

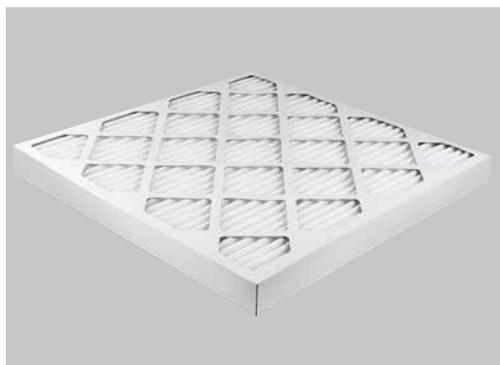
Felting

Felting and structuring needles
for the nonwovens industry



The technology: Needling and structuring

Groz-Beckert develops, produces and sells machine needles, precision parts, precision tools and systems for different textile production and joining techniques. The product portfolio services the fields of Knitting and Warp Knitting, Weaving, Tufting, Carding, Sewing and the manufacture of Nonwovens. Specifically for the nonwovens industry, Groz-Beckert offers more than 2,000 high-performance needles for flat needling or structuring. Typical uses include geotextiles (for instance nonwovens for drainage) and other technical textiles for filtration (air and fluid filters) and automotive applications (trunk lining).



Cassette filter



Parcel shelf



Wheel arch liner

The bonding of nonwoven fabrics can be performed thermally, chemically or mechanically – including also the use of felting needles. When using the mechanical bonding method, the fibers are transported and integrated into the fabric by barbed felting needles. This increases the friction forces between the fibers, which serves to increase the bond of the nonwoven fabric. The needle board of a needling machine accommodates a large number of felting needles which are guided through the nonwoven fabric.

The task of structuring needles, conversely, is to structure already bonded nonwoven fabric in special machines. The surfaces are produced with a velvety or grainy character, or feature geometric or linear patterns.

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Felting needles

Felting needles are used for the mechanical bonding of fiber nonwovens in needling machines. Depending on the fiber materials and required properties of the end product, different needle types are appropriate which differ in terms of their length, the shape of the working part and the distribution or properties of the barbs. In order to allow the stringent demands imposed on wide-ranging different applications – in terms of surface properties, tear resistance, uniformity, minimal damage to the fiber and substrate material as well as service life – felting needles with wide-ranging working part shapes are available, whose characteristics are described in the following.

Standard triangular



Features:

- The working part cross-section is an equilateral triangle
- Working part parallel from the point to the tapered transition
- As standard, there are between 1 and 3 barbs along each edge.
- Barb dimensions are identical across all edges

Benefits:

- Uniform deflection in every direction of load
- Universal application
- Produces high surface quality

Fields of application:

Suitable for all applications

Availability:

- Gauges: 12–46 gauge
- Needle lengths: 2.5", 3", 3.5", 4", 4.5", 5"
- Barb styles: KV, RF, FB, HL

Other gauges and needle lengths on request



Standard triangular working part cross-section

Vario barb needle



Features:

- The working part cross-section is an equilateral triangle
- Working part parallel from the point to the tapered transition
- As standard, there are 2 to 3 barbs along each edge.
- Graduated barb size per edge: The closer to the point, the smaller the barb

Benefits:

- Uniform deflection in every direction of load
- Improvement of the surface aspect (smaller funnel-shaped recesses in the end product) compared to conical felting needles
- Reduction of machine load
- Less soiling during waste fiber needling (of felting needles, needle board, base plates and stripper plates) compared to conical needles
- Reduced penetration force at the start, resulting in improved needle guidance, lower deflection and less needle breakage

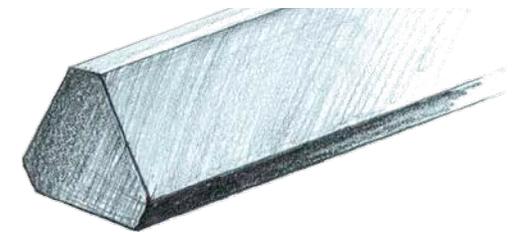
Fields of application:

Pre-needling, needling of natural and regenerated fibers, high-tenacity fibers such as para-aramid fibers

Availability:

- Gauges: 16–36 gauge
- Needle lengths: 3", 3.5", 4"
- Barb styles: KV, RF, FB, HL

Other gauges and needle lengths on request



Standard triangular working part cross-section

Conical needle



Features:

- The working part cross-section is an equilateral triangle
- Markedly rising taper angle from the point to the end of the working part
- Reduced number of barbs (smaller than 9 barbs)
- Graduated barb size per edge: The closer to the point, the smaller the barb

Benefits:

- Uniform bending strength coupled with maximum stability in all directions of load
- Generally lower needle breakage
- Reduced penetration force at the start due to downward graduation of barb size towards the point

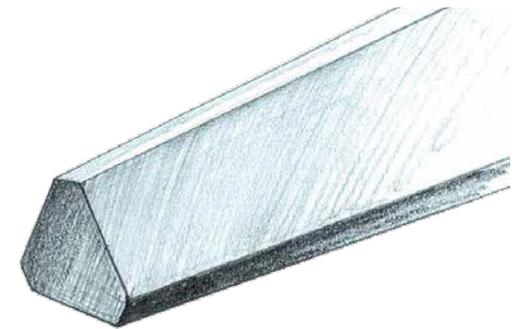
Fields of application:

Particularly suitable in the pre-needling infeed area, and for needling of natural and regenerated fibers, high-tenacity fibers such as para-aramid fibers

Availability:

- Gauges: 18–43 gauge
- Needle lengths: 2.5", 3", 3.5", 4", 4.5", 5"
- Barb styles: KV, RF, FB

Other gauges, barb styles and needle lengths on request



Conical working part cross-section

GEBECON®



Features:

- Conical working part and continuously tapered working part as far as the shank
- Graduated barb size per edge: The closer to the point, the smaller the barb
- Reduced number of barbs (smaller than 9 barbs)
- Lower working part and taper angle compared to the standard conical needle

Benefits:

- Uniform bending strength coupled with high flexibility, ensuring improved stability (less needle breakage) compared to standard needles and higher production speed coupled with reduced web draft compared to conical needles
- Reduced penetration force at the start, resulting in improved needle guidance, lower deflection and less needle breakage
- No overloading due to the high number of barbs, resulting in improved bending properties and less needle breakage in the rear working part area of the needle
- Improvement of the surface aspect (smaller funnel-shaped recesses in the end product) compared to conical felting needles
- Reduction of machine load
- Less soiling during waste fiber needling – of felting needles, needle board, base plates and stripper plates

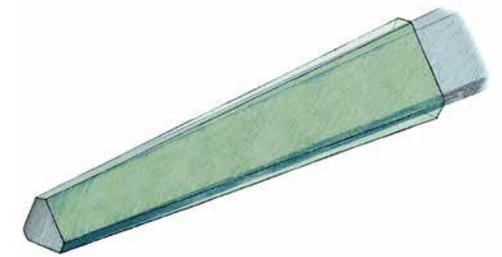
Fields of application:

- Pre-needling in all segments where high demands are placed on product quality (surface) and needle quality (breakage/bending), for instance automotive sector, synthetic leathers, geotextiles, filter felts and any type of technical felt
- Needling of fine, ultra-fine, micro and special fibers

Availability:

- Gauges: 25–43 gauge
- Needle lengths: 3", 3.5"
- Barb styles: RF, HL

Other gauges, barb styles and needle lengths on request



GEBECON® working part cross-section

The special features of GEBECON®

With GEBECON®, a unique, patented needle group with a conical needle geometry has been created. The outstanding benefit of GEBECON® needles is their ability to rise to even the toughest challenges due to a high level of needle elasticity and special surface quality demands on the end product.

Cross STAR®



Features:

- Working part similar to an equilateral four-edged star
- Working part parallel from the point to the tapered transition
- Barb dimensions are identical across all edges
- Most common number of barbs: Either 1 or 2 barbs per edge

Benefits:

- Greater needling efficiency due to distribution of the barbs over 4 edges
- More uniform MD/CD tear resistance ratio (machine direction/cross direction) over all fabric weights

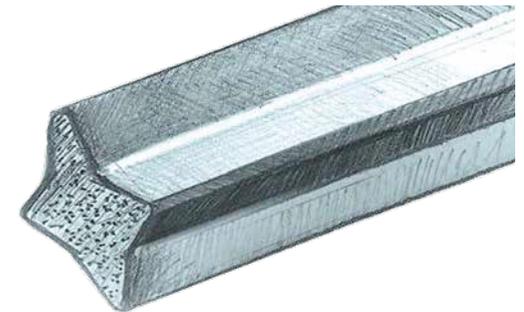
Fields of application:

Geotextiles (heavyweight fabrics) and where high isotropic properties are required

Availability:

- Gauges: 32–40 gauge
- Needle lengths: 3", 3.5"
- Barb styles: RF, FB

Other gauges, barb styles and needle lengths on request



Cross STAR® working part cross-section

Tri STAR®



Features:

- Equilateral triangular working part
- Working part parallel from the point to the tapered transition
- Barb dimensions are identical across all edges
- Most common number of barbs: 2 barbs per edge
- Working part side concave in shape, creating more acutely angled edges
- 8 % lower working part cross-section compared to the standard needle

Benefits:

- Higher needling efficiency due to improved fiber entanglement in the barb area
- Suitable productivity increase

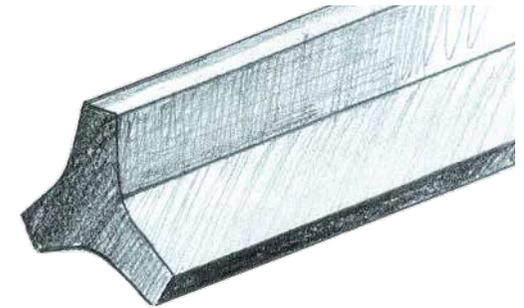
Fields of application:

Geotextiles (lower product weights) with stringent demands on tear resistance

Availability:

- Gauges: 32–38 gauge
- Needle lengths: 3", 3.5"
- Barb shape: RF

Other gauges, barb styles and needle lengths on request



Tri STAR® working part cross-section

Teardrop working part



Features:

- Teardrop shaped working part cross section
- Working part parallel from the point to the tapered transition
- Barb dimensions are identical across the edge
- Most common number of barbs: 4, 6 or 8 barbs

Benefits:

- Higher needling efficiency due to improved fiber entanglement in the barb area
- Extremely gentle effect on the warp and weft thread networks of the base material

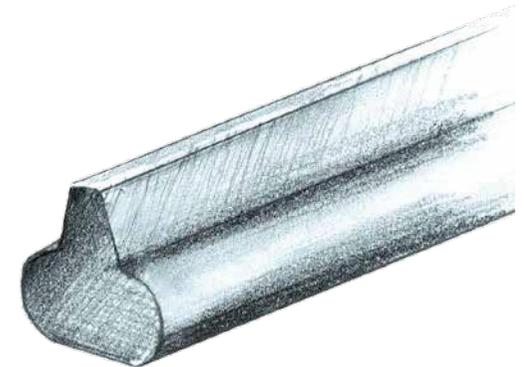
Fields of application:

Generally where base materials are used, for instance paper machine and filtration felts, or for needling furniture upholstery fabrics

Availability:

- Gauges: 30–40 gauge
- Needle lengths: 3", 3.5"
- Barb styles: RF, HL

Other gauges, barb styles and needle lengths on request



Teardrop working part cross-section

EcoStar®



Features:

- Equilateral triangular working part
- Working part parallel from the point to the tapered transition
- Barb dimensions are identical across all edges
- Most common number of barbs: 2 barbs per edge
- Rectangular shaped edge surfaces
- 13 % lower working part cross-section compared to the standard needle

Benefits:

- Improved surface of the finished product
- Lower penetration force without compromising efficiency
- Reduced energy requirement

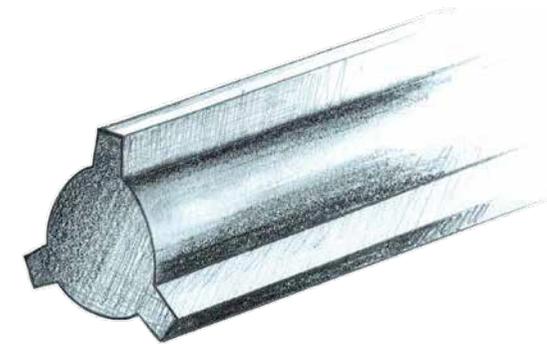
Fields of application:

Generally for all applications involving extreme demands on the product surface

Availability:

- Gauges: 32–42 gauge
- Needle lengths: 3", 3.5"
- Barb shape: RF

Other gauges, barb styles and needle lengths on request



EcoStar® working part cross-section

Structuring needles

The task of structuring needles is to structure already bonded nonwoven fabric in special machines. These surfaces are produced with a velvety or grainy character, and may also feature geometric or linear patterns. A distinction is drawn between fork and crown needles on the basis of their geometry. While crown needles generate a particularly uniform structure, fork needles are used to create a grainy structure. Both needle types are combined to produce very dense velour fabrics with an uniform surface quality. For processing ultra-fine fibers, fine gauge fork needles are also available.

Fork needle



Features:

- Shank with single or multiple reduction and cylindrical working part
- Three-dimensionally rounded fork geometry
- Fork setting V or D

Benefits:

- Gentle fiber take-up – coupled with long service life of the needle
- No needle breakage or bending due to optimum needle straightness
- Fabric appearance is influenced by the fork setting V and D

Gauges:

17–43 gauge

Fields of application:

- Automotive interiors
- Home textiles: Floor coverings, decorative nonwovens
- Toy industry: Teddy bears

Needle lengths:

62.30; 65.30; 68.30; 75.80; 77.80 mm

Other gauges and needle lengths on request

Benefits of fine gauge fork needle:

- High level of uniformity during the structuring process
- Pronounced loops (grainy structure)
- Very dense surface quality due to efficient fiber processing capacity
- Optimum product quality due to high process reliability
- Maximum surface quality due to ultra-fine working part cross-sections (smaller funnel-shaped recesses)

Crown needle



Features:

- High dimensional accuracy of barbs
- Minimal, precisely maintained barb spacing
- Structure similar to felting needles, only difference lies in barb arrangement: Precisely one barb on each edge of the working part
- Short distance from the point to the barbs

Benefits:

- Particularly uniform, velvety surface structure
- Simultaneous fiber pick-up during structuring due to high dimensional stability of barbs and very low, precisely maintained barb spacing

Fields of application:

- Automotive interiors
- Home textiles: Floor coverings

Gauges:

25–46 gauge

Needle lengths:

65.30; 68.50; 78 mm

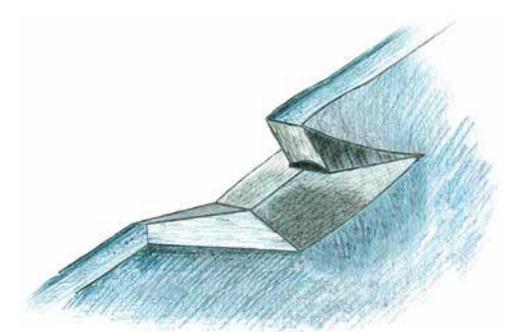
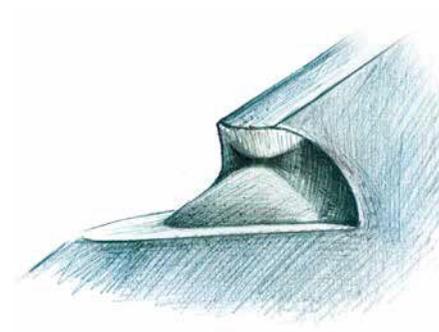
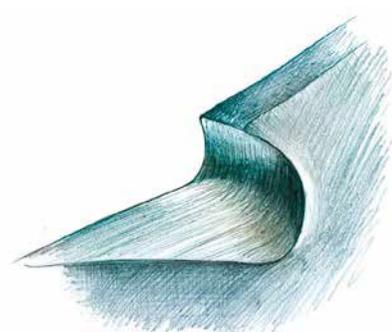
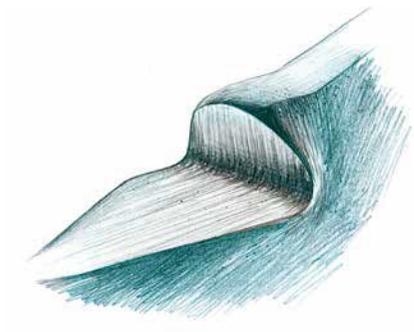
Barb styles:

RF, HL

Other gauges, barb styles and needle lengths on request

Felting needles – barb styles

Groz-Beckert offers four different barb styles. The dimensions and shape of the barbs are highly significant in determining the efficiency of the needling process, as they are used in transporting and bonding the fibers within the nonwoven. By forming fiber loops, the nonwoven becomes increasingly compressed. This results in higher friction forces from fiber to fiber, which determine the final strength and volume as well as all other mechanical properties of the nonwoven fabric.



KV barb

Features:

The traditionally cut barb with its pronounced edges remains in widespread use in a range of application fields. This can also represent an economical alternative to other barb styles.

HL barb

Features:

The HL barb stands for maximum care of the fibers. The three-dimensionally rounded shape is achieved using precision tools. The fibers adhere to the rounded barb area and are therefore gently needled.

RF barb

Features:

The accentuated base of the barb and the rounded edges in the undercut area have a positive impact on the wear characteristics and so guarantee a long service life of the needle.

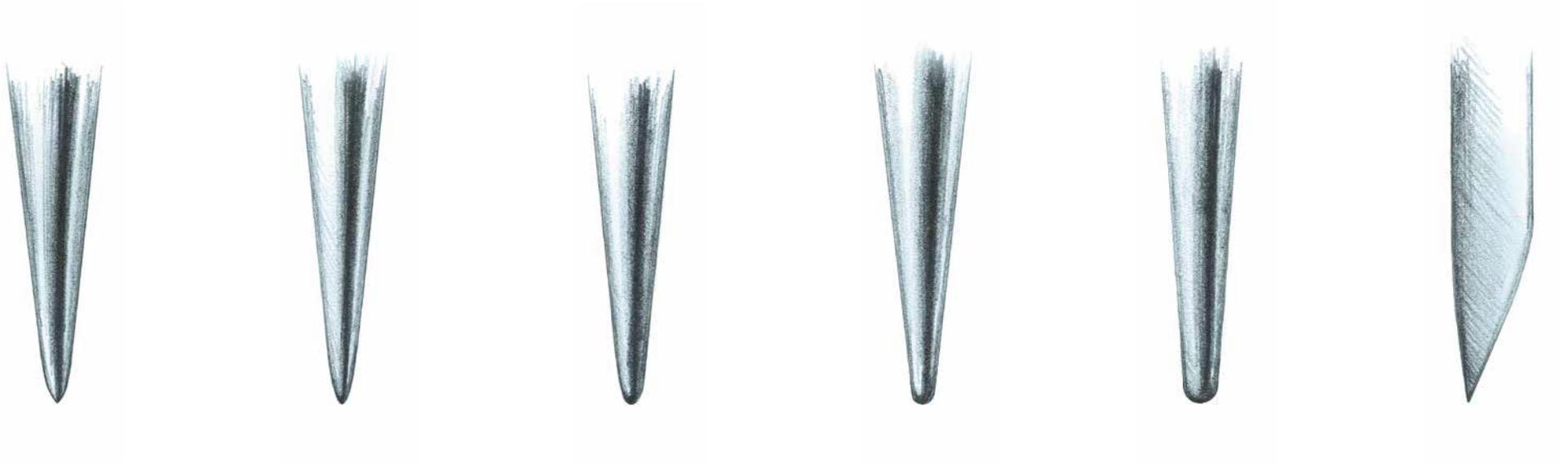
FB barb

Features:

The FB barb also has a three-dimensionally shaped contour. The efficient transport of fibers takes place over the defined surfaces in the undercut area. These two characteristics result in a uniform needling effect plus a long needle service life.

Felting needles – point configurations

Depending on the structure and gauge of the base material used, for instance filtration felts and technical felts, needle points are used with differently pronounced radii (SS, LS, S, S1 and S2 points). The chisel point is a cutting point, which is used for instance for needling open a fiber nonwoven fabric used to cover foam.



SS-point

Feature:

The standard defines a sharp point (SS) for felting needles over the entire gauge range

LS-point

Feature:

Very slightly rounded point

S-point

Feature:

Slightly rounded point

S1-point

Feature:

Rounded point

S2-point

Feature:

Very rounded point

M-point

Feature:

Chisel point

Felting needles – coatings

Standard needles demonstrate pronounced traces of wear created by the fibers after some time. The shape of the barb changes and the danger arises that needling can lack uniformity and that the required product characteristics are no longer achieved. To eliminate this risk, Groz-Beckert offers coated and treated needles with improved wear resistance. Using Groz-Beckert GEBEDUR® needles, a consistent, economical needling process is achieved in continuous industrial operation over a long period. In order to improve the service life of needles, the surface of the working part is given a special coating (GEBEDUR® I), or metallurgically treated (GEBEDUR® II). Surface coating with chrome protects against premature corrosion.

GEBEDUR® I



Feature:

Surface coating with titanium nitride

GEBEDUR® II



Feature:

Special metallurgical treatment

Partially chrome-plated



Feature:

Partial chrome-plated surface coating

Benefits:

- Increased service life
- Improved wear properties
- Consistent, economical needling over extended periods
- Minimized machine set-up and downtimes
- High level of process reliability

Fields of application:

- Synthetic leather manufacture
- Needling of materials for the automotive industry, for instance headliners, parcel shelves, door panels and floor coverings
- Production of technical felts such as geotextiles, filter felts and press felts
- Needling of all kinds of abrasive fibers such as glass, ceramic and carbon fibers
- Manufacture of products from natural fibers such as jute, coir, sisal, hemp and flax

Additional benefits of partial chrome plating

- Corrosion protection
- Lower degree of soiling due to anti-adhesive properties
- Reduced penetration force due to smooth surface

Needle packaging methods

Groz-Beckert pays attention to greater user convenience – even when it comes to packaging its products. The needles are protected in the box by corrosion protection oil and paper for simple, rapid removal in units of 250 or 125 pieces. Groz-Beckert felting and structuring needles are available in three packaging variants.

Standard packaging

The standard packaging size contains 500 felting needles (with coarse needle types, 250 needles). 250 or 125 needles in each case are laid opposite each other for maximum space savings and are wrapped separately in corrosion protection paper. The needles can be removed individually, several at a time or as a complete package.



Packaging in truncated pyramid-shaped protectors

The truncated pyramid packaging is suitable for fine fork needles and all crown needles. The needles are removed as a whole packet at a time (250 pcs).

Benefits:

Special point protection



Packaging in boxes with diagonal divider

In the medium term, the diagonal divider boxes will take over from the standard packaging. The needles can be removed individually, several at a time, as a complete diagonal package.

Benefits:

Special point protection



Accessories

Alongside felting and structuring needles, Groz-Beckert also offers application aids: Needle removal tools, needle board inserts, crank positioning disks and needle inspection boards as well as a slide rule to determine penetration depth and stitch density. Specially designed needle packaging concepts round off the range.

Needle removal tools

Using what are known as needle removal tools, felting and structuring needles can be knocked out of the needle board.



Standard needle removal tools

Groz-Beckert offers several different tool versions for removing felting and fork needles with cylindrical working parts:

- FN 19–25 gauge: for felting needles with a working part gauge of 19–25
- GA 17–20 gauge: for fork needles with a gauge of 17–20
- FN 30–43 gauge: for felting needles with a working part gauge of 30–43
- GA 25–43 gauge: for fork needles with a gauge of 25–43

Needle removal tools are useful in day-to-day work with felting and structuring needles, as they allow needles to be reused following non-destructive removal. These are specially designed for felting needles with a triangular working part or non-standard working parts such as Tri STAR®, Cross STAR®, Teardrop and fork needles.



FN CON needle removal tool

Groz-Beckert supplies the FN CON needle removal tool for removing felting needles with a tapered working part. This tool prevents tapered felting needles from becoming jammed, enabling a trouble-free work process when removing needles from the needle board.

Using Groz-Beckert needle removal tools, the needles can be simply and directly removed from the needle boards. It is of no consequence whether individual needles, whole segments or the entire needle board have to be knocked out.

Needle board inserts

Needle board inserts are used predominantly to identify different needle groups in the needle boards. These may be different needle types or the same type of needle but in groups that have been in use for different working periods (needle rotation system).

Needle board inserts serve to stabilize the needles in the board. As the needle board ages, the hole diameter changes, which can compromise straight needle guidance in the board. Under certain circumstances, this can lead to greater needle deflection when penetrating the nonwoven fabric, possibly impacting the stripper or base plate, and breaking.



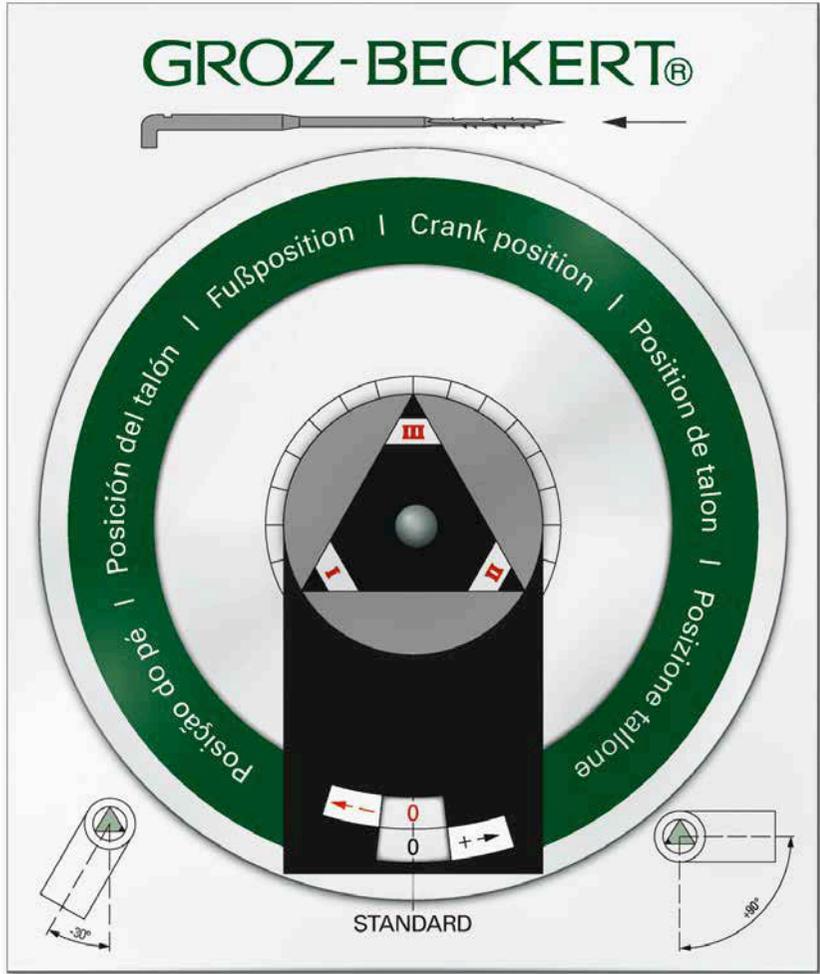
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644071				Green
643651				Red
643631				White
643741	15gg	9/16	G2	Blue
643731				Yellow
643751				Red
643711				White
644091	15gg	9/16	G5	Blue
644111				Yellow
644081				Red
644101				White
643621	13gg	15/16	G1	Green
643991	15gg	15/16	G1	Blue
644051				Yellow
644061				Green
643661				Red
643981				White
643801	Nisert	187		-
643811	Nisert	192		-

Crank positioning disk

Gentle needling is particularly important when producing nonwoven fabrics with a base weave. Several factors have to be taken into account here which can all influence the needling process. The right machine parameters are just as important as correct positioning of a suitable felting needle – and positioning of the needle crank, as this has a direct impact on the alignment of the working part.

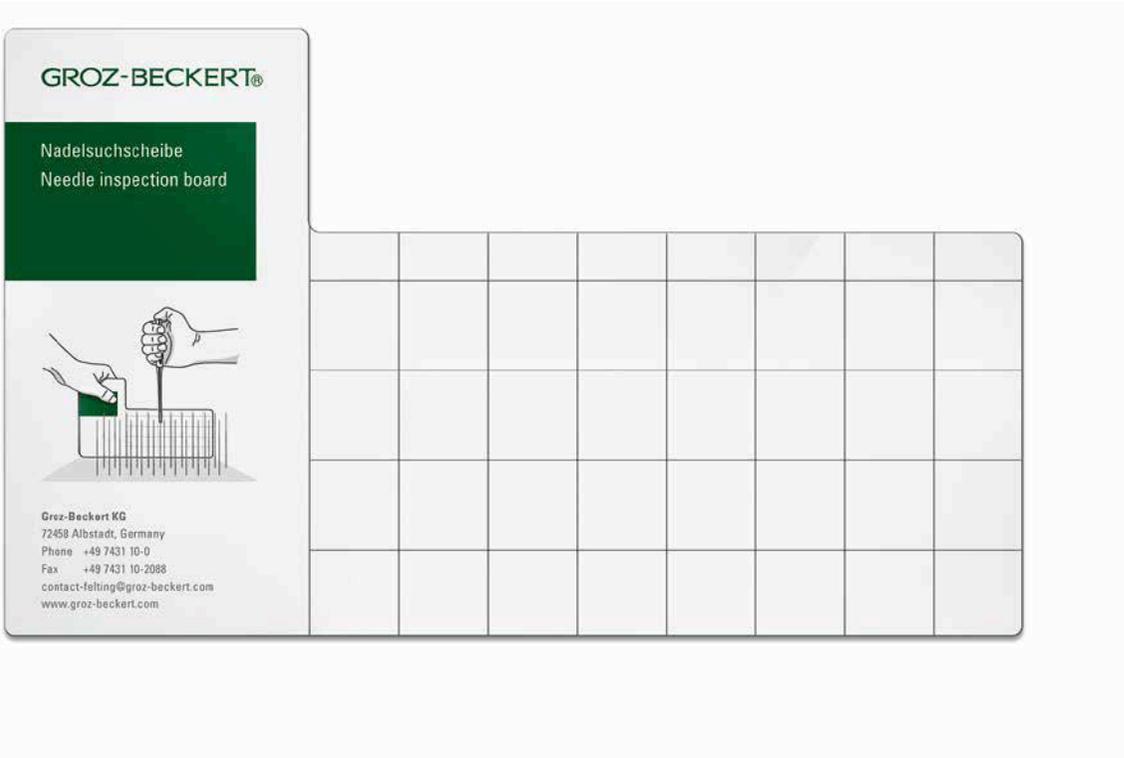
When it comes to crank positioning, Groz-Beckert refers to the needle perspective looking at the needle point with the crank aligned downwards, while users prefer the perspective looking at the needle crank anchored in the needle board.

To prevent misunderstanding, Groz-Beckert has developed a crank positioning disk which allows both these perspectives to be viewed at the same time. With the aid of this disk, all possible scenarios can be depicted and clearly indicated for users. This allows users to simulate the relative rotary position between the crank and working part while looking at the needle crank/at the rear of the disk, and to then take a reading of the number of degrees at the front of the disk.



Needle inspection board

The large number of needles located in the needle board makes it practically impossible to locate individual damaged needles. A suitable aid for more quickly locating and exchanging broken and bent needles in the board is the Groz-Beckert needle inspection board. The board is guided through the needles at right angles to the machine running direction Row by row. This allows every needle to be inspected and replaced if necessary.



The Groz-Beckert needle inspection board has several functions. In filled needle boards, it can be used to check whether needles are correctly aligned. Row by row monitoring can be conveniently and effectively performed.

Needle board cleaning periods and other production interruptions can be used to examine the needle boards for broken, damaged or bent needles using the needle inspection board.

Even with higher needle board densities, the Groz-Beckert needle inspection board is ideal for needle inspection due to its thin, flexible design.

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KNITTING , WEAVING , FELTING , TUFTING , CARDING , SEWING

