

**Instruction manual for TeraSpin spindles with
HF series of inserts**



This manual includes safety related information and hence must be easily and quickly accessible to the in-charge of production/maintenance and to every member that works on machines with these components.

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1. Legal stipulations

The spindles and their accessories such as brakes supplied by TeraSpin must be used only for the purpose they are intended for and in accordance to this manual. TeraSpin declines all responsibility for any damage or injury due to inappropriate or hazardous usage.

2. General notes on safety

2.1 Safety precautions

Spindles are a part of ring spinning frames, which represent low risk, and low probability of injury to operators. However, it is not possible to eliminate completely all sources of potential danger. Daily routine also demands constant attention. It is necessary to follow the instructions in this manual and the manuals of the manufacturers of the ring spinning frames to eliminate the risk as much as possible. All manuals, especially documents related to safety, must be kept in such places where the concerned staff can easily and quickly access them and refer to them. Appropriate steps must be taken to ensure that only authorised and trained staff have access to machines. If safety instructions are followed in day-to-day work, it reduces the risk of injury and it is therefore never a waste of time.

2.2 Local safety rules

Local safety rules and laws in force in the respective country of operation must be observed.

2.3 Obligatory notification

In case any abnormal behaviour or abnormal sound of the spindle is observed, please stop that particular spindle immediately. TeraSpin is not responsible for any damage that may occur due to failure to observe this regulation.

2.4 Maintenance

Observe the maintenance regulations of the ring frames as recommended by the respective machine manufacturers. During maintenance work, turn off the machines' main or safety switches. This prevents machines being accidentally switched on by a third person.

2.5 Appropriate dressing style

All machine parts which are moving or rotating and are either not covered or not possible to cover are prone to cause accidents. The risk of accidents in such areas can be considerably reduced by wearing appropriate clothing. A few points regarding clothing style are mentioned below:

- Do not wear loose clothing such as wide open sleeves, long sleeves, scarves, ties, etc.
- Long hair must be specially protected by properly tying it up
- Always wear a cap of proper size so that it does not fall down while working
- Do not wear rings on your fingers or wrist watches, bracelets, etc.
- Do not keep any tools or pens in your open pockets. Such objects might drop out or fall into the machine while working on the machine

2.6 Disposal

One must follow the laws and regulations in force in the respective country of operation for spindles at the end of their lives with respect to reutilisation, recycling and waste disposal. Any oil, grease, plastic parts, etc., must be disposed off in accordance with the regulations laid down by the respective local government.

3. Spindles

TeraSpin offers a comprehensive range of complete spindles for all makes and models of ring frames and doubling frames.

Based on the application, TeraSpin spindles are equipped with suitable spindle bearing units. The spindles are manufactured with highest level of precision to ensure steady and vibration free operation as well as a long service life.

Types :

- Spindles of aluminium plug type
- Spindles of bare blade type
- Spindles with and without yarn cutters
- Spindles suitable for 4-spindle tape drives and tangential belt drives
- Spindles with external locking and self-locking systems

All spindles are optimised considering

- The bobbins (tubes) and ring diameters to be used
- The type of spindle drives
- The minimum and maximum spindle speed
- The type of spindle brakes to be used

3.1 Types of spindle bearing units

Parameters	HF-100	HF-1	HF-21
Maximum spindle speed (rpm)*	25000*	22000*	20000*
Maximum bobbin length (mm)	190	210	270

* Each spindle bearing unit has been designed for the maximum mechanical spindle speed as mentioned in the above chart. However, actual operating speed depends on various parameters as recommended by the machinery manufacturers and maintenance practices and machine condition, the raw material, environment, yarn count being spun, bobbin (tube) length, bobbin (tube) clearance, bobbin (tube) rigidity, bobbin (tube) protrusion over plug, spinning ring diameter, type of spindle top part, etc. For actual maximum spindle speed please consult TeraSpin.

Alerts:

- Please do not run spindles at a speed more than recommended
- Please do not run damaged spindles

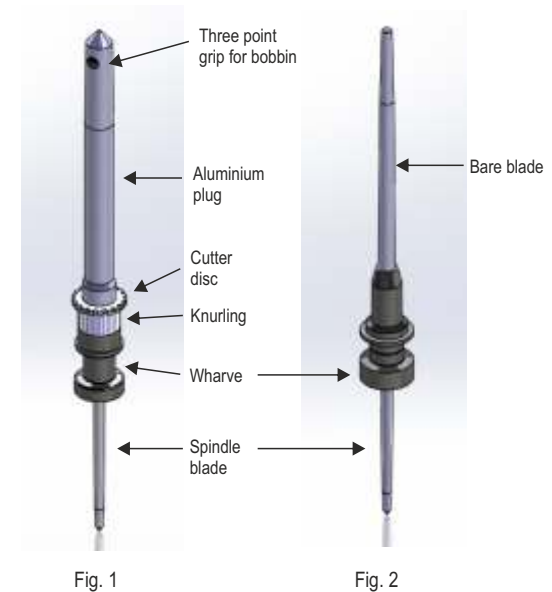
Consequences:

In case of failure to observe the above mentioned points

- The spindle may be overloaded and will fail prematurely
- Injuries to staff



3.2 Spindle top parts



There are mainly 2 types of spindle top parts viz. aluminium plug type spindle (Fig. 1) and bare blade type spindle (Fig. 2)

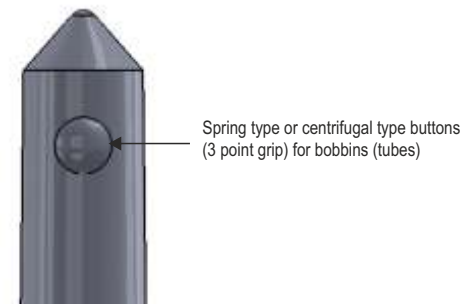


Fig. 3

Buttons (three point grip) for bobbins (tubes)

Top parts can be equipped with either spring type or centrifugal type buttons (3-point grip) for bobbins (tubes) as shown in Fig. 3

Locking of the top part

There are 2 types of locking systems available to stop the top part of a spindle from coming out of bolster during doffing, viz. external lock (hook type) as shown in Fig. 4, and self locking type as shown in Fig. 5.



Fig. 4

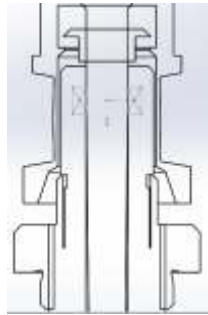


Fig. 5

For safe removal of top parts and replacing of self-locking ring, please refer to section 5.2, page 17.

Cutters for auto doffing spindles

Cutter consists of aluminium serrated disc and steel cutter as shown in Fig. 6 or Smart Yarn Catcher as shown in Fig. 7.

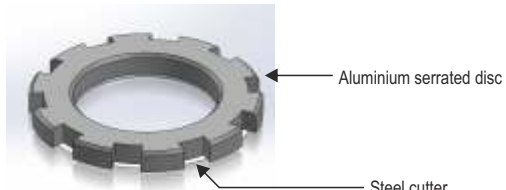


Fig. 6



Fig. 7 Smart Yarn Catcher

Alerts:

- Please do not run any spindle which shows any sign of damage
- Please do not run any spindles without a bobbin
- Please do not run spindles if the buttons (3 point grip) are damaged
- Please ensure that the top part of the spindle is properly locked by the external locking/self locking system before starting the machine
- If required, please pull down the lower clamping face (approx.3-4 mm) of the Smart Yarn Catcher by hand for cleaning as shown in Fig. 8
- Pulling of Smart Yarn Catcher upward or applying any kind of force from the bottom of Smart Yarn Catcher is prohibited as it is likely to damage the Smart Yarn Catcher



Fig. 8

Consequences:

- Injury to staff
- The buttons (3 point grip), bobbin (tube), yarn cutter, body of the top part or bolster can be damaged
- The hook of external lock or self-lock can be damaged. This also increases the risk of accident and may damage the auto doffer



3.3 Spindle brakes

Each spindle must be run with only suitable knee or finger brakes (please refer to Fig. 9). TeraSpin can supply spindles with their knee or finger brakes.



Fig. 9

The right type of brakes must be installed to avoid any damage either to spindle or brake or both.

Alerts 1:

- **Never stop the rotating spindle or bobbins (empty tubes or cops) by hand. Always use brakes**

Consequences:

- Injury to staff
- The buttons or bobbins (tube) itself can be damaged
- The top part or bearing of the insert can be over loaded thereby causing spindle failure



Alerts 2:

- At a time, stop only one spindle per drive tape
- Always use brakes to stop spindles!
- Stop the spindle for a short time only

Consequences:

- The spindle tape heats up and may break
- Twist loss on other spindles

**3.4 Bobbins (tubes)**

The service life of spinning and twisting spindles is generally affected by imbalances in the rotating spindle elements (spindle top part and bobbin/tube, with and without yarn). The higher the imbalances, the higher will be the load on the bearings of the spindles. This load increases disproportionately as the spindle speed increases thereby causing premature wear and failure of the spindle bearings. Moreover, such imbalances lead to spindle vibrations with detrimental effects on yarn quality and ends down rates. They also result in higher energy consumption and noise emission. Hence, the use of high quality bobbins (tubes) is a basic requirement for all spindles. TeraSpin recommends using the bobbins (tubes), which are manufactured as per ISO 368.

Bobbin (tube) clearance

A bobbin (tube) has to be considered as an integral part of a spindle. The clearance between the bobbin (tube) and the spindle upper part has to be kept as low as possible and maintained below 0.2 mm at all times. It is suggested to use bobbins (tubes) made of dimensionally stable materials and construction to avoid changes in the bobbin (tube) diameter resulting from continued bobbin handling.

Concentricity of bobbin (tube)

For optimum spindle performance, the bobbin (tube) concentricity should be as good as possible at all times. It helps to avoid variations in yarn due to eccentric run of the bobbin (tube) with unequal yarn draw and more hairiness.

Bobbin (tube) curvature and difference in wall thickness

Bobbins (tubes) with curvature or large differences in wall thickness may increase imbalance, thereby affecting spindle life.

Bobbin (tube) stiffness

In order to achieve optimum spindle life, it is necessary to use bobbins (tubes) with adequate stiffness and dimensional stability. This becomes more critical for the bobbins (tubes) that are not supported over their full length by the spindle top part. Further, the bobbin (tube) projection over the spindle top part should also be as low as possible for the same reason. Under any circumstances the bobbin (tube) projection over the spindle should not be more than 25 mm.

Wear on bobbin (tube) and bobbin seats

Bobbins (tubes) should be checked periodically for damages/abnormal wear, if any. Damaged/worn out bobbins (tubes) should not be used. Bobbins (tubes) and the spindle clutch system are likely to get damaged if the running spindles are stopped by hand instead of using spindle brakes.

Alerts:

Mills ordering spindles must ensure that

- Clearances between bobbins (tubes) and spindles is the minimum possible
- TeraSpin is provided information about the bobbin (tube) dimensions (basic dimensions and production tolerance) to design suitable spindles
- They do not use the bobbins (tubes) with different dimensions or damaged one as these directly affect spindle life and performance
- Only bobbins (tubes) which are made for specific spindles are used and not the ones which are made for some other spindles
- TeraSpin recommends to use the bobbins (tubes) having maximum 25 mm of protrusion above spindle plug. It is always advisable to keep this protrusion the minimum possible

TeraSpin is not responsible for any damage to spindles or any injury which occurs due to running spindles with unmatching bobbins (tubes), bobbins of poor quality or due to stopping spindles by hand.

4. Installation, running-in and oiling

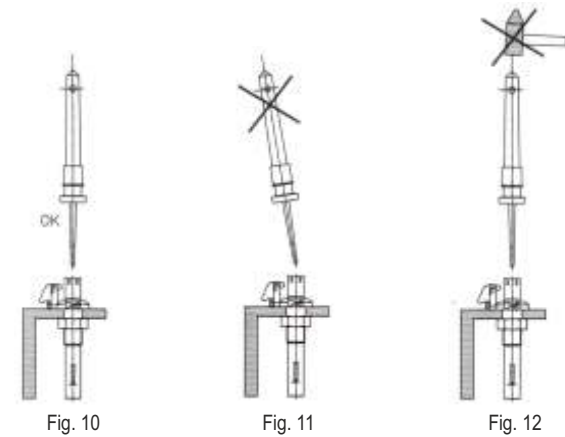
4.1 Installation of spindles

To achieve maximum spindle speed, smooth running and trouble free long life of spindles, we recommend that you follow the guidelines below:

1. Clean the steel bolster externally with a soft and clean cloth.
2. Clean the spindle rail before fixing the bolster.
3. Please do not forget to use a washer between the spindle rail and the nut. This prevents damage to the threading provided on the bolster housing, if over tightened.
4. Do not tighten bolster nuts with torque over 5 kg-m in order to prevent damage of bolsters. **While using torque wrench, set max. torque at 5 kg-m.**
5. Remove the bolster cap and clean the bolster from inside and rinse it with an appropriate spindle lubrication machine with the recommended spindle oil (**please refer section 4.2, page 10-11**).
6. Fill the bolster with the recommended spindle oil up to the maximum recommended level (**please refer section 4.2, page 10-11**).

Note: TeraSpin complete spindles are supplied without oil filling and hence, correct quantity of oil must be filled in as specified in running-in procedure before putting the spindles into operation. Operation of spindles without oil, even for a short period, will damage the spindle bearing unit.

7. **Put 2-3 drops of oil at the neck bearing rollers (critical).**
8. Wipe the spindle upper part, blade and steel wharve with a soft and clean cloth.
9. Insert spindle upper part gently into the bolster assembly.



Note: Please make sure that while inserting the spindle upper part into bolster assembly, you are holding it in a vertical position (as shown in Fig. 10). If it is inserted in a skewed manner (as shown in Fig. 11) or if it is dropped into the bolster assembly (as shown in Fig. 12), it can damage the neck bearing of the spindle bearing unit and the spindle blade, which will directly affect the performance and life of the spindle.

10. Wipe off any spindle oil spilling out of bolster assembly with a cloth.

Note: Please do not use any kind of powder to soak the spindle oil overflows as it may enter into the bolster assembly and damage the neck bearing and spindle blade tip.

11. Please check the free rotation of spindles by rotating the upper part by hand before starting the machine.
12. Position the spindle tape or tangential belt gently over the spindle wharve.
13. Run the machine at initial speed for 30 minutes without bobbins and check for any abnormal vibration, noise or excessive heat generation.

4.2 Lubrication of spindle bearing unit

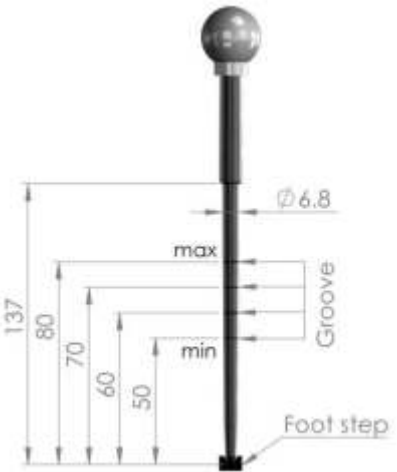
Types of spindle bearing unit	Lubricant	Lubrication intervals Operating hours	Viscosity class to ISO
HF-1, HF-100, HF-21	Servospin EE10*	5000	VG 10

* Solvent refined high-grade oil – with good anti-wear properties and containing anti-oxidant and anti-corrosion additives

The oil level should be checked on a random sample of spindles after half the number of operating hours shown. **The roller bearing should be thoroughly coated with oil before putting the spindle into service and also at each lubrication operation.**

Viscosity class

Viscosity class according to ISO	Mean kinematic viscosity at 40°C mm ² /s (cSt)	Limits of kinematic viscosity at 40°C mm ² /s (cSt)	
		Minimum	Maximum
VG 10	10	9	11



Oil quantity

- 1st oil change: Maximum oil level 80 mm for HF-1 and HF-21 spindle bearing units and 70 mm for HF-100 bearing units.
- Subsequent oil changes: Oil level at 65-70 mm for HF-1 and HF-21 bearing units and 60 mm for HF-100 bearing units.
- Oil level should never fall below 50 mm.
- This will ensure proper oil circulation up to the neck bearing even at lower spindle speeds.

Precautions:

1. Ensure no fly/fluff enter the spindle bearing unit during oiling.
2. Clean and wipe the spindle blade before inserting it into the bolster assembly.
3. After installation and oil filling it is recommended to perform bare running of the spindles for 30 minutes. During this period please check each spindle carefully for any abnormal heat generation or sound or vibration.
4. Always use the dip stick provided by TeraSpin to check the oil level in the bolster.
5. Ensure the bearing is oiled with 2-3 drops of oil during the first oiling.
6. Make sure there is no air bubble left inside the damping spring.
7. Check the oil level at least 30-40 minutes after filling oil inside the bolster as oil enters slowly between the layers of damping coil and hence, the oil level reduces.

8. In case new spindles have a different wharve diameter than spindles earlier used on the machine, make sure that correct spindle tape length is being chosen to suit the wharve diameter of the new spindles.
9. Please ensure correct tension in the spindle tape.
10. Please do not use damaged or incorrect bobbins (tubes) as these may lead to damage/bend of the upper part. This will further result in poor performance and even early failure of the spindles.
11. During topping/oil change, make sure that combination of bolster with respective top part does not get changed.
12. Please do not keep bolster in an open condition for long time as fluff/dust will enter inside the bolster.
13. The spindle top part, when removed from the bolster, must be handled with care and stored vertically. It should not get damaged due to rough handling. Also before re-fixing the top part in the bolster, make sure that there should not be any fluff, foreign particles, dust stuck on it.
14. **Please ask spindle lubricating machine manufacturer to provide the right kind of adaptor to suit the insert HF-1 / HF-100 / HF-21.**

4.3 Running-in schedule

Sr. No.	Activity	Frequency	Remark
1	Flushing and oiling by machine	New installation / 6 monthly	80% of target speed or 15000 rpm, whichever is lower
2	2-3 drops of oil at the neck bearing rollers (critical)	Every time	
3	1st oil flushing and change by oiling machine	24 hours	After every 24 hours, increase rpm by 1000 till target speed is achieved
4	2nd oil flushing and change by oiling machine	7 days	
5	3rd oil flushing and change by oiling machine	30 days	
6	Oil quantity measuring/topping	3 months	Check 10% spindles randomly
7	Scheduled oil change (regular) based upon the spindle speed	6 months	Approximately

The frequency given above is applicable to ideal working and environment conditions. The interval of topping/oil changing can be shorter if the working/environmental condition demands.

It is recommended to check the oil level in bolster randomly after half the number of operating hours mentioned in the table above. If the oil level is less than mentioned in section 4.2 on page 11, oil must be added to achieve desired oil level in the bolster.

Spindle oil must be flushed out completely and new oil should be filled in case the oil quality in the bolster is deteriorated (i.e. if oil colour changes or contaminated).

Disposal of used oil:

The rules and regulations laid down by the Government of respective country must be obeyed and used oil must be disposed accordingly.

Alerts:

- Never run the spindle without adequate quantity of oil inside the bolster
- The quality and quantity of the oil must be checked regularly

Consequences:

- The spindle can be damaged or may fail



TeraSpin is not responsible for any **damage** to spindles or any **injury** that occurs due to running the spindle **without oil** or **with insufficient oil** or **with the wrong type of oil** or **of poor quality oil**.

4.4 Spindle centering

Precise centering of the spindle with respect to the spinning ring is a must for the smooth running of the spindles at high speed. Also, improper spindle centering affects the yarn quality and the number of end breaks.

Spindle centering must be done by using proper tools provided by the ring frame manufacturers. Also the procedure suggested by the ring frame manufacturers should be followed.

4.5 Fixing of polymer finger brake

Care should be taken while fixing the polymer finger brake to avoid any damage please follow the following procedure:

1. Fix the bolster without brake on ring frame.
2. Use the special plier supplied by OEM to hold the bolster while tightening the bolster nut.

3. Please do not fix the brake inside the bolster before fixing it on the spindle beam and do not hold the brake while tightening the bolster nut. This may damage the finger brake.
4. After fixing the bolster, insert only one brake leg inside the bolster slot. Then turn the finger brake slowly until the other leg of the finger brake enters in the bolster slot (as shown in image below).



5. Please note that it is not possible to remove the brake without removing the bolster.

5. Maintenance

5.1. Important practices to be followed strictly

TeraSpin spindles are designed and manufactured for trouble free, high and consistent performance over a long time period. However, in order to achieve all this, it is very important to observe certain maintenance and handling practices as mentioned below:

1. Kindly follow the procedure strictly as mentioned in section 4.1 on page 9-10 during spindle installation.
2. Please use spindle oil suggested by TeraSpin only and as mentioned in section 4.2 on page 10-11.
3. It is very important to follow the running-in process (mentioned in section 4.3 on page 12) for new spindles to ensure trouble free, high and consistent performance over long time period.
4. Once the running-in is completed, follow the oil topping and oil changing schedule strictly as mentioned in section 4.3 on page 12.
5. The frequency of oil topping and oil changing given in section 4.3 on page 12 is applicable to ideal working and environment conditions. The interval of topping/oil changing can be shorter if the working / environmental condition demands.
6. It is recommended to check the oil level in bolster randomly after half the number of operating hours mentioned in section 4.2 on page 10-11. If the oil level is less than mentioned in section 4.2 on page 10-11, oil must be added to achieve desired oil level in the bolster.
7. Spindle oil must be flushed out completely and new oil should be filled in case the oil quality in the bolster is deteriorated (i.e. if oil colour changes or contaminated).
8. Ensure no fly/fluff enter the spindle bearing unit during spindle oiling.
9. Clean and wipe the spindle blade before inserting it into the bolster assembly.
10. Always use the dip stick provided by TeraSpin to check the oil level in the bolster.
11. **Ensure the neck bearing is oiled with 2-3 drops of oil during the first oiling.**
12. Please do not use damaged or incorrect bobbins (tubes) as these may lead to damage/bend of the upper part. This will further result in poor performance and even early failure of the spindles.
13. During topping/oil change, make sure that combination of bolster with respective top part does not get changed.
14. Please do not keep bolster in open condition for long time as fluff/dust will enter inside the bolster.
15. Yarn accumulated on knurling must be cleaned regularly.
16. Top part, when removed from the bolster, must be handled with care and stored vertically. It should not get damaged due to rough handling. Also before re-fixing the top part in the bolster make sure that there is no fluff, foreign particles or dust stuck on it.
17. Please ask spindle lubricating machine manufacturer to provide the right kind of adaptor to suit the insert HF-1 / HF-100 / HF-21.

5.2. Self locking (internal locking)

In case of spindles with self locking (internal locking), if any kind of damage is observed on a retaining ring, it must be replaced immediately. In order to replace the retaining ring, please follow the procedure mentioned below:

1. Please remove the spindle top part by using the lifting tool only.



2. Cut the old (damaged) retaining ring (1) using a knife & remove it.

3. Fix the new retaining ring (1) by using taper pin (2) & punch holder (3).

4. Put the taper pin (2) on the top of the bolster (4) as shown in Fig. 13.

5. Insert new retaining ring (1) in the taper pin (2) and push it softly down with the help of the punch holder (3). Carry out this process by hand only & do not use a hammer.

6. Insert the top part carefully into the bolster & lock properly.



Fig. 13

Alerts:

- Please ensure that top part is properly inserted inside the bolster and secured properly by the retaining ring before starting the machine

Consequences:

- Injury to staff
- Damage to spindles



Summary of Dos and Don'ts

1. During maintenance and oiling please store spindle top parts vertically and do not store horizontally.



Wrong practice



Right practice

2. Do not tighten bolster nuts with torque over 5 kg-m in order to prevent damage of bolsters. Use the torque wrench set at 5 kg-m for this purpose.

3. In case of self locking type spindles, press the top part by hand into the bolster with adequate pressure and ensure that it gets locked.

4. Please ensure that spindle top parts are properly secured by hook (external lock) or self lock (internal lock) before starting the machine. Do not run any spindle with a damaged hook/internal lock.



5. Please do not run the spindles without bobbins (tubes).* Also please do not run the spindle with unmatching/damaged bobbins (tubes) and also in case the buttons are damaged.

***Bare running of the spindles without bobbins (tubes) is recommended for 30 minutes only during installation of new spindles as mentioned in section 4.1 on page no. 9-10**



6. Please do not touch the running spindles. Do not clean the running spindles. Do not stop running spindles by hand, always use the brakes.



7. In case of spindles of self-locking type, please use the lifting tool to remove the top part from the bolster.

8. Never run any spindles which have got any kind of damage.



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