Operating instructions for roller bearing spindles

1. Purpose

HL spindle bearings of sizes 0, 1, 2 are designed for use in light duty applications and sizes 3, 4, 5, 6, 7 for spinning and twisting spindles used in medium and heavy duty applications. All sizes can be used in processes with and without ring as well as with and without spindle top.

Spindle bearings have the following well-proven design features:

- Robust spindle collar roller bearing whose small dimensions allow for the use of small wharve diameters
- Spindle step with small bearing contact area makes for low friction values and low power requirements
- Spindle collar and spindle step are elastically connected via a centring spiral element allowing for the self-adjustment of the spindle to the ideal axis of rotation.
- Wear-free, oil-hydraulic dampening system allowing dampening to be adapted to the speed in an optimum manner over the entire speed range.

Because of their design, **roller bearing spindles** must not be used **for any other purposes**.

➢ Determining the size of HL spindle bearings

The size to be selected for a spindle bearing in a given application is dependent on various variables and conditions. The following variables and conditions determine the selection of a spindle bearing:

1. Dimensions of the full bobbin or tube
2. Weight of the full bobbin or tube, gross
3. Total weight of complete top and full bobbin
4. Quality of bobbin
5. Quality of the tube seat

The maximum permissible axial load „A", i.e., compl. top plus full bobbin, is shown in Table 1.

Table 1 — 1 daN = 1kg

SfN spindle bearing	Max. axial load „A" in daN
HL10	1.0
HL21	1.0
HL30	1.5
HL44	4.0
HL55	5.5
HL66	7.5
HL68 (without lubrication area on shaft foot)	9.0
HL68 (with lubrication area on shaft foot)	14.0
HL77	14.0

If the axial load is > 14daN, an HL bearing with breast plate of size 1803, 2003 or 2503 must be used in consultation with SfN.
The spindle bearing to be used must be selected based on the cop weight (gross in kg) and on the required speed according to the diagram in Annex 1, page 5.

2. Mounting / dismounting

- Insert the lower parts of the spindles into the holes of the spindle bearing plate and secure them with a hexagon nut.
  For the **tightening torque** to be applied for fixing the hexagon nut, refer to Table 2.

  Table 2

Max. permissible tightening torque for hexagon nut							
Bearing	HL10 HL21	HL30	HL44	HL55	HL66 HL68	HL77	HL1803 HL2003
kpm	10	10	11	12	14	14	14

- Then, fill in oil (item 3.1). Then plug the spindle tops into the lower parts.

  Important !
  For spindle tops with internal locking mechanism, the spindle top must be pushed **though a rotational motion** over the wharve lock until it audibly engages.

  For dismounting, proceed in the reverse order. To avoid damage to the wharve, use an appropriate unlocking lever as described in Annex 2, page 6.

- **Centring**. Depending on the installation conditions, centre the spindle relative to the spinning ring, or the spinning ring relative to the spindle, as applicable.

3. Maintenance

3.1. Commissioning

Fill lubricating oil into the lower part of the spindle in accordance with the bearing type used.
When filling in oil, make sure that the **roller bearing will be wetted with oil** each time lubrication is carried out.
This will be necessary, in particular, before the spindle top is inserted for the first time into the lower part. **The high-performance spindle may become damaged even if running dry only for a short time.**
Only high-quality doped solvent raffinate with wear reducing properties may be used as lubricating oil. Its additives must ensure higher resistance to aging and improved corrosion protection.
For filling in oil, a spindle maintenance unit should be used in which a lubricating insert seals off the foot bearing so that the oil will be forced through the foot bearing and then through the dampening spiral.
Important!
In all other lubricating devices, it takes time for the oil to fill the gap so that the air can escape.

The oil consumption is strongly dependent on the loading of the spindle and unbalance of the tubes/bobbins. The oil level must **not drop below the minimum mark** of the oil dip stick.

Up to the time of completion with the spindle top, always keep the spindle casing closed with the protective cap to prevent contamination of the spindle bearing.
When inserting and removing the spindle tops, make sure that the tops are kept vertically.
The following lubricating oils (viscosity class ISO VG) should be used

Aral	Sumarol CM
BP	Energol HLP-HM
ESSO	NUTO H
ADDINOL	ADDINOL HLP
MOBIL	Velocite
SHELL	Tellus HLP
DEA	Astron HLP

The oil quantity and viscosity class must be chosen in accordance with Annex 3, page 7.

3.2. Maintenance

- When carrying out maintenance operations during which the top will be off for a longer period of time, seal the spindle bearings with the protective caps.

- The spindle tops have a very low unbalance to ensure a high service life of the spindle bearings. Therefore, it is absolutely necessary to protect them from **impacts, shocks and other external forces.**

- Never place the spindle tops with the tip of the shaft foot onto stone or concrete floors to avoid damage to the surface.

- As with any other sliding or rolling contact bearings, the bearings will wear in during initial operation. Therefore, to minimise wear, **always insert the same tops into the same lower parts.**

- When removing the spindle top, check the top including the interior of the wharve for proper cleanliness.
  When removing the top, wipe off the shaft of the spindle top so that the adhering oil cannot get into the wharve, because when the tops are fitted back in place, there would the risk of contamination of the driving belt, yarn and adjacent machine parts.
  When choosing appropriate cleaning agents, make sure that they will not detrimentally affect the lubricant (kerosene, e.g., will be suited). Before fitting the tops, thoroughly wipe off the cleaning agent. No cleaning agent must get into the bearing.

- When fitting or removing the spindle tops, make sure that the tops are kept vertically. If the top is tilted during installation, this may result in scratches in the roller raceway of the shaft, which, in turn, may affect the running behaviour of the spindle.
- Check the oil level in the spindle casing with the **oil dip stick** (according to Annex 3), and carry out oil renewal in accordance with Table 3.

  Use a **spindle lubricating device** not only for initial filling, but also for topping up lubricating oil and for oil renewal.

  Wipe off any oil which has possibly been spilled during oil renewal from the lower part of the spindle.

Table 3

Type	Oil renewal *) after operating hours (h)				ISO viscosity class of oil	Immersion depth of spindle shaft (mm) max.	min.
HL 10	15,000				VG 10	80	50
HL 21	15,000				VG 10	80	50
HL 30	15,000				VG 10	100	70
	for axial load						
	< 3.5 da N	3.5-5.5 da N	5.5-9 da N	> 9 da N			
HL 33	10,000	-			VG 10	100	70
HL 35	10,000 -	- 7,000			VG 10 VG 22	100 100	70 70
HL44/403	10,000	-			VG 10	110	70
HL 45	10,000 -	- 7,000			VG 10 VG 22	110 110	70 70
HL 55	10,000 -	- 7,000			VG 10 VG 22	125 125	90 90
HL 66, 68	10,000 -	- 7,000 -	 4,000 -	 - 4,000**)	VG 10 VG 22 VG 46	145 145 145	90 90 90
HL 77	10000	- 7,000	- 4,000	- - 4,000**)	VG 10 VG 22 VG 46	190 190 190	120 120 120

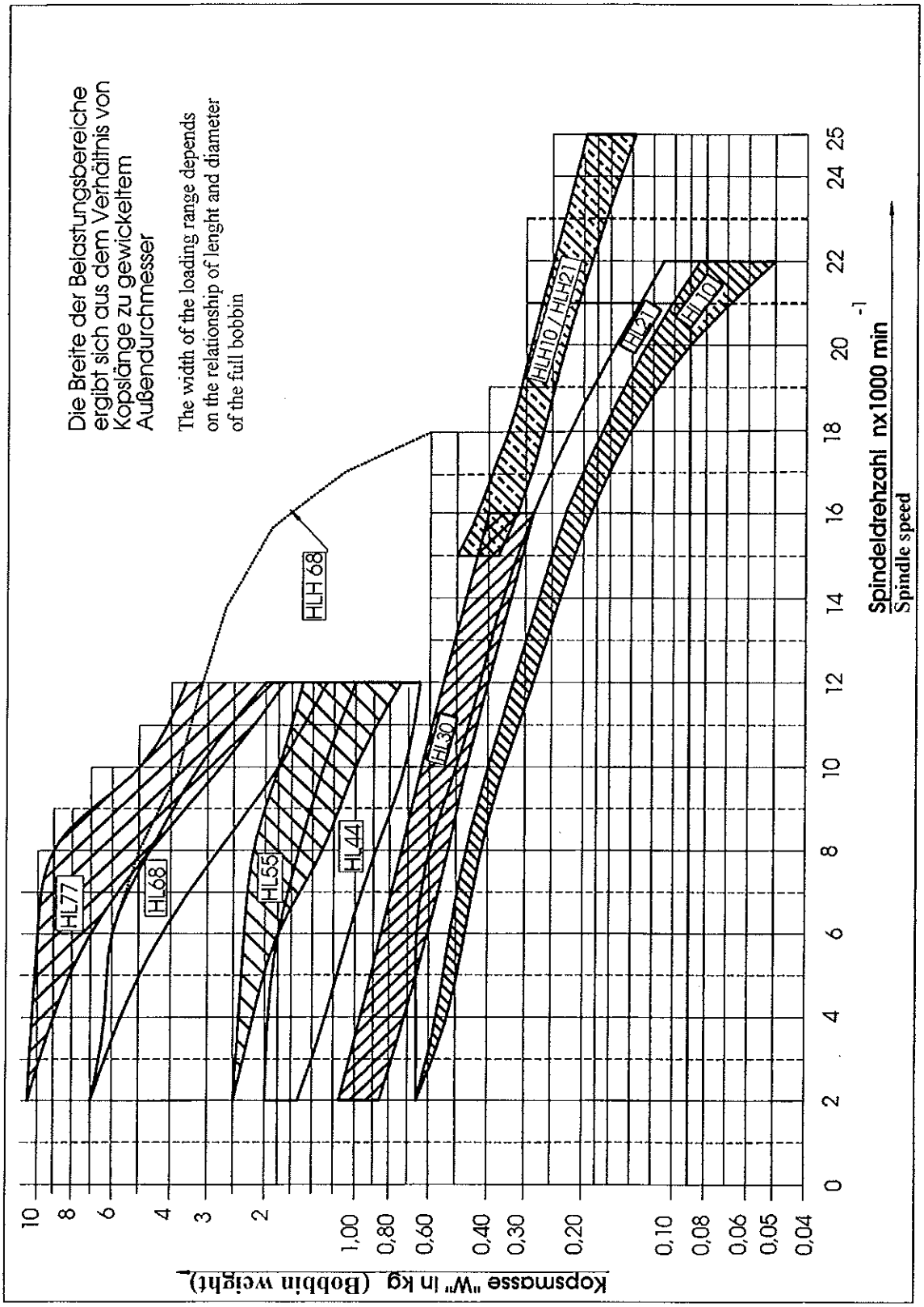
For spinning or twisting with spindle heads (e.g. crown), use an oil of viscosity class ISO VG 68 for the bearing sleeves HL21,HL 30, HL33, HL 35 and HL 44.
For bearing sleeve sizes HL 45, HL 55, HL 66/68 and HL 77, use an oil of viscosity class ISO VG100.

4. Use not in conformity with intended purpose – remaining dangers

- It is not permitted to operate the spindles without tubes, because there is the risk of injury from flung away spring pieces.
- Since roller bearing spindles are high-speed machine parts, they may be stopped only with the help of a suitable spindle brake. Using the fingers for braking is not allowed.

  Braking of spindles with the spindle braking must be performed only as long as is necessary. There is the risk of fire as a result of excessive heating.
- If roller bearing spindles are left running without oil, the spindle bearing and spindle shaft will be destroyed. In addition to this, they will heat up as a result of friction. This may result in burns and there will also be the risk of fire.
- Spindle tops which are found to be whirring in the spindle casing in spite of an appropriate oil level must be replaced immediately.

Determination of spindle bearing limit (Annex 1)

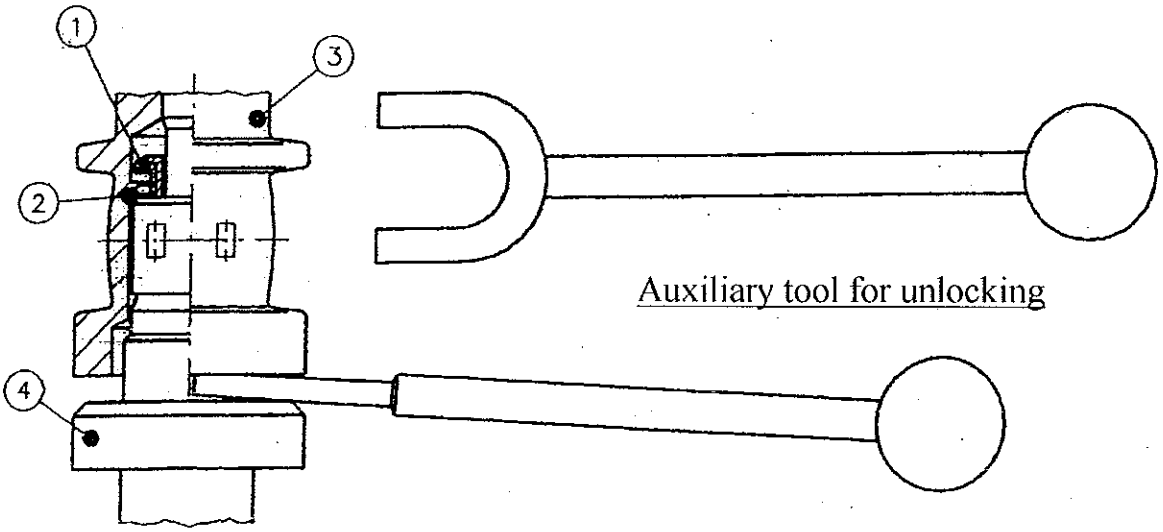


Hookless spindle design (Annex 2)

Unintentional pulling out of the spindle top from the lower part of the spindle is prevented in most cases by a wharve lock using a spindle hook. This external spindle safeguard in the driving area of the spindle has the drawback that this area becomes contaminated with dirt and lints and is difficult to clean.
Therefore, the spindle bearing described herein is available also with a simple and reliable internal spindle top lock. This lock with connection dimensions is shown in Annex 2.

When the spindle top is fitted, a plastic ring (1) sitting on the centring spiral element is forced with a slight pressure over a shoulder (2) to locate in the wharve (3) such that the spindle top is secured in place.

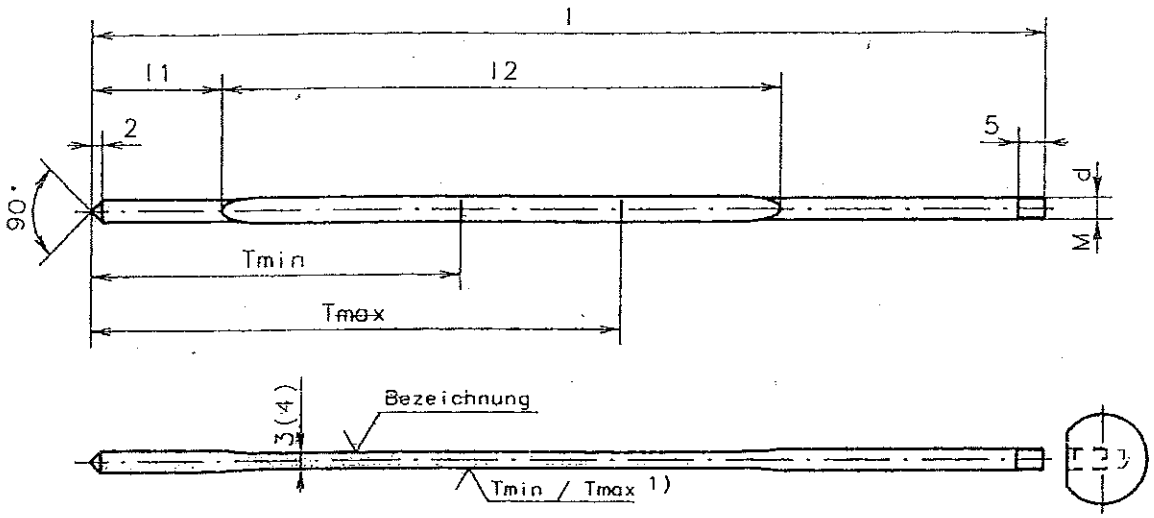
By strongly pressing a fork-shaped auxiliary tool (unlocking lever), which is positioned between the wharve (3) and the collar (4), the plastic ring (1) can be forced over the wharve shoulder (2) so that the spindle bearing is released.



Plastic locking rings as well as auxiliary tools for fitting the rings and unlocking the spindle top are available from the bearing manufacturer.

Annex 3

Füllstandslehren für Schmierung und Ölwechsel
Level gauges for lubrication and oil renewal



BG/ø	Bezeichn. (HL-Typ)	Ölmenge ccm min	Ölmenge ccm max	Ölsorte VG	Meßschaft* 1) Tmin	Meßschaft* 1) Tmax	Meßstab Tmin	Meßstab Tmax	l	l1	l2	d	M	Bestell-Nr. Order-No.
1/6.8	HL 10 HLH10	5	8.5	10	50	80	40	70	180	25	105	4	M4	7608 2433
2/7.8	HL 20 HLH20	5	8.5	10	50	80	40	70	180	25	105	4	M4	7608 2434
3/8.8	HL 30 HL 33 HL 35	7	11	10	70	100	44	77	180	25	105	4	M4	7608 2435
	HLH30	9	12	(68)			55	77	180	25	105	4	M4	7608 2436
4/ 10	HL 44	8	14	10	70	110	50	85	210	25	105	5	M5	7600 2754
	HL403	6	12											
5/ 12	HL 55	12	19	22	90	125	60	95	210	25	105	5	M5	7600 2756
	HL56/6921	8	11		70	95	38	55	210	25	105	5	M5	7608 2437
	HL56/7044	12	15		60	85	47	60	210	25	105	5	M5	7608 2438
6/ 14	HL 66/68	20	37	46	90	145	60	115	260	35	105	5	M5	7600 2757
	HLH68/	19	26				60	95	260	35	105	5	M5	7608 2442
	HLH68/7162	23	30	68	130	180	75	117	290	35	105	5	M5	7608 2439
7/ 16	HL 77	36	72	46	120	190	80	140	290	50	105	5	M5	7600 2759
	HL2003/KH20	43	70	.	130	200	75	130	.	.	.	5	M5	7608 2440
	HL2503/KH25	.		.	160	230	.	.	.	.	.	5	M5	7608 2441