



Mounting and Maintenance Instructions

Worm Gear Screw Jacks MULTI®, JUMBO®

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Subject to errors and technical modifications which improve the devices.

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Contents

1	Safety	4
1.1	Significance of the instruction manual	4
1.2	Authorized use	5
1.3	The operator's obligations.....	5
1.4	Operating personnel.....	5
1.5	Notes and signs for risks and danger zones.....	5
1.6	Signs and adhesive labels	5
1.7	Modifications and alterations to the unit.....	6
1.8	Warranty.....	6
1.9	Safety signs used in the instruction manual	6
2	Product description.....	7
2.1	Principles of operation.....	7
2.1.1	Rotating screw	7
2.1.2	Axially translating screw.....	7
3	Storage and transport.....	8
4	Assembly	9
4.1	Adjusting the limit switches	10
4.2	Mounting the drive motor	11
4.3	Mounting several worm gear screw jacks in parallel	12
4.4	Safety nut SFM (wear indication) – mount flanged nut for TGS	13
4.4.1	Version R	13
4.4.2	Version N	14
5	Initial start-up	15
6	Operation.....	16
7	Malfunctioning	16
8	Maintenance	17
8.1	Lubrication with grease	17
8.2	Lubrication with oil (special version)	18
9	Spare Parts List.....	19
9.1	TGS-R / KGS-R with rotating screw.....	19
9.2	TGS-N/TGS-V with axially translating trapezoidal screw.....	20
9.3	KGS-N/KGS-V with axially translating ball screw	21

1

Safety

The machine has been constructed according to current state-of-the-art principles and valid regulations. Special attention has been given to the safety of the user. The machine complies with the EU Machinery Directive, harmonized standards, European standards or the corresponding national standards:

- DIN EN 292-1 and DIN EN 292-2:
Safety of Machinery
- DIN EN 418:
Safety of Machinery. Emergency Stop Equipment
- DIN EN 60 204:
Electrical Equipment of Machines
- DIN EN 50 081-2 and DIN EN 50 082-2:
Electromagnetic compatibility EMC

This is confirmed by a manufacturer's declaration.

It is forbidden to start up the linear units until it has been ensured that the machine or plant in which it has been installed complies with the regulations in the EU Machine Directive, the harmonized standards, European standards or the corresponding national standards.



Proper connections are essential to comply with the law on the electromagnetic compatibility of the machines. Please therefore observe Standards EN 50 081-2 and EN 50 082-2 to avoid electromagnetic interference.

The electrical installation must be done by a qualified EMC technician.

The following regulations apply:

- relevant accident prevention regulations
- generally accepted safety regulations
- EU Directives
- other applicable standards
- national regulations

1.1

Significance of the instruction manual

The instruction manual belongs to the machine and

- must be kept readily accessible until the machine is discarded,
- must be handed over to owners or borrowers if the machine is sold or lent.

Always contact the manufacturer if there is anything that you do not understand properly in the instruction manual.

It is unavoidable that there are still a few risks for persons and property associated with this machine. Therefore, every person who works with this machine and is involved with transport, installation, operation, maintenance and repair of the machine must be trained and be aware of the possible dangers. The instruction manual, in particular safety instructions, must be carefully read, understood and followed.

No knowledge or inadequate knowledge of the instruction manual voids the liability of Thomson Neff GmbH for any claims. The operator is therefore recommended to have written confirmation of staff training.

1.2 Authorized use

The worm gear screw jacks **Muli** and **Jumbo** are exclusively designed for carrying out lifting, lowering, tipping and slewing movements with the following lifting forces:

Muli 0 - Muli 5 up to 100 kN

and

Jumbo 1 - Jumbo 5 up to 500 kN.

Basically, the applications allowed for worm gear screw jacks Muli and Jumbo are relevant (see chapter 2).

Any other application other than specified or one going beyond the above mentioned capacity is unauthorized. The manufacturer is not liable for damages resulting from such applications. The user alone has to bear the risk.

Since the worm gear screw jack can be applied in various areas, the user is responsible for the specific application of use.

In compliance with the regulations concerning the electromagnetic compatibility of machines, the worm gear screw jacks **Muli** and **Jumbo** may only be used in industrial areas according to the definition EN 50 081-2.

1.3 The operator's obligations

In accordance with EU Directive 89/655/EEC Art. 6(1) and 7 on Use of Work Equipment and EU Directive 89/391/EEC Art. 1(1) and 6(1), the operator is obliged to instruct, in particular with regard to safety, staff who are involved with assembly, operation, maintenance, repair or disassembly of a linear unit.

In accordance with EU Directive 89/655/EEC Art. 4a (Use of Work Equipment), the operator is also obliged to check the machine before initial start-up and after repairs and any malfunctioning.

1.4 Operating personnel

The worm gear screw jacks are designed according to state-of-the-art technology and are in line with applicable safety regulations. However, the general risks of personal injury or damage to property connected with the use of such machinery cannot be completely eliminated. Therefore the units may only be assembled and operated by competent and qualified personnel and only be used for the authorized application.

Therefore a careful study of the operating manual is to be made before attempting to use or service the worm gear screw jacks, and particular attention is to be paid to the safety instructions.

Work to be performed on electrical parts, such as:

- installation of limit switches,
- mounting of the drive,
- check of the direction of rotation

may only be carried out by qualified electricians.

1.5 Notes and signs for risks and danger zones

The linear units are designed to be safe. However, should there be any remaining risks for persons or property, the user must indicate these risks by the use of signs or written instructions on procedures.

1.6 Signs and adhesive labels

Keep marks, signs and adhesive labels so that they can be read in full and always follow them.

Replace damaged or illegible signs and labels.

1.7 Modifications and alterations to the unit

It is not permitted to make any alterations to the safety features or design of the unit without our consent. Thomson Neff declines any responsibility in case of such alterations.

Wearing and spare parts may only be replaced after consultation with our service technicians or by them personally.

It is not permitted to disassemble or disconnect any safety or protection device.

When using special accessories (e.g. sliding clutch), the assembly instructions of the manufacturer must be observed!

The following regulations must be complied with:

- the relevant regulations for the prevention of
- accidents,
- generally recognized safety regulations,
- EC-guidelines,
- national regulations.

1.8 Warranty

The warranty conditions were stated in the sales documentation. Any claim for warranty is voided if

- the machine has not be used in accordance with its intended use,
- the instructions stated in this instruction manual have not been followed,
- the machine has been modified without the manufacturer's permission,
- screws sealed with locking enamel have been unscrewed.

The manufacturer is only liable if original spare parts have been used for maintenance and repair work.

1.9 Safety signs used in the instruction manual



This symbol indicates possible danger for persons. Please follow the instructions to prevent injury.



This symbol indicates possible danger for the machine. Please follow the instructions to prevent damage to the machine.



This symbol indicates special information

- on optimum use or
- on easier operation of the machine.

2 Product description

Thomson Neff worm gear screw jacks are used whenever precisely controlled lifting, lowering, tilting and slewing movements are required. The standard range comprises 11 types (**Muli 0 - Muli 5** and **Jumbo 1 - Jumbo 5**).

The units are distinguished by shell bodies machined on 4 sides. The cubic shape of this shell body allows ideal attachment of a motor, gearbox or rotary encoder. All versions are designed for both tensile and compressive loads and will operate in any orientation or mounting position. Two basic designs are possible:

2.1 Principles of operation

2.1.1 Rotating screw

Trapezoidal screw TGS / Ball screw KGS

- Rotating version TGS-R / Rotating version KGS-R

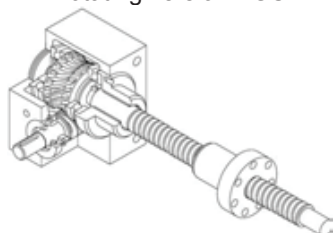


Fig. 1: Rotating screw

2.1.2 Axially translating screw

Trapezoidal screw TGS

- Standard version TGS-N
- Version with anti-rotation device TGS-V

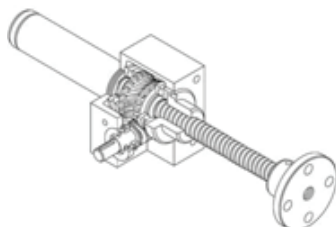


Fig. 2: Trapezoidal screw

Ball screw KGS

- Standard version KGS-N
- Version with anti-rotation device KGS-V

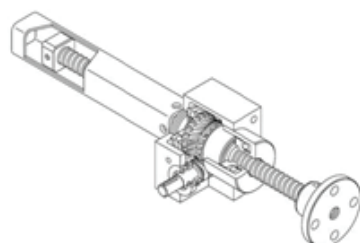


Fig. 3: Ball screw with anti-rotation device

3

Storage and transport

The **MULI**® and **JUMBO**® worm gear screw jacks are high-precision machines: Heavy impact can damage the precise mechanism of the machines, thus impairing their performance. In order to avoid damage during storage and transport, the linear units are supplied in padded packaging:

- as protection against damage and strong vibrations,
- as protection against slippage,
- inside sufficiently large boxes.



Assembled gear screw jacks should only be transported with the supplied transport safeguard.

The machines must be protected against:

- dirt,
- corrosion,
- water,
- and aggressive atmospheres.

4

Assembly

The worm gear screw jack is mounted at the shell body or other mounting parts (see chapter 4.6). The shell body is always screwed onto a machined surface (no laminated steel profiles or similar) to avoid alignment errors or noise.



Side forces need to be absorbed by appropriated guides, otherwise the life of the unit will be reduced. In addition an exact alignment of the units need to be warranted when assembled. The tolerances of the four mounting sides are according to DIN ISO 2768-mH.

Depending on the installation, the worm gear screw jack and the screw must be aligned and bolted precisely either right angle or parallel to the machine part. Accessibility of grease nipples must be guaranteed during

service. In order to avoid alignment errors, crank the unit manually and without load over its entire lifting length. Unequal power demands and/or axial vibration at the outer diameter of the screw are caused by alignment errors between the worm gear screw jack and its additional guides.

Correction procedure:

1. Loosen the relevant mounting bolts.
2. Again, crank the worm gear screw jack manually.
3. At an equal power demand align the parts, other-wise:
4. Loosen the relevant mounting bolts and repeat the procedure.



When aligning the worm gear screw jack, under no circumstances must you exert blows on shaft ends or spindle!

4.1 Adjusting the limit switches

Mechanical limit switches are used to shut down the electric drive before mechanical end position is reached. The braking distance required is dependent on speed and delay. This braking distance must as a minimum be provided for between the switching point of the limit switch and the actual mechanical end position.



Note circuit diagram of the limit switch.

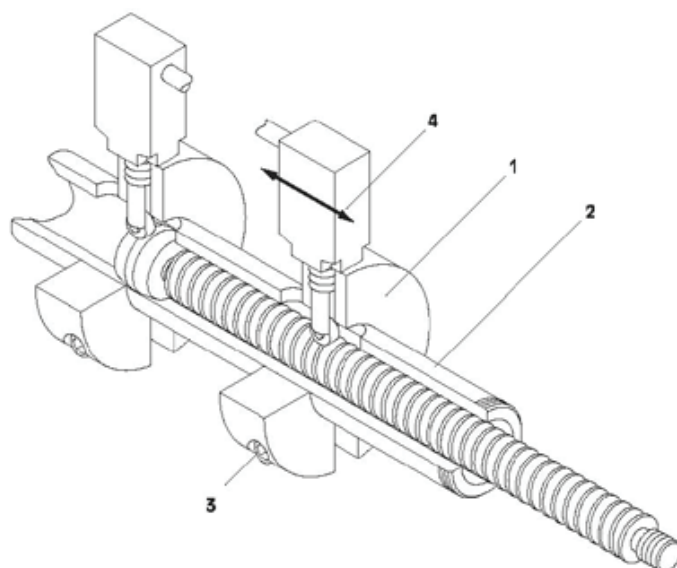


Fig. 4: Limit switches

No.	Name
1	Clamping ring
2	Protection pipe
3	Mounting bolt
4	Limit switch

1. Detach the corresponding clamping ring (1) at the protection pipe (2) by loosening the mounting bolt (3).
2. Move the limit switch (4) into the desired position.
3. Clamp the ring (1) by tightening the mounting bolt (3).
4. Check the position of the limit switch (4) by turning the screw manually.
5. If necessary, repeat the procedure.

4.2 Mounting the drive motor



The electrical installations and the checking of the direction of rotation may only be carried out by a licensed electrician.

Before mounting the drive, check the direction of rotation of the worm gear screw jack and the operation of the limit switches.

In order to do this:

1. Place the 4 - pole three-phase A.C. motor series M (1) into mounting position next to the worm gear screw jack.



Connect the three-phase A.C. motor in compliance with the electrotechnical regulations.

2. Switch on the motor and check the direction of rotation, in association with the safety limit switches (if necessary, change the direction by changing the connection of the motor).
3. Attach motor adapter flange (5) to the shell body (6), using four screws.
4. Attach coupling half (4) to the wormshaft of the worm gear screw jack.
5. Push tooth wheel (3) onto the coupling half of the worm gear screw jack.
6. Mount the second coupling half (2) onto the drive shaft of the motor.
7. Attach motor with coupling half to the motor adapter flange (5) by means of four screws.

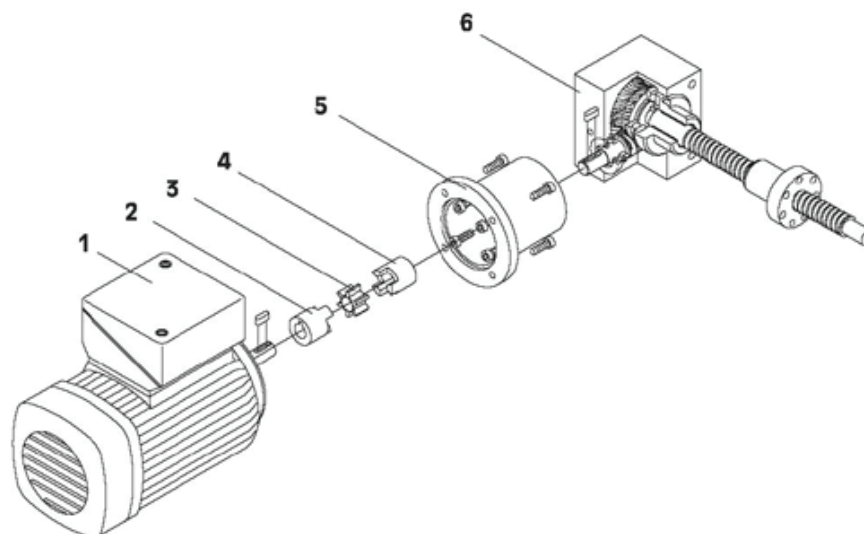


Fig. 5: Mounting the drive motor

No.	Name
1	4 - pole three-phase A.C. motor
2	Coupling half
3	Tooth wheel
4	Coupling half
5	Motor adapter flange
6	Shell body

4.3 Mounting several worm gear screw jacks in parallel

Precondition:

One worm gear screw jack has already been installed and fastened as described in chapter 4.



An exact alignment of the units need to be warranted when assembled.

The tolerances of the four mounting sides are according to DIN ISO 2768-mH.

1. Bring the second worm gear screw jack (1) into the desired position, but do not fasten it yet.
2. Type with rotating screw: align travelling nuts (5) onto the same position.
3. Slide universal joint shaft (2) onto the worm shaft (3) of the already fastened worm gear screw jack and fasten with coupling half-shell (4).
4. Slide the universal joint shaft (2) onto the worm shaft (1) of the second worm gear screw jack and fasten with coupling half-shell.
5. Fasten the worm gear screw jack (1).

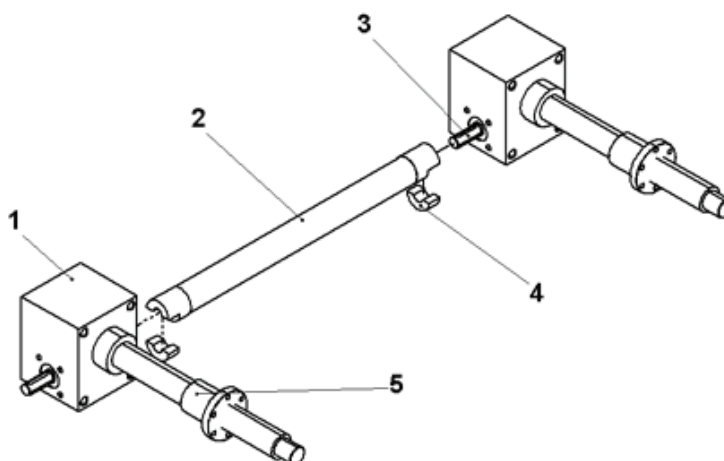


Fig. 6: Mounting parallel

No.	Name
1	Worm gear screw jack
2	Joint shaft
3	Worm shaft
4	Coupling half shell
5	Travelling nut

4.4 Safety nut SFM (wear indication) – mount flanged nut for TGS



The function of the safety nut is only guaranteed if assembly position and forces acting upon it are in accordance with the relevant figure (see Fig. 7 to 10).

4.4.1 Version R

The safety nut (1) is positioned below the travelling nut (2) without axial load and is therefore not subjected to wear. The functioning of the safety nut is guaranteed only when installation and applied forces are as shown in the illustration (see right). As the travelling nut wears, the distance "X" (=1/4 of the lead of the thread of a single-thread screw) between the two nuts is decreasing, which provides a visual check of wear without the need for dismantling.

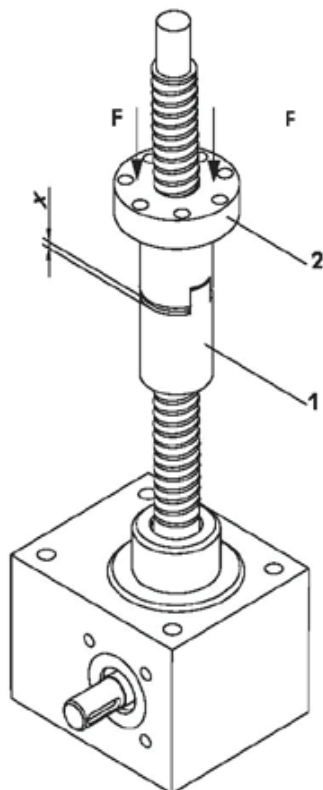


Fig. 9: Compressive load

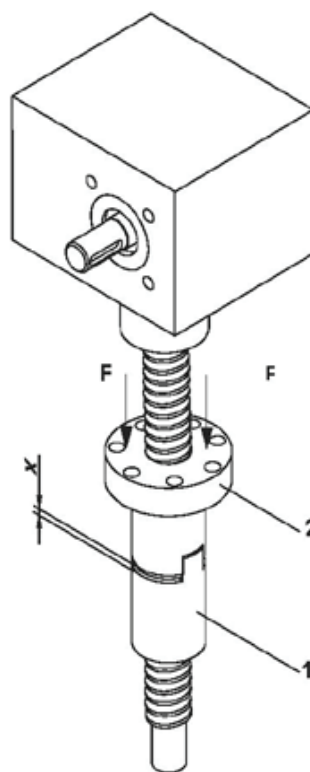


Fig. 10: Tensile load

No.	Name
1	Safety catch nut
2	Running nut
X	Dimension for axial clearance



The component must be replaced when the axial backlash with a single-start thread is more than 1/4 of the thread pitch (= measure X). Otherwise safety can no longer be guaranteed. If it wears more than 1/4 of the thread pitch, it might cause potential dangers to people and objects. Therefore, the measure X must be regularly checked.



A wear check without prior disassembly is possible.

In case of break of the thread of the travelling nut, the safety nut will take over the load.

4.4.2

Version N

The design is similar to that for version R.

With increasing wear of the thread in the worm-wheel the distance "X" (=1/4 of the lead of the thread of a single-thread screw) is decreasing between top edge of the safety nut and top edge of the bearing cover.

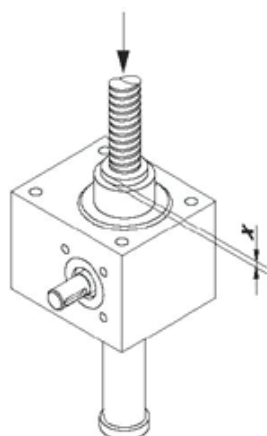


Fig. 7: Compressive load

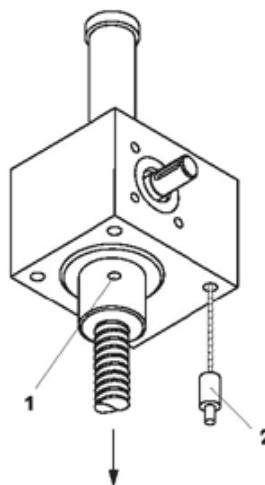


Fig. 8: Tensile load

No.	Name
1	Checking opening
2	Control pin
X	Dimension for axial clearance



The worm-wheel nut must be replaced together with the safety nut when the distance "X" is decreased to 0 mm resp. the top edge of the safety nut is flush with the top edge of the bearing cover, otherwise, safety cannot be guaranteed and people and property can be endangered.

If it wears more than $\frac{1}{4}$ of the thread pitch, it might cause potential dangers to people and objects. Therefore, the measure X must be regularly checked.



The worm-wheel nut must be replaced together with the safety nut if you can no longer put the control pin (upon execution of tension load) (2) completely into the checking opening (1). Otherwise safety can no longer be guaranteed.

Objects and persons can be endangered with wear greater than $\frac{1}{4}$ of the thread pitch. Therefore, the wear and tear must be regularly checked.



A wear check without prior disassembly is possible.

The safety lock nut takes over the overlying load stress if there is a break in the thread of the worm-wheel.

Inductive sensors upon request.

Subject to change of design.

Please specify the load direction when ordering.

5 Initial start-up

The **MULI** and **JUMBO** worm gear screw jacks can produce lifting, lowering, tilting and feed movements with great force.

Attached parts can cause injury, e.g. persons may be squashed or damage may be caused by collision with other components.



Therefore, be extremely careful during start-up.

When the linear unit accelerates or breaks, the load being transported can become loose and flung away.



Compare the manufacturer's specifications for the supports used with the mass and acceleration values.

It is forbidden to start up the worm gear screw jacks until it has been ensured that the machine or system in which they have been installed complies with the regulations in the EU Machine Directive, the harmonized standards, the European standards or corresponding national standards.



Proper connections are essential to comply with the law on the electromagnetic compatibility of the machines. Please therefore observe Standards EN 50 081-2 and EN 50 082-2 to avoid electromagnetic interference.

The electrical installation must be done by a qualified EMC technician.

Follow the instructions in Chapter 4 "Assembly" for safe and proper preparation of your linear unit for the initial start-up.

Before the initial start-up, convince yourself that the inductive and/or mechanical limit switches work properly. First allow the assembled worm gear screw jack to move several times along the entire travel section at such a slow speed that you can stop the movement if there is a risk of collision.



Do not start up the system until you have ensured that there is no risk of collision when the maximum stroke has been overrun.

6 Operation

Linear movements with great force can be produced with the **MULI** and **JUMBO** worm gear screw jacks. Attachments on the power bridges can cause injuries, e.g. crushing of limbs or damage due to collision with other machine parts. Therefore, be extremely careful during start-up.

During operation, occasionally check that the worm gear screw jack works properly (noise and mechanical clearance).

Operating and supervising staff are obliged to check the linear units and the machines at least once per shift to detect any external signs of damage or faults. Report immediately any changes (including operating performance) that impair safety.

7 Malfunctioning

If the linear unit malfunctions, qualified staff must check the operating sequences and repeat start-up if necessary. In particular, follow the instructions in Chapter 5 "Initial start-up" to prevent injuries and damage.

8 Maintenance

8.1 Lubrication with grease

The worm gear screw jacks are delivered in a ready for operation mode and are lubricated with a lithium-soap-grease. The lubrication is via the lubrication port in the gear housing..

Version N

Please choose the required quantity of grease depending on your application. We recommend lubricating the gears every 200-300 operating hours (at duty cycle of 20%).

Version R

As this is a closed-loop system we recommend lubricating the gears every 700 operating hours (at duty cycle of 20%).

Lubrication at the grease nipples of the worm gear screw jack (see fig. 14).

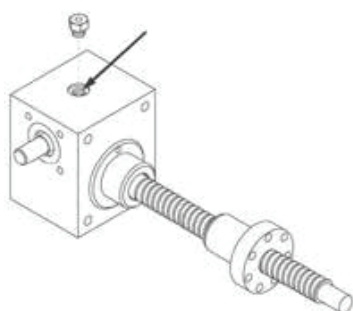


Fig. 14: Lubricating nipple

8.1.1 Required grease type

- Divinol Lithogrease G 421
- Alternative upon request

8.1.2 Required quantity of grease

	MULI 0	MULI 1	MULI 2	MULI 3	MULI 4	MULI 5	JUMBO 1	JUMBO 2&3	JUMBO 4	JUMBO 5
Quantity [gr, cm ³] N/V – TGS/ KGS	30	70	100	200	700	1000	1200	1500	2000	2800
Quantity [gr, cm ³] R – TGS/KGS	30	70	100	200	700	1000	1200	1500	2000	2800



- The quantity values are approximate values. The amount of lubricant is sufficient when a slight grease out-put is visible on the seals.
- Grease types with same thickening agents and similar oil base can be mixed in most cases without any harmful outcome. Please consult our product specialists in case of a question.

8.2 Lubrication with oil (special version)

The worm gear screw jacks are delivered in a ready for operation mode and are lubricated with a mineral oil. Synthetic oil can be used alternatively. We recommend lubricating approx. 500 operating hours after initial operation and then every approx. 2000 operating hours.

When using synthetic oil we recommend lubricating approx. 3000 operating hours after initial operation, at latest after 3 years.

8.2.1 Procedure of oil change for Versions N/V, R

- Warming-up of the gear.
- Secure gear against accidentally movement or start-up.
- Drain the oil by opening the lower drain plug, depending on the mounting position.
- Sealing of the drain plug.
- Remove top drain plug and fill-in the required oil type until it is visible and leveled in the center of the oil gauge glass, plus a little more.
- Sealing of the drain plug.

8.2.2 Required oil type

- Divinol Hypoid gear oil DB SAE 90 (mineral)
- Upon request: Divinol Synthogear SL 75W-90 (synthetic)
- Alternatives upon request

8.2.3 Required quantity of oil

	MULI 0	MULI 1	MULI 2	MULI 3	MULI 4	MULI 5	JUMBO 1	JUMBO 2&3
Quantity [ml]	25	50	75	150	340	700	760	800



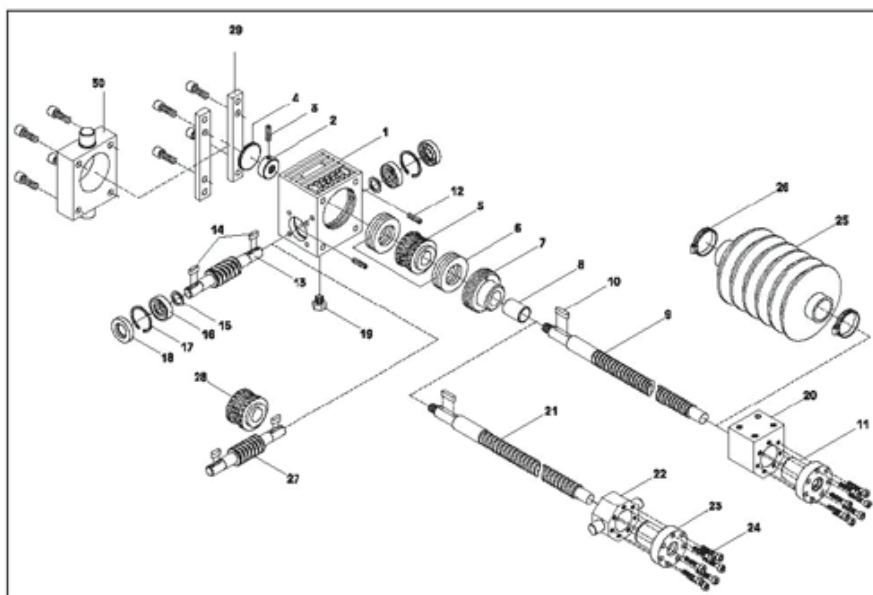
- The quantity values are approximate values. For the exact quantity please check the oil gauge glass.
- Do not mix mineral and synthetic oil/grease types as this will decrease the lifetime of the gear!

8.2.4 Lubrication of screw

Oil filled gears have separated lubrication systems. The lead screw is lubricated separately from the worm wheel gear set. Seals ensure that the gear is leak-proof.

9 Spare Parts List

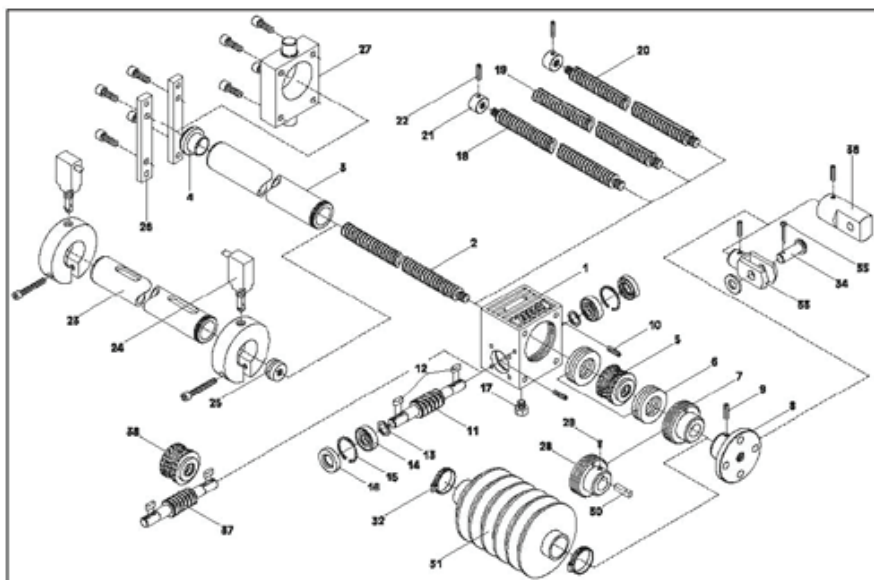
9.1 TGS-R / KGS-R with rotating screw



Pos.	Designation
1	Shell body
2	Locknut
3	Threaded pin
4	Screwed blanking plug R
5	Worm wheel R - H
6	Thrust ball bearing
7	Bearing cover R
8	Journal bearing
9	Trapezoidal screw
10	Key DIN 6885
11	Trapezoidal threaded nut EFM
12	Threaded pin
13	Worm shaft N/V/R-H
14	Key DIN 6885
15	Shim DIN 988

Pos.	Designation
16	Ball bearing or taper roller bearing
17	Circlip DIN 471
18	Seal DIN 3760
19	Grease nipple
20	Adapter support KON
21	Ball screw
22	Universal joint adapter KAR
23	Ball screw nut KGF
24	Cap screw DIN 912
25	Bellow F
26	Hose clamps
27	Worm shaft N/V/R - L
28	Worm wheel R - L
29	Mounting brackets L with mounting bolts
30	Universal joint adapter K with mounting bolts

9.2 TGS-N/TGS-V with axially translating trapezoidal screw

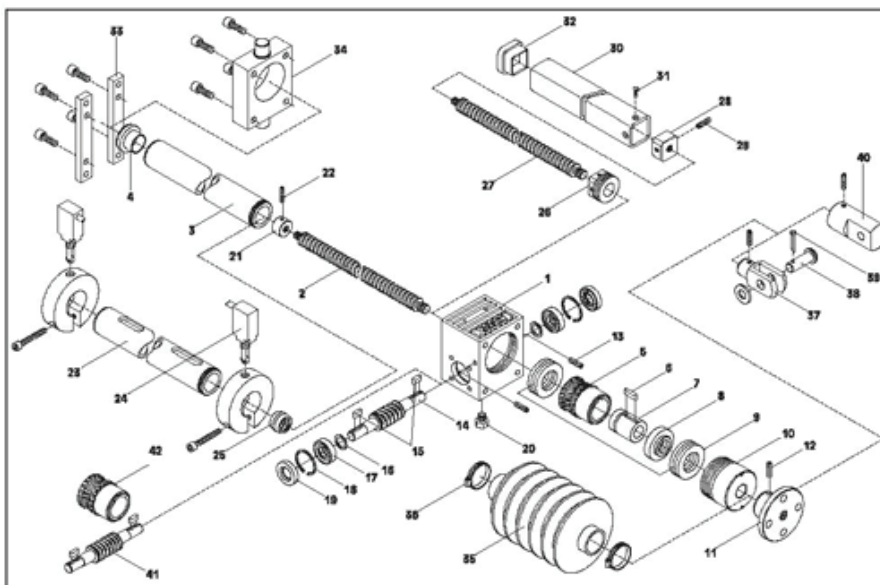


Pos.	Designation
1	Shell body
2	Trapezoidal screw N without AS stop
3	collar
4	Protection pipe
5	Protection pipe end cap
6	Worm wheel N/R - H
7	Thrust ball bearing
8	Bearing cover N
9	Mounting plate BP
10	Setscrew for mounting plate
11	Setscrew for bearing cover
12	Worm shaft N/V/R - H
13	Key DIN 6885
14	Shim DIN 988
15	Ball bearing or taper roller bearing
16	Circlip DIN 471
17	Seal DIN 3760
18	Grease nipple
19	Trapezoidal screw N with AS stop

Pos.	Designation
20	Trapezoidal screw V with AS stop collar
21	Stop collar N/V
22	Threaded pin
23	Protection pipe for limit switch mounting
24	Limit switch with roller lever XCM - F102
25	Limit switch cam
26	Mounting bracket L with mounting bolts
27	Universal joint adapter with mounting bolts
28	Bearing cover V
29	Countersunk screw
30	Anti-rotation device V
31	Bellow F
32	Hose clamps
33	Clevis end GA
34	Cotter bolt DIN 1434 with washer
35	Split-pin DIN 94
36	Clevis end GK
37	Wormshaft N/V/R - L
38	Wormwheel N/V - L

9.3

KGS-N/KGS-V with axially translating ball screw



Pos.	Designation
1	Shell body
2	Ball screw N with AS stop collar
3	Protection pipe
4	Protection pipe end cap
5	Worm wheel N/V - H
6	Key DIN 6885
7	Ball screw nut KGM
8	Thrust collar N/V KGS
9	Thrust ball bearing
10	Bearing cover N/V
11	Mounting plate BP
12	Setscrew for mounting plate
13	Setscrew for bearing cover
14	Wormshaft N/V/R - H
15	Key DIN 6885
16	Shim DIN 988
17	Ball bearing or taper roller bearing
18	Circlip DIN 471
19	Seal DIN 3760
20	Grease nipple
21	Stop collar N/V

Pos.	Designation
22	Threaded pin
23	Protection pipe for limit switch mounting
24	Limit switch with roller lever XCM - F102
25	Limit switch cam
26	Protection pipe adapter
27	Ball screw V with stop collar / anti-rotation device
28	Stop collar / anti-rotation device
29	Threaded pin
30	Protection pipe (square)
31	Countersunk screw
32	Protection pipe end cap
33	Mounting bracket L with mounting bolts
34	Universal joint adapter K with mounting bolts
35	Bellow F
36	Hose clamps
37	Clevis end GA
38	Cotter bolt DIN 1434 with washer
39	Split-pin DIN 94
40	Clevis end GK
41	Wormshaft N/V/R - L
42	Wormwheel N/V - L

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21

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