NEEDLES

INTRODUCTION

Needle plays an important role in determining the appearance and performance of the final seam. Several things can determine the type of needle to pick, the material you are using; the thread you have chosen or the type of stitch you plan. When you are doing regular, not decorative, sewing, the type of material determines the shape of the needle's point, and the material thickness determines the needles' size. But before deciding on a needle, you first need to know the needle system your machine uses

Needles are available in different length and thickness to suit the requirement of various machines. Needle size is normally marked on its shank. Needle for hand stitching are also available in various curve shapes to suit the requirement of stitching.

NEEDLE PARTS AND FUNCTION

A **Butt:** It is top most part of the needle. It facilitates easy entry of needle in to the needle bar and provides firm sitting in to the needle bar cavity.

B **Shank**: This part of needle is inserted in to the needle bar and provides a firm seating for the needle in the needle bar for stability during stitching. It also provides space for tightening of needle screw on it for proper fixing of needle in to the required place. The shank diameter varies according to the needle system.

C. **Blade:** It is the longest part of the needle between the shank and eye of the needle. The shape and diameter of the needle determines the penetration strength and size of the perforation in the material.

In reinforced needles, blades tapers gradually from shank to blade and this tapered area is called Shoulder. This tapering gives more strength to the needle and reduces vibration at high speed. It also reduces friction between the needle blade and material, thus reducing needle heat.

D. **Long Groove**: It is situated on the threading side (apposite of clearance cut) along the blade of the needle. The Function of the long groove is to hold the thread along the blade when the needle pierces into the material, so that friction is reduced and thread is not caught between the needle blade and the material when it passes through.

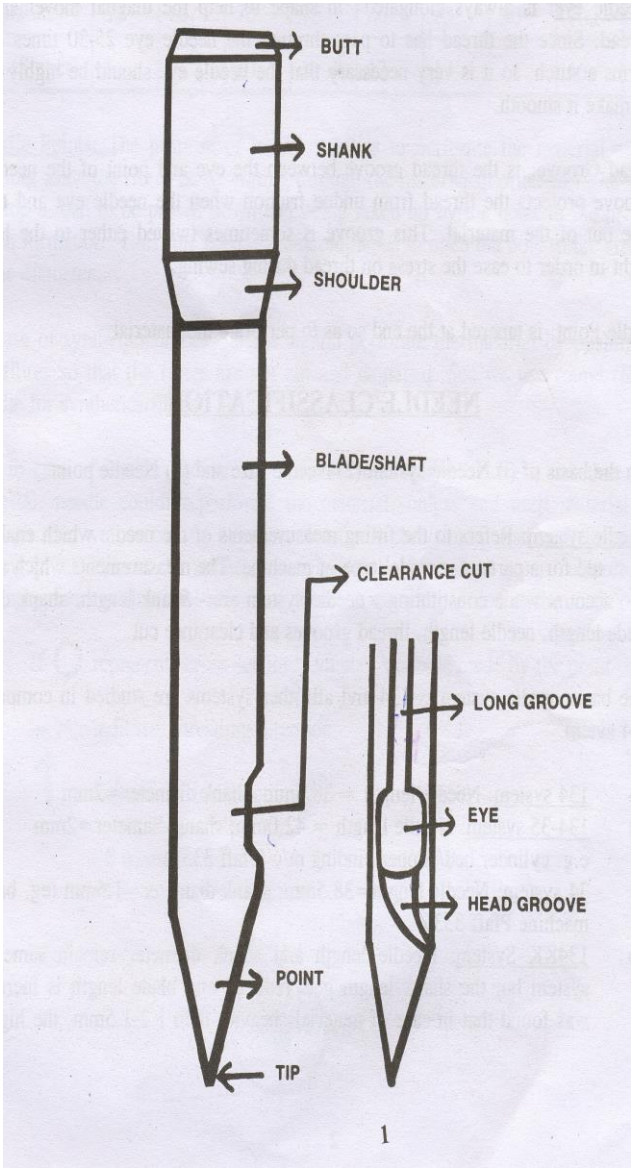


Figure 1

E. **Clearance cut**:It is a flat cut in the blade of the needle above the eye on the thread exit side.

- When needle insertion is done, the clearance cut should always face the hook.
- The clearance cut helps in better stitch formation as hook point could come closer to the needle to pick up the top thread loop. It also reduces the chances of damage to needle or hook point.

F. **Needle eye**: It is a hole at the end of the needle. It is elongated in shape to help the diagonal movement of the thread. Since the thread has to pass through the needle eye 25 to 30 times before it forms a stitch, so it is very necessary that needle eye should be highly polished

to make it smooth. Needle type and size determines the size and shape of eye.

G. **Head Groove**: It is a passage between the eye and point of the needle. This groove protects the top thread from undue friction when the needle eye and the point rise out of the material. This groove is sometimes twisted either to left or to right in order to ease the stress on the thread during sewing according to direction pulls.

H. **Needle Point**: It is tapered at the end, just above the needle tip so needle can easily penetrate in to the material.

CLASSIFICATION OF NEEDLES

Needle can be classified on the following basis:

(i) Needle system,

(ii) Needle size, and

(iii) Needle point.

Needle System

It refers to the fitting measurements of the needle in to the sewing machine, which enables it to be suited for a particular model/type of machine. The measurements, which are taken into account while constituting a needle system, are: Shank length, shank diameter, blade length, needle length, thread grooves and clearance cut.

134 is the basic needle system and all the other systems are studied in comparison to 134 system.

134	134-35	34	438	134KK
Needle length = 38.5 mm and shank diameter = 2 mm e.g. normal flat and post bed machines	Needle length = 42.0 mm and shank diameter = 2 mm e.g. cylinder bed machine (Pfaff 335)	Needle length = 38.5 mm and shank diameter = 1.6 mm e.g. Bar Tacker machine (Pfaff 3336)	Needle length = 38.5 mm and shank diameter = 2 mm e.g. Zigzag machine (Pfaff 335) It has a longer clearance cut to enable the hook to pick up the loop better on both the sides.	Needle length = 38.5 mm and shank diameter = 2 mm but shank length gets reduced and blade length is increased. It was found that in case of materials heavier than 1.2-1.5 mm, the higher part of the needle entered the material leaving holes which looked ugly as well as they reduced the rest strength of the material. Thus KK was introduced as a subclass of 134 system. But KK should not be used on high-speed machines as due to longer blade and shorter shank, strength of the blade is reduced.

Needle Size/Thickness

It refers to the diameter of the needle blade just above the needle eye.

Needle size could be indicated by the number metric system (N. M.) system or Singer/Simon co system.

In case of NM system, thickness is indicated in 100^{th} of a mm. For e.g., if blade diameter is 0.8 mm, then needle size is $0.8 \times 100 = 80$. The lower the needle size, the finer the needle blade.

NM size is the American size, which is usually used in Australia, and the Simon co system is the European size.

Metric (Schmitz)	60	65	70	75	80	85	90	100
Singer/Simon co	8	9	10	11	12	13	14	16

The essential criteria that must be taken into account while choosing the right needle size are:

Thread/Seam Appearance

The needle size is determined by the thickness of the thread and the desired seam appearance.

Material and Material Properties

The harder and thicker the material, the thicker the needle must be.

Suitable sewing machine

Duty must be considered as light, medium or heavy to select suitable needle.

Needle Points

The purpose of needle point is to perforate the material either by pushing aside the fibers or by cutting through the material, thus making way for the top thread to be passed down and being taken up by the hook in the process of stitch formation. That is why the needle is tapered- in order to open the hole to the size of the blade diameter.

In case of **synthetics/fabrics**, needle should perforate the material by pushing aside the fibers so that the fibers are not cut and damaged. So, we use round ® point needle for synthetics/fabrics.

In case of **leather and similar material,** due to the hardness and thickness of the material, needle couldn't perforate the material, unless and until material is cut through. So, we use cutting point needles for leather/ similar materials. Since, when cutting point will cut the material, a hole will be formed of a particular shape, so cutting points are classified according to the shape and position of the cutting edge.

Characteristics and Benefits of Needles with Cutting Points

(i) Realisation of a specific seam appearance.

(ii) Easier penetration of the material with less needle heating.

The needle points are divided in to two basic categories are:

Round Point and

Cutting Point

*If **** represents the blade diameter, ----- indicates threading direction, indicates seam direction, **s** means Schmale (narrow), and **ss** means Schr Schmale (extra narrow).

Round Point Needles

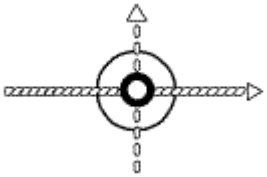
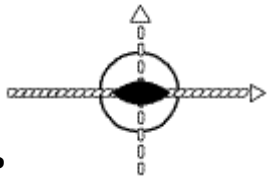
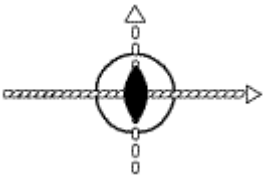
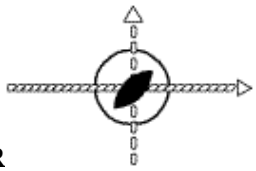
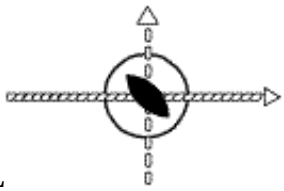
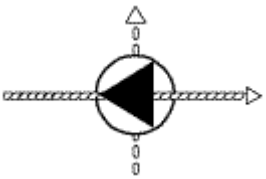
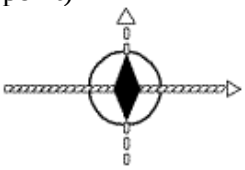
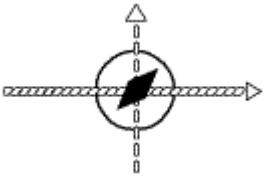


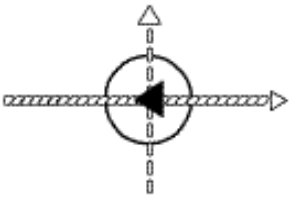
Figure 7.1: R (R) SET Normal Round Point

Cutting Point Needles

With 2 cutting edges (As the min. cutting edges are two, we get a lens shaped cross- section)				
P/ Wedge point- P family includes P, Ps, Pss, PCL, PCR, etc.	 **P**	Result: A very strong seam. Distance between stitches: 6 to 8 stitches/cm	**PCL (cut to left)**	**PCR (cut to right)**
S/ Cross point	 **S**	Result: A very straight seam. Distance between stitches: 3 to 4 stitches/cm		
LR/ Reverse twist point	 **LR**	Result: A slightly recessed, straight seam. Distance between stitches: 5 to 6 stitches/cm		
LL/ twist point	 **LL**	Result: A slightly recessed, straight seam. Distance between stitches: 5 to 6 stitches/cm		

With 3 cutting edges (For hard, dry leathers)	TRI/ D (triangular point) 

With 4 cutting edges (for extra hard & dry leathers)	**Spear point**	**DI/ DIA** (diamond point) 	**VR**- R TW SP (reverse twist spear point) 	**VL**- TW SP (twist spear point)

Combination point of round & cutting point (SD1 is basically a round point needle with a triangular tip, the cutting edges being very short).	**SD1** (TRI TIP) triangular tipped round point 	The small triangular tip cuts approx. 10% of the stitch hole, with the remaining 90% being displaced by the conical round point (R point). Result: A straight seam. Distance between stitches: 6 to 8 stitches/cm

Dry and hard material has more resistance against the perforation by the needlepoint, so three or four cutting points needle are found most suitable for this kind of material to be stitched. Care should be taken during selecting these needle points are, the operation type and seam appearance.

RELATION OF NEEDLE AND THREAD

Limited to leather manufacturing, you also can determine the right needle size with the following table. This table shows in simplified form – regardless of the seam appearance – which needle size should be used to suit the thickness of thread and material properties:

Thread size	Light leather		Medium to heavy leather	
	Needle size NM	SIZE	Needle size NM	SIZE
80	65-70	9-11	70-80	10-12
60	80-90	12-14	90-100	14-16
40	90-100	14-16	100-110	16-18

30	110-120	18-19	120-130	19-21
35	110-120	18-19	120-130	19-21
20	120-130	19-21	130-140	21-22
25	130-140	21-22	140-160	22-23
15	130-140	21-22	140-160	22-23
10	140-160	22-23	160-180	23-24
8	160-170	23-24	180-200	24-25

Needle Heat

Now days, most high-speed industrial sewing machines sew at very high speed from 4,000 to 10,000 stitches per minute. Also, the most common sewing threads used for the manufacturing of apparel or non-apparel items are either polyester or nylon that have been produced using a melt-spinning process. Many of the fabrics being sewn are made from synthetic fibers that can be impacted by excessive heat. Some needle holes that appear to be needle cuts are actually caused by excessively hot needles.

The friction between the needle blade and the material creates needle heat. The following factors can have an impact on the amount of heat that is generated:

- Material thickness
- Material finish or density
- Sewing machine speed
- Needle contact surface
    - Needle Size or diameter
    - Needle length
    - Type of needle blade
    - Type of needle finish

Needle heat is usually more of a problem when sewing either synthetic threads and/or synthetic fabrics and can cause excessive thread breakage and/or damage to the fabric being sewn.

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Ways of Minimizing the Needle Heat

- Use a smaller diameter needle whenever possible. A smaller diameter needle will definitely minimize needle heat and may be the solution in marginal situations.
- Use a "ball eye" needle. A "ball eye" needle is where the diameter across the eye is generally .003 or .004 inch larger than the blade diameter, therefore, it opens up a larger hole, minimizing the friction on the needle blade. Many needle manufacturers even have an "oversized ball eye" needle in some classes of needles that are commonly used for sewing heavy fabrics.

- On leather, vinyl, and other homogeneous fabrics, use a needle with cutting edges like a diamond, triangle, or wedge point. These needle point types actually cut through the fabric minimizing the penetration resistance and needle heat. Cutting point needles are not recommended for woven or knitted fabrics used for making apparel due to fabric damage.
- Use needle coolers or devices that blow compressed air on the needle during sewing. This requires the availability of compressed air and lines carrying this air to the sewing machines. Machines should have control switches that conserve the consumption of compressed air and only supplies air on the needle during sewing.
- Use cotton wrapped polyester core spun thread. The cotton wrapper acts as an insulator protecting the thread from the heat.
- Equip the machine with a needle positioner that positions the needle down after long high-speed runs. This allows the fabric to help dissipate heat and hopefully prevents the thread from melting; however, it can cause more needle holes on synthetic fabrics.
- Slow the sewing machines down to an acceptable level to minimize thread breakage due to needle heat.

SELECTION OF NEEDLE

Selection of needle depends on the Machine, Material, Seam and Thread to be used. Same needle system cannot be used for all types of stitching machines. Needle size and cutting point changes for different thickness of the material and seams. Leather requires a cutting point needle while synthetic materials require round point needle. If the material is soft and thin a lesser size and with two cutting point needle may be used, if the material is thick, higher size needle will be used as thin needle may get broken or thread may also break. Needlepoint may also change for heavy material as DIA. VR; VL is required for heavy and dry materials. Similarly selection of needles also depends on the size of thread and seam types. Heavy threads require thicker needle to be used and thinner needle for thinner threads. Appearance of seams also guide the selection of needle as for close seams and French seams wedge point needles should be used while for decorative seams LL, LR and S point etc can be used.

Things to remember during using the needle are:

- Slight twisting of needle could change the seam appearance.
- Use of large size needle on soft and thin material leads to puckering.
- Do not use S point needle, where stitch density is high.
- Do not use CL or CR needle, where stitch density is high, as it reduces the rest strength of the material.
- Always check the needle system while changing the needle and the machine.
- Using a right combination of thread and needle, lubrication of top thread, using a cooling stream, could reduce needle heat, use chromium-plated needle treated in phosphate bath.
- For automatic stitching machines, which are multidirectional, most cutting points needle may unsuitable according to the desired seam appearance. SD1 is the best needle point in this case as it does not changes seam appearance with the directional changes.

NEEDLE POLICY

It is a system of issuing the needle against the broken needles, while sewing the upper. Record of broken needle is maintained to ensure the safety of the wearer. When needle is being used for stitching and breaks, small tiny parts of needle may be left in the upper and can hurt the wearer. The supervisor should issue the new needle after getting the all broken parts back. Record should be maintained for the operation on which, needle breaks and broken needle should be assembled in file. It also helps in planning the quantity of needle to be required for the production for particular style and material.