolios and successfully position themselves in new markets with a wide variety of glass applications.



Printed circuit board with insulating glass fabric



Yarn separation by means of vacuum nozzle



Drawn-in glass yarn

Heavy fabrics – sensitive yarns



Big bags woven with polypropylene tapes

In the manufacture of carpet backing, but also for fibre-reinforced composites, packaging, or geotextiles, polypropylene tape yarn of various widths up to 5 mm is woven – often on large weaving machines handling widths of 6 metres or more. Also felts, used e.g. in paper manufacturing machines, is woven on wide weaving machines. Here, the yarn woven is predominantly monofilament of various diameters up to 0.4 mm, sometimes larger.

Demanding warp change process

The special characteristics of these weaving materials in conjunction with the large weaving widths places great demands on the warp change process, in which a new warp is laid into the weaving machine and the

warp threads tied in to the ends of the woven warp. Of particular importance here is that all tape yarn must be held under uniform tension for automatic tying in. If the yarns cross, they will escape the stretching process and cannot be equalized in their lengths. Non-uniform tension would have fatal consequences for backing produced for composites. Because only with exact placement of the tape yarn can a uniform coating of the chemical binder be applied across the entire surface. This prevents irregular strength within the thermoplastic composites which are pressed into boards.

MAGMA T12 with innovative stretching system

The MAGMA T12 tying machine by Stäubli is ideally suited for these special requirements. It features a new stretching system for fast and precise tensioning of tape yarns: Integrated into the brush-beam, sawtooth-shaped elements flawlessly engage all threads, so that when the brush-beam is slightly rotated the entire tape-film layer is stretched. This new feature also drastically cuts overall preparation time.

Parallelism for monofilaments

The monofilaments of the woven-out warp must also be tied in to those of the new warp with flawless parallelism. Only in this way can it be ensured that the open fabric texture remains intact, which is critical for optimal properties of dry screening (e.g. moisture removal), perfect thermal transmission, and prevention of vapour blisters. Additionally, the fabric texture must not be



disturbed by crossed or missing monofilaments, which would disturb the dimensional stability of the textile under heavy tension.

The stretching system of the MAGMA T12 tying machine ensures parallelism and prevents crossed filaments. MAGMA T12 easily ties in tape yarn and monofilaments up to a diameter of 0.5 mm. And the smooth warp-change process contributes greatly to high quality of the end product.



MAGMA T12 tying polypropylene tapes

Webbing – life-saving narrow fabrics

Belts that hoist heavy payloads, parachute straps you can bet your life on, seatbelts that hold you safely in case of a car crash, slings and harnesses as life insurance for free climbers, conveyor belts that transport goods over long distances – these diverse applications have one thing in common: The material used is woven into flat webbing with special technical properties, particularly, light weight and exceptionally high strength.



Life-saving straps for professionals

Sophisticated narrow fabrics

These so-called narrow fabrics are normally woven on needle looms, but other specialized weaving machines can also be used as long as the high standards of the end product are respected regarding safety, reliability, strength, and reproducibility. Safety regulations normally tolerate zero defects, meaning 100% quality is required. Special manufacturing methods are required e.g. for shock-absorbing belts designed to absorb impact forces. Usually such fabrics are woven with two or more layers using highly specialized fibres in a complex weave structure.

Specially adapted Stäubli Jacquard machines

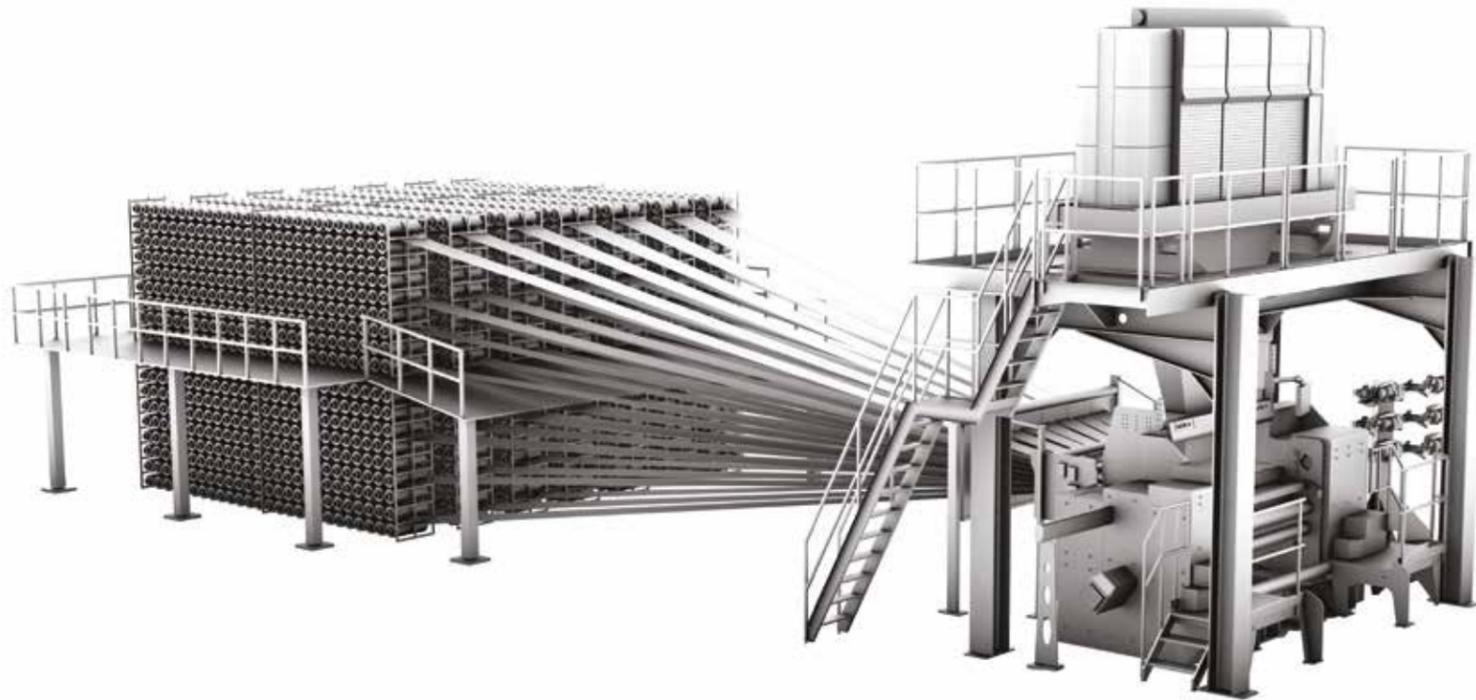
This type of shed formation is where Stäubli Jacquard machines excel. The LX12, LX32, and LX62 are compact Jacquard machines that are specially adapted for use on narrow-fabric weaving machines. They easily fit on various weaving systems. Depending on the pattern to be woven, they can be equipped with either 2- or 3-position shed-lifting modules. A user-friendly programming tool and easy control allows the

use any type of binding structure including special bindings for multilayers, tubular webbing, and many more applications in various technical fields. Stäubli narrow-fabric Jacquard machines cover the range from 192 to 896 hooks. They feature robust construction for long-term, dependable service in demanding environments. They perfectly meet the needs of mills that produce high-quality webbing for demanding technical applications – products that could save your life.



LX32 Jacquard machine for narrow fabrics

High-performance machines for sophisticated fabrics

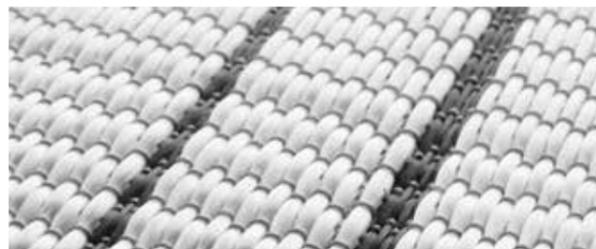


TF20 weaving system

Individual system configurations for technical textiles

Many weaving mills today specialize in the production of complex and innovative textiles. They are continually on the lookout for cutting-edge technologies which can enable them to produce new types of fabrics – products which until recently were unimaginable and impossible to make. To meet the ever-increasing requirements of the market for technical textiles, Stäubli has developed a modular weaving system that allows individual system configuration and provides maximum flexibility.

This means mills can optimally adapt their weaving systems to the product-specific requirements of the article to be woven. At the same time, the modular design allows the mill to flexibly respond whenever changes to the machine setup become necessary in the future. The system offers virtually unlimited weaving possibilities, whether for flat, spacer, or complex multi-layer fabrics. Stäubli shedding machines in combination with the double-rapier weft insertion system and a special slaying motion allow high-volume production of very dense fabrics and efficient processing of a wide variety of technical and highly sensitive yarns.



Glass carbon fabric



Multi-layer fabric

Technical textiles made of carbon fibre

The weaving of multi-layer or spacer fabrics with sensitive yarns, such as reinforcement textiles made of carbon for composite materials, places special demands on the weaving process. Any damage to the carbon yarn will lower the quality of the finished textile, thus gentle processing of the yarn must be ensured.

A particularly critical part of the process is weft insertion. This is done in a particularly elegant way by means of a free-moving rapier system. The „Free Move Rapiers“ insertion principle integrated into the Stäubli TF20 weaving system allows weaving with rapier rods and heads that are not guided by the shed. Additional yarn protection is provided by individually configurable motion sequences of the yarn-guiding elements and the parallel reed motion.

Weaving systems in the TF20 series feature modular design and can be individually configured according to customer needs. A bobbin creel is offered for warp supply as well as a choice of single- or double-tiered warp beam stands handling up to four warp beams. The system is equipped with proven Stäubli dobbies or Jacquard machines for optimal shed formation.

For the most complex textiles, Stäubli two- or three-position Jacquard machines are used – or, for maximum flexibility, the UNIVAL 100, featuring thread control by individual jactuators.

Heavy industrial textiles

Heavy industrial textiles, including multi-layer types, or filter fabrics are often woven at high densities, which places special demands on the weft insertion system. The double rapier system of the TF20 series allows simultaneous insertion of two wefts in different sheds and makes, in combination with the rotational slay motion, for high production speeds.

The robust construction of the weaving system allows for high beat-up forces at a beat-up angle of 90°.

The system economically produces high-density textiles displaying excellent uniformity.

The warp can be supplied from a bobbin creel or from a single- or double-tiered warp beam stand. For shed formation, a choice of heavy-duty electronic rotational dobbies or highly flexible servo-driven dobbies is available. Thanks to the modular design the system offers the capability of handling high weaving widths.



„Free Move Rapier“ especially for sensitive yarns

Exceptional technical features

Stäubli weaving systems are equipped with a colour touch-screen for user-friendly setting of weaving parameters. The machines have a liquid cooling system for high-efficiency cooling at the highest operating speeds and for the shortest downtimes for maintenance and cleaning. The most technically advanced drives are used, which are protected against conductive dust.

Best possible benefits are furthermore guaranteed by the use of servo-drives with energy recovery, which can be controlled via CAN bus.

All machines are constructed to meet the protective rating standard IP65, which allows the unrestricted use of special yarns such as carbon.



Control by multi-colour touch-screen

Woven synthetic grass – optimized for top sports performance



Artificial grass woven on ALPHA 500 LEANTEC

Synthetic grass and grass carpet are common examples of technical textiles. These are being used more and more often today in stadiums, on golf courses and in domestic applications.

Amongst the various production methods for this type of surface covering, weaving has proven to be the optimal solution. It ensures vertical pile knops – meaning the grass surface will not bias the direction of ball play – and adequate fixation of the pile yarn. A variety of binding options ensures optimal water permeability. Especially noteworthy is that the grass matt can be made of a single material, allowing for 100% recyclability, and that the double carpet weaving process makes for extremely economical production.

Weaving systems like the ALPHA 500 LEANTEC, with a weaving width of 3.0 to 5.3 metres, allow economical production of top-quality synthetic grass mats. The double rigid rapier guided by the shed allows for the production of spacer fabrics with a lancet height up to 140 mm or even higher for special weave patterns. The use of lancets prevents spacing deviation within the fabric, ensuring a uniform product surface.

A servo-controlled cutting knife ensures perfect cutting. A variety of operating modes allows sharpening and cutting for pile heights up to 2x68 mm. This option is necessary to deliver optimal quality of specific technical textiles such as synthetic grass.

Challenging weaves for heavy technical fabrics

Shed formation in special area

High warp tensions and densities, high fabric complexity, and changing pattern structures and shed parameters are fields of application for the UNIVAL 500T.

This servo-controlled dobby allows individual shed opening, pick for pick and frame for frame, and is therefore an ideal tool to produce technical fabric - and also to explore and develop new kinds of fabrics with innovative properties. The UNIVAL 500T features a modular design and can be expanded to drive up to 56 heald frames.

The picture shows a UNIVAL 500T mounted on a weaving machine for PMC (paper machine clothing) using 12 to 18 heald frames to produce heavy and wide technical fabric.

In such applications, warp tension can reach up to 60 tonnes, requiring - depending on shed geometry - extremely high lifting forces for each heald frame, which must be handled by the servo motors.



Selection of heavy technical fabrics



UNIVAL 500T on PMC weaving machine / Foto: courtesy Jürgens Maschinenbau

Fast moving technology in robotics and connecting solutions

ROBOTS DESIGNED FOR EVERY APPLICATION AND EVERY INDUSTRY



Car body incorporating made of carbon fibre composites

Turnkey solution for carbon-fiber-reinforced polymer machining

Because of their low weight and highly specific properties, carbon-fiber composites (CFRP) are the material of choice for an increasing number of applications in the automotive and aerospace industries. The introduction of such light materials in new application fields requires appropriate processing methods that guarantee a high level of efficiency and productivity along with precision and repeatability. The processing of fiber composites is, however, governed by a unique set of factors. It is particularly difficult to arrange for the milling of oversize components with conventional machines.

Innovative TX200 High Speed Machining (HSM) robot from Stäubli

Stäubli engineers have put a great deal of expertise into a powerful turnkey solution for processing CFRP to be used in conjunction with industry-specific software packages. The TX200 precision robot is fitted with a high speed milling spindle and dedicated software.

Total freedom for large parts

The robot offers new freedom and flexibility in the manufacturing environment. Thanks to its 2,194 millimeters reach, large parts can be easily machined. If necessary, the range can be extended to suit the job with the use of an external axis so that parts several meters in length can be conveniently worked on. The high performance of the TX200 HSM also makes it perfect for processing fiber composites. Its repeatability is ± 0.06 mm, which is well within standard carbon-fiber composite processing requirements. The multiple inherent advantages open up completely new uses in the machining of fiber composites, whether

in the processing of lightweight components in the aerospace industry, in applications for the automotive industry, or in the processing of parts for wind turbines. The robot has recently proven its worth in a number of different applications.



TX200 High Speed Machining

The TX200 HSM is part of a complete range of High Speed Machining robots offered by Stäubli with a reach of up to 2594 mm.

A STÄUBLI CONNECTORS DIVISION APPLICATION



Composite materials reduce aircraft weight

Less weight for aircraft

Improved manufacturing processes for composite materials holds great potential for transportation industries, including the aeronautics sector. With its connectors for high-performance vacuum applications, Stäubli supports manufacturers in their infusion moulding applications and in holding parts during machining.

With new Kevlar or carbon-based materials gradually replacing aluminium or titanium parts, it is now possible to design lighter aircrafts. The resulting 10% reduction in the total weight of an aircraft offers immediate benefits for airline companies: lower fuel consumption, fewer stops, an extended flying range, and greater numbers of passengers or volume of freight carried.

New focus on structural aircraft parts

While composite materials have previously been reserved for non-functional parts such as seat shells and cabin panelling, current research is focusing on structural aircraft parts – often very large components – subject to extreme temperatures or bending stress. This is where Stäubli contributes its expertise in the provision of complete lines of energy connection solutions for vacuum processes.



Stäubli connectors for fluids and gases

For aircraft manufacturers, Stäubli Connectors provides components throughout the entire vacuum supply line. A key application concerns the polymerisation of composite materials for infusion-moulded parts in the autoclave. Here, Stäubli's connection solutions offer high levels of performance: the connectors are subject to both internal vacuum pressure and pressure in the autoclave – at temperatures that can reach 300°C.

Thanks to its expertise in the field and in its testing laboratories, Stäubli is capable of satisfying the reliability requirements of these new industrial processes.

Stäubli Technical Flash

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