INSTALLATION GUIDE

TeraSpin drafting system of PK 1500 series and PK 1600-40 for roving frames

TeraSpin is a business unit of A.T.E. Enterprises Private Limited, a company engaged in the service of the textile industry since 1939. TeraSpin came into existence in 2012 after A.T.E.'s takeover of SKF India's textile spinning component business. Since then it has been innovating and making continual improvements in quality and reliability in the service of spinning mills and machinery manufacturers around the world.

TeraSpin's product range consists of weighting arms, top rollers & cradles for roving frames and ring frames, spindle bearing units and complete spindles for ring frames and doubling frames. TeraSpin also offers customized upgrades for existing ring spinning and roving frames.

Website: www.teraspin.com
Email: sales@teraspin.com

Published by

A.T.E. ENTERPRISES PRIVATE LIMITED

Content

Drafting systems of PK 1500 series and PK 1600-40 for roving frame

TeraSpin PK 1500/1600 series of weighting arms mainly represent 3-roller or 4-roller double apron drafting systems for roving frames.

Top arms for roving frames:

Weighting arm	Type of drafting	Apron roller position
PK 1500-0962604	3-roller drafting	Center
PK 1500-0962602	3-roller drafting	Center
PK 1500-0001938	4-roller drafting	3rd from front roller*
PK 1500-0001940	4-roller drafting	2nd from front roller*
PK 1600-40	4-roller drafting	2nd from front roller*

**In drafting system, the final delivery roller, which delivers the material after complete drafting process is considered as a front roller.*

Compared to 3-roller drafting, 4-roller drafting (PK 1500-0001938) has an additional condensing zone. By additionally condensing the fibre material in this zone, a reduction in the spinning delta is achieved, thus improving the incorporation of the fibres into the roving. Some spinners believe this results in the following advantages:

- ✓ Reduces number of roving breakages
- ✓ Increases efficiency
- ✓ Greater package density due to more compact roving frame bobbin
- ✓ Reduces fly generation

Installation of weighting arms

Please ensure the following before fitting weighting arms:

1. The bottom roller and support rod slides must be securely mounted on the roller stand.

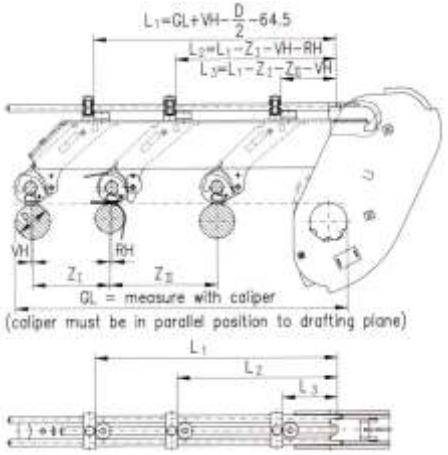
Once this is checked, follow the procedure detailed below for fitment of the weighting arm:

1. Slide weighting arms onto the support rod.
2. Insert height setting screw into the guide groove of the support rod and tighten locking screw lightly.
3. Open pendulum arms as far as the stop.
4. Place support rod with previously fitted weighting arms on the support rod slides and tighten the screw.

Adjustment of the draft field

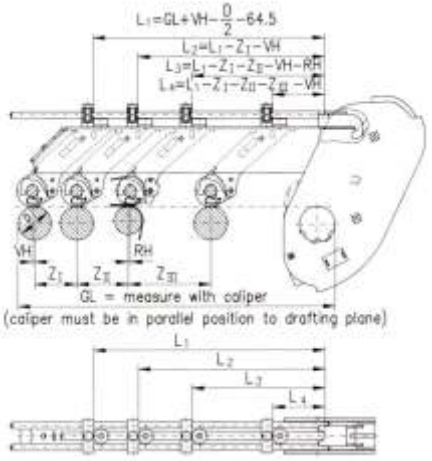
1. Set the draft field setting gauge by using the following formulae:

For PK 1500-0962 604 and PK 1500-0962 602 weighting arms



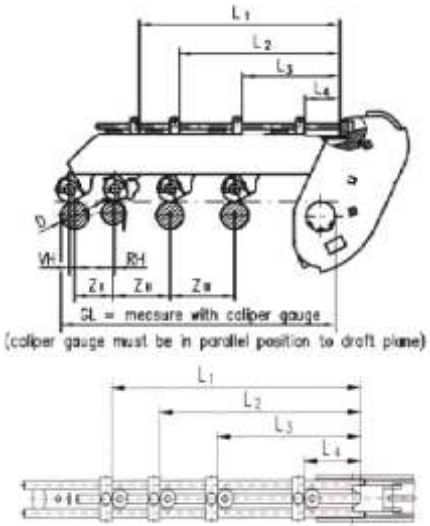
L_I=GL+VH-(D/2)-64.5
L_2 =L_I-Z_I-VH-RH
L_3 =L_{II}-Z_I-Z_{II}-VH
(all units are in mm)

For PK 1500-0001938 weighting arm



L_I=GL+VH-(D/2)-64.5
L_2 =L_I-Z_I-VH
L_3 =L_I-Z_I-Z_{II}-VH-RH
L_4 =L_I-Z_I-Z_{II}-Z_{III}-VH
(all units are in mm)

For PK 1500-0001940 and PK 1600-40 weighting arm



L_1=GL+VH-(D/2)-64.5
L_2 =L_1-Z_I-VH-RH
L_3 =L_1-Z_I-Z_{II}-VH
L_4 =L_1-Z_I-Z_{II}-Z_{III}-VH
(all units are in mm)

2. Please ensure that the distance between the center of front bottom roller to the center of the arm bar is as mentioned below:
   a. For all PK 1500 series of weighting arm – max. 249 mm (except PK 1500-0001938).
   b. For PK 1500-0001938 – max. 253 mm.
   c. For all PK 1600 series of weighting arm – max. 288 mm.
3. Release the hexagonal socket screw of the weighting elements.
4. Slide weighting elements towards the bracket.
5. Hook the adjusted draft field gauge into the frame.
6. In case of 4-roller drafting, push the screw of front weighting element, 2nd weighting element, 3rd weighting element and rear weighting element forward till they touch the 1, 2, 3 and 4 respectively on the draft field gauge and tighten it.
7. In case of 3-roller drafting, push the screw of front weighting element, middle weighting element and rear weighting element forward till they touch the 1, 2 and 3 respectively on the draft field gauge and tighten it.
8. Please make sure that distance between center of the rear bottom roller to the center of arm bar is not less than 60 mm.

Height setting (Weighting arm pressure setting)

In the process of weighting arm height gauging, an attempt is made to make the weighting arm bracket parallel to the bottom roller drafting plane. By doing this, the springs are “zero set” and the recommended compression of springs will give the necessary load. TeraSpin's drafting system has a loading system where all three lines exert a load independent of each other. TeraSpin does not recommend use of any load indicator gauge and the height setting tool provided by TeraSpin is sufficient to assure the designated loads. Further, these coil springs have only positive tolerances, which means that under no circumstances (with the proper height gauge) can the load fall below specification. It is due to this very reason that even a slight relaxation in the height setting process doesn't impact any reduction of the load on the rollers.
Before starting the height setting procedure, please ensure the following:

1. Set the eccentric load selector of all the weighting elements to GREEN using the tool provided in the setting gauge.
2. Uniform fitting (top rollers with recommended top roller cot diameter and apron cradles suitable for weighting arms) must be used across the entire frame.

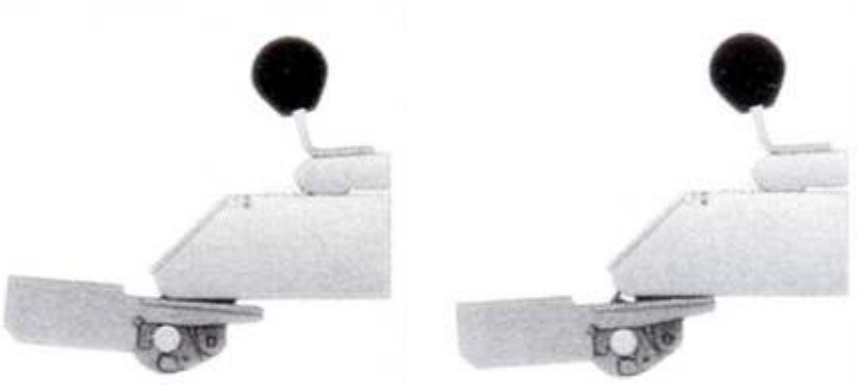
Follow the procedure explained below for height setting (weighting arm pressure setting):

1. Align the weighting arm with respect to the bottom roller flutes. Use a nylon hammer only for light tapping and centering. The use of a steel hammer is strictly prohibited.
2. To start height setting, a pre-load on the bottom rollers and the bottom roller bearings is must. This is achieved by ensuring adequate load after pressing the weighting arm with top rollers. Necessary adjustment of the height setting screw to be done manually. A small part of the height setting screw is to be screwed-in for light loading and with the weighting arm open. This is rough gauging.
3. Please note this is the first step of height gauging and hence do not lock the top arms at this stage.
4. Place the height gauge on the axle of the front top roller and push till it stops. A magnet holds the height gauge in position.
5. Adjust the weighting arm pressure by turning the height setting screw until the height gauge is parallel to the bottom edge of the arm (visual check).
6. For correct adjustment see the figure on page 12. Adjust the complete machine in the manner described above.
7. As each weighting arm starts getting loaded and as one reaches towards the end of the machine, the load on the bottom roller also increases. As a result, the previously loaded top arms tend to show less pressure due to the resilience of the bottom rollers. This can be noticed by using the height gauge on already set top arms. No locking of top arms is suggested at this stage.
8. This is followed by final checking of the draft field setting and height setting with half-tightening the locking screw.
9. Open and close the top arms one by one before final tightening of the locking screw. Do normal tightening and then a 15° turn of the allen key/screw ensures adequate torque on the screw. No extension pieces to be used for the allen key for tightening.
10. Please make sure that the adjacent weighting arms remain pressed.

Note : Adjustment of load/height has to be done by opening the weighting arms. If any attempt is made to adjust (increase or decrease) the load with weighting arm pressed, there is a possibility of damage to the components inside the weighting arm, especially the nut of the height adjustment screw.

The above procedure is followed during installation/regular setting and when the top arms on the entire machine are replaced. However, it is not mandatory for a single piece replacement on a running machine.

Weighting arm adjustment too high and too low



Optimisation of TeraSpin drafting for roving frames

Most common draft values for optimum yarn quality

	Minimum	Maximum	Recommended range
Total draft	5	18	8 - 12
Break draft	1.06	1.5	1.12 - 1.18
Tension draft*	1.02	1.08	1.05

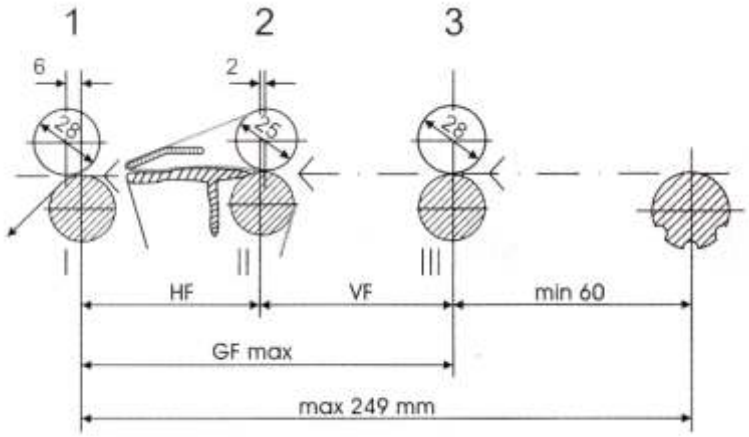
**Applicable for 4-roller drafting only*

A total draft of more than 12 is hardly used as it is advisable to have higher total draft at ring frame because of yarn quality. It is not recommended to employ total draft < 5, because at such a low draft proper drafting may not take place, which will lead to inferior roving and yarn quality. In case of a 4-roller drafting system, tension draft of 1.05 is used as a support for condensation between the 2nd and 3rd roller in PK 1500-0001940 and PK 1600-40 weighting arms and between the front and 2nd roller in the PK 1500-0001938 weighting arm.

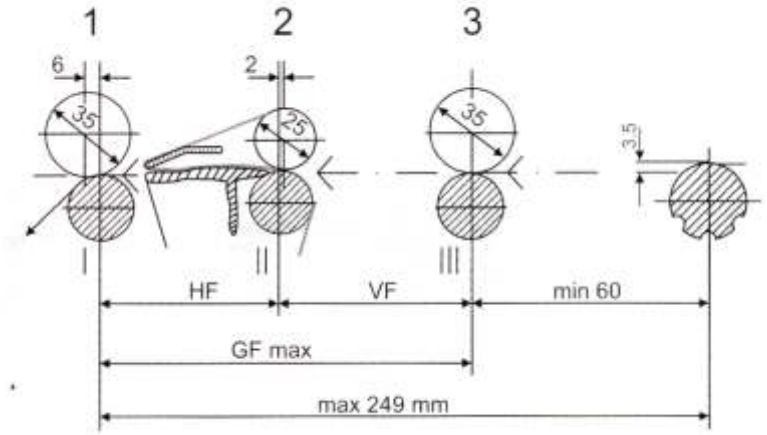
Sliver hank limitation

Making roving from a sliver hank of Ne 0.2 and finer may cause improper drafting, resulting in poor yarn quality, due to less fibre cohesion in the sliver. In such case extra care has to be taken in feeding sliver from sliver can up to Roving frame drafting system. It is not advisable to process sliver coarser than Ne 0.098 on these roving frame drafting systems.

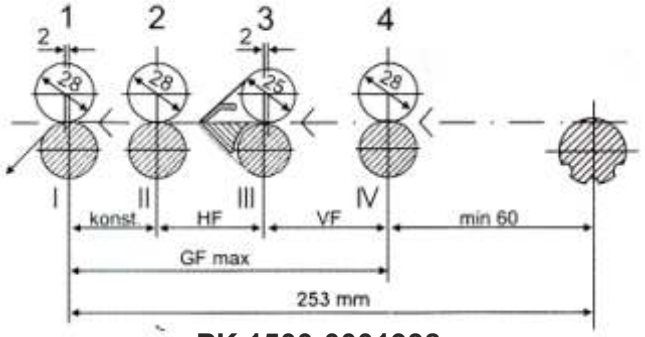
Draft zone setting



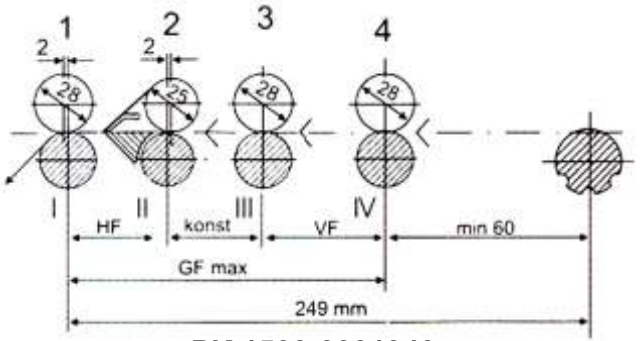
PK 1500-0962 604



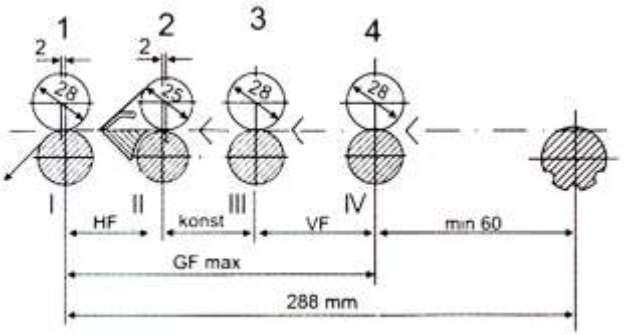
PK 1500-0962 602 and PK 1500-0962 604



PK 1500-0001938



PK 1500-0001940



PK 1600-40

Weighting arm	Cradle	Bottom roller ø (mm)#				Bottom roller setting (mm)				Max. fibre length (mm)
		I	II	III	IV	HF	VF (min)	VF (usual)	GF (max)	
PK 1500-0962 604	OH 514-1275261	27/30	25/27	27/30	-	46	40	60-80	189	40
	OH 534-1275268	30/32	25/27	30/32	-	60		60-80		54
	OH 534-000110	30/32	25/27	30/32	-	60		60-80		54
	OH 524-000110	30/32	25/27	30/32	-	76		70-90		60
PK 1500-0962 602	OH 514-1275261	30/32	25/27	30/32	-	46		60-80		40
	OH 534-1275268	30/32	25/27	30/32	-	60		60-80		54
	OH 534-000110	30/32	25/27	30/32	-	60		60-80		54
	OH 524-000110	30/32	25/27	30/32	-	76		70-90		60
PK 1500-0001938	OH 514-1275261	27/30	27/30	25/27	27/30	46	45	46-50	193	40
PK 1500-0001940	OH 514-1275261	27/30	25/27	27/30	27/30	46	45	46-50		40
PK 1600-40	OH 514-1275261	27/30	25/27	27/30	27/30	49	40	60-80	228	40
	OH 534-1275268	30	27/30	30	30	60	40	60-80		54
	OH 534-000110	30	27/30	30	30	60	40	60-80		54
	OH 524-000110	30	27/30	30	30	76	40	70-90		60

 # Dia. of bottom rollers depends on machine manufacturers

The front zone setting (HF) depends on the dimensions of the top apron cradle to be used, the diameter of top and bottom rollers and the space required for the front zone condensers to be used. One has to be careful in setting the slip-draft distance, because too narrow a slip draft distance may cause undrafted sliver, which leads to higher end breaks on the roving frame. In such a case, the slip-draft distance can be regulated by adjusting the overhang of the front top roller. One can go for a maximum of +6 mm front top roller overhang. If the problem still persists then one can also increase the load on the front top roller or go for a little wider front zone setting.

The rear zone setting (VF) depends on the fibre mass, the fibre length and the drafting qualities of the fibre material to be spun.

Top roller loading

Weighting arm	Weighting elements & load (daN)					
	Front			Second		
	Black	Green	Red	Black	Green	Red
PK 1500-0962604	20	25	30	10	15	20
PK 1500-0962602	20	25	30	10	15	20
PK 1500-0001938	9	12	15	15	20	25
PK 1500-0001940	20	25	30	10	15	20
PK 1600-40	20	25	30	10	15	20
PK 1601-01	20	27	35	9	12	15

Weighting elements & load (daN)					
Third			Rear		
Black	Green	Red	Black	Green	Red
15	20	25	-	-	-
15	20	25	-	-	-
10	15	20	10	15	20
15	20	25	15	20	25
10	15	20	10	15	20
20	25	30	-	-	-

Top roller cradle system

TeraSpin top arms of the PK 1500 series & the PK 1600-40 for roving frames can be fitted with the OH 514 (short) cradle, the OH 534 (medium) cradle and the OH 524 (long) cradle in combination with different apron top roller diameters, depending on the application and the weighting arm.

In roving frames, the top roller loading depends on type of fibre, the fibre mass and the total draft to be employed. Generally, the greater the fibre mass, the higher the loading on the top rollers. Also for low total draft, it is recommended to apply a high load on the top rollers. In weighting arms of the PK 1500 series all the top weighting elements have three different load options. However, the magnitude of these three loads is different for different weighting elements depending on its position in the weighting arms. Generally, it is recommended to opt for a medium load on all the top rollers, i.e. green. One can select the appropriate load on each weighting element as per requirement.

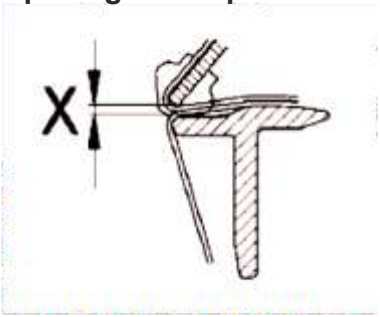
The processing of man-made fibres calls for higher top roller pressure, especially on the front top roller. Too low a pressure on the top rollers may also lead to improper drafting which results in undrafted sliver and more end breaks. In case of the 4-roller weighting arm PK 1500-0001938, lower front top roller pressure is used because only a tension draft of approx. 1.05 is employed in the condensing (front) zone.

Load adjustment

Load adjustment is effected by means of an eccentric load selector activated by a special wrench. The three different load on each weighting element can be identified by the colour code on each eccentric load selector.

Selection of distance clips

Opening 'X' at apron release point



The vertical distance between the nose bar and the cradle at the nip point (distance 'X' in the figure above) determines the intensity with which the fibres are controlled and guided between the top and bottom aprons in roving frames as well as in ring frames. To achieve optimum drafting conditions, the opening 'X' can be adjusted using distance clips to achieve the best quality of yarn (in the ring frame) and roving (in the roving frame).

Selection of the opening 'X' is also dependent on the following parameters:

1. Type of fibres.
2. Fibre mass in main drafting zone.
3. Yarn/roving count.
4. Type of apron & its thickness.
5. Type of nose bar & its built-in position.
6. Type of cradle.

Considering all the above parameters, one has to select the optimum opening 'X' to have the best combination of roving quality and smooth working of the roving frame. Typically the narrower the opening 'X', the better the roving quality.

However, although an extremely narrow opening 'X' can give better roving quality, it may affect the performance of the roving frame in terms of more ends down and undrafted sliver. Below mentioned are the general guidelines to select distance clips to achieve a balance between the better roving quality and smooth working of the roving frame. However, one has to reconfirm and fine tune the opening 'X' by conducting practical trials.

Choice of distance clips* with TeraSpin cradle OH 514-1275261

OLC No.	OLC 0964104	OLC 0964105	OLC 0964106	OLC 0030491	OLC 0964107	OLC 0964108	OLC 7126	OLC 0964109	OLC 0964110
OLC colour	White	Grey	Black	Orange	Ivory	Green	Pink	Blue	Brown
Opening 'X' in mm	3.5	4	4.5	5	5.4	6.5	7.5	9	11.8
Ne 0.4 to 0.8						✓	✓	✓	
Ne 0.8 to 1.1					✓	✓	✓		
Ne 1.1 to 1.3				✓	✓	✓			
Ne 1.3 to 1.5			✓	✓	✓				
Ne 1.5 to 1.8		✓	✓	✓					
Ne 1.8 to 2.2	✓	✓	✓						
Ne 2.2 to 2.5	✓	✓							
Above Ne 2.5	✓								

** Distance clips are not included with the supply of cradles*
Note : The above mentioned distance clips are to be used in combination with TeraSpin cradles only

Choice of distance clips* with TeraSpin cradle OH 534-0001275268 and OH 534-000110

OLC No.	OLC 0964104	OLC 0964105	OLC 0964106	OLC 0030491	OLC 0964107	OLC 0964108	OLC 7126	OLC 0964109	OLC 0964110
OLC colour	White	Grey	Black	Orange	Ivory	Green	Pink	Blue	Brown
Opening 'X' in mm	3.5	4	4.5	5	5.4	6.5	7.5	9	11.8
Ne 0.4 to 0.8								✓	✓
Ne 0.8 to 1.1							✓	✓	✓
Ne 1.1 to 1.3						✓	✓	✓	
Ne 1.3 to 1.5					✓	✓	✓		
Ne 1.5 to 1.8				✓	✓	✓			
Ne 1.8 to 2.2			✓	✓	✓				
Ne 2.2 to 2.5		✓	✓	✓					
Above Ne 2.5	✓	✓	✓						

** Distance clips are not included with the supply of cradles*
Note : The above mentioned distance clips are to be used in combination with TeraSpin cradles only

Choice of distance clips* with TeraSpin cradle OH 524-000110

OLC No.	OLC 0964104	OLC 0964105	OLC 0964106	OLC 0030491	OLC 0964107	OLC 0964108	OLC 7126	OLC 0964109	OLC 0964110
OLC colour	White	Grey	Black	Orange	Ivory	Green	Pink	Blue	Brown
Opening 'X' in mm	3.5	4	4.5	5	5.4	6.5	7.5	9	11.8
Ne 0.4 to 0.8									✓
Ne 0.8 to 1.1								✓	✓
Ne 1.1 to 1.3							✓	✓	✓
Ne 1.3 to 1.5						✓	✓	✓	
Ne 1.5 to 1.8					✓	✓	✓		
Ne 1.8 to 2.2				✓	✓	✓			
Ne 2.2 to 2.5			✓	✓	✓				
Above Ne 2.5		✓	✓	✓					

** Distance clips are not included with the supply of cradles*
Note : The above mentioned distance clips are to be used in combination with TeraSpin cradles only

Top roller cots

When cots are newly mounted & ground, the top roller diameter of all the top rollers (other than apron top rollers) shall be 28 mm with a short cradle. But for PK 1500-0962602 weighting arm, it will be 35 mm as this weighting arm is specially designed to process longer fibre length (40-60 mm).

Cot hardness is decided considering the roving hank & fibre type. Generally for top rollers (front and rear, LP 315), shore hardness of 83° is used. For an apron top roller, LP 317, cots of 80° shore hardness are more common.

Cot grinding

Cot grinding intervals depend on the following factors:

1. Quality of the cot.
2. Type of fibres.
3. Climatic conditions.
4. Pressure employed on the top roller.
5. Top roller running time.
6. Finishing agents or other additives.

Reduction in cot dia. due to subsequent grinding of front and rear top roller is permissible up to a maximum 3 mm. Within this limit it is not necessary to re-adjust the height of the weighting arm. The cots of the apron top roller LP 317 may not be ground, as the top apron dimensions are matched to apron top rollers of fixed diameters.

Condensers and roving guide

In roving frame drafting systems, the task of the condensers is to evenly fold the flank fibres back into the fibre material. The condenser aperture should be neither too narrow nor too wide in order to avoid possible faults in the drafting process.

Generally closed condensers are recommended in roving frame drafting, except in the front zone. A favourable cross-section ratio for the delivery aperture of closed condensers (height x width) of 1:4 or 1:5 have been found more suitable.

Rear roving guide

The rear roving guide is to be positioned as close as possible to the rear pair of rollers. One should consider the position and type of the roving guide rail while selecting the rear roving guide. If the opening width has been correctly chosen, any tangled sliver portion will be smoothed out.

Rear zone condenser

The rear zone condenser is positioned in front of the double-apron unit. The lower edge of the front aperture lies on the drafting plane. Its function is to slightly condense the fibres before it enters the front zone or double-apron unit and gently fold any flank fibres which may have spread outwards back into the sliver body. Make sure that the opening width of the rear zone condenser is not too small, otherwise it may cause faulty drafting.

Front zone condenser

The front zone condenser condenses the outspread flank fibres. Subsequently the spinning delta is made smaller and roving breakages, lapping and fly generation are reduced. Care should be taken in order to match the opening width of the condenser to the roving hank as well as to the fibre characteristics.