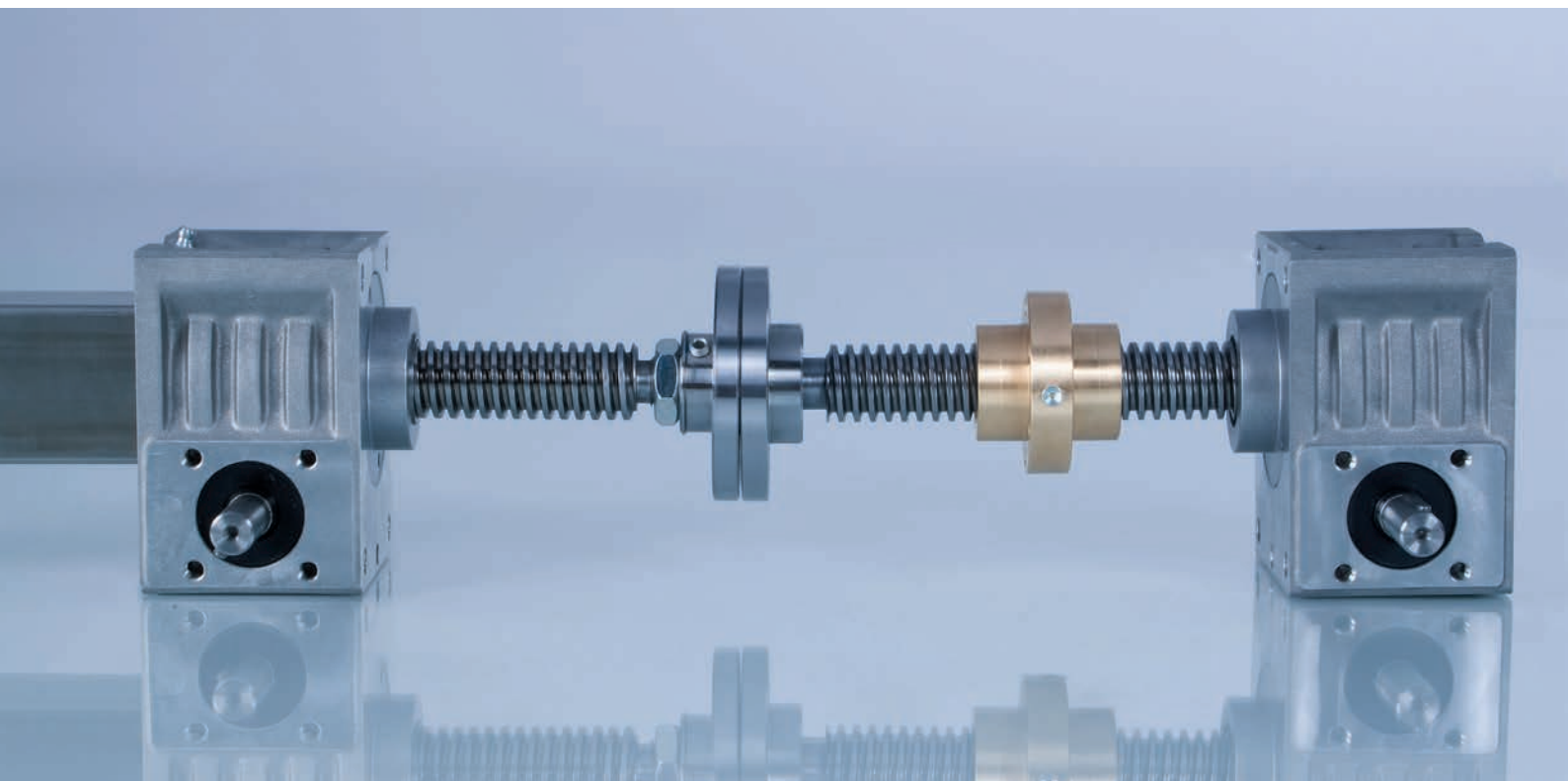


Assembly and Operating Manual



Assembly and Operating Manual

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1.1 Using the Manual

This assembly manual must categorically be followed for the integration of the screw jack in a system, so that first, the functions can be fulfilled in keeping with the specifications, and second, personnel and equipment protection is guaranteed.

Only by strictly following this installation manual, can the safety of process and personnel be achieved.

Not complying with this manual can result in dangerous situations. If the screw jack is transferred to a third party, this manual must also be passed on.

Please contact Nozag in case of doubts or questions.

1.2 Supplementary Documentation

- Data sheets
- Dimension diagrams
- Catalog

This documentation can be obtained at www.nozag.ch or directly from Nozag.

1.3 Reference to Machinery Directives and Compliance

The screw jacks conform to the present state-of-the-art and the applicable regulations. They fulfill the preconditions so that they can be integrated in systems without problems, both functionally and from a safety standpoint.

As long as the integration of a screw jack is performed in accordance with this assembly manual, then basic system requirements enacted in the following Directives shall be deemed as having been complied with:

2006/42EG Annex II (Machinery Directive)
2004/108/EC (EMC Directive)

The engineering connections must be carried out in keeping with the governing requirements and with the EMC Directives!

1.4 Qualified Personnel

The layout, assembly, commissioning and maintenance of the screw jacks may only be carried out by personnel specially authorised, trained and instructed in the field of electrotechnical machinery.

1.5 General Safety Instructions

The operator must ensure that persons entrusted with the assembly and maintenance have read and understood the Assembly and Maintenance Manual and follow it in every respect, in order to:

- avoid dangers to life and limb of users or third parties or to property
- ensure the operational safety of the screw jack
- exclude the possibility of usage failure through incorrect handling

Work on screw jacks may only be carried out at standstill and with sufficient safeguarding against unintentional switching on.
Replaced lubricants should be disposed of in a technically correct manner and keeping within the applicable regulations.

For the integration of the screw jacks in equipment, machines or systems, it is the responsibility of the manufacturer of the equipment, machines or systems to include the specifications, instructions and descriptions as given by Nozag of the screw jacks, in his operating manual.

1.6 Warning and Symbols used

The following symbols are used in this text to provide warnings of possible danger and useful additional information:



Danger to humans

This symbol indicates that non-compliance with the safety instructions can result in serious bodily injury or death.



Danger to property (material)

This symbol indicates that non-compliance with the safety instructions can result in property damage (destruction of materials).



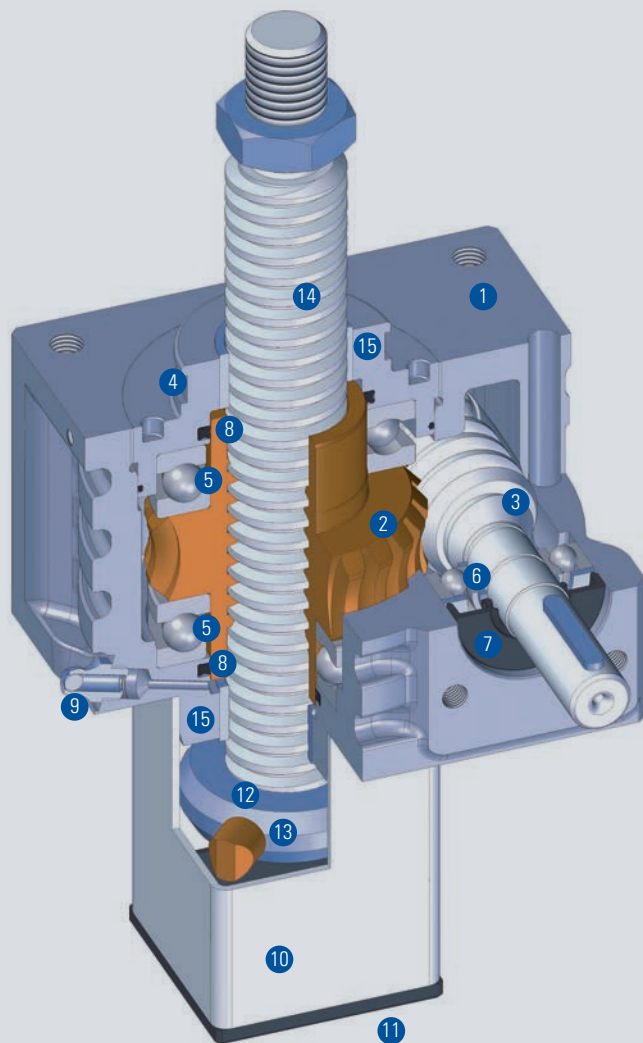
Notice

This symbol indicates that there is additional useful information provided here.

2. Product Description

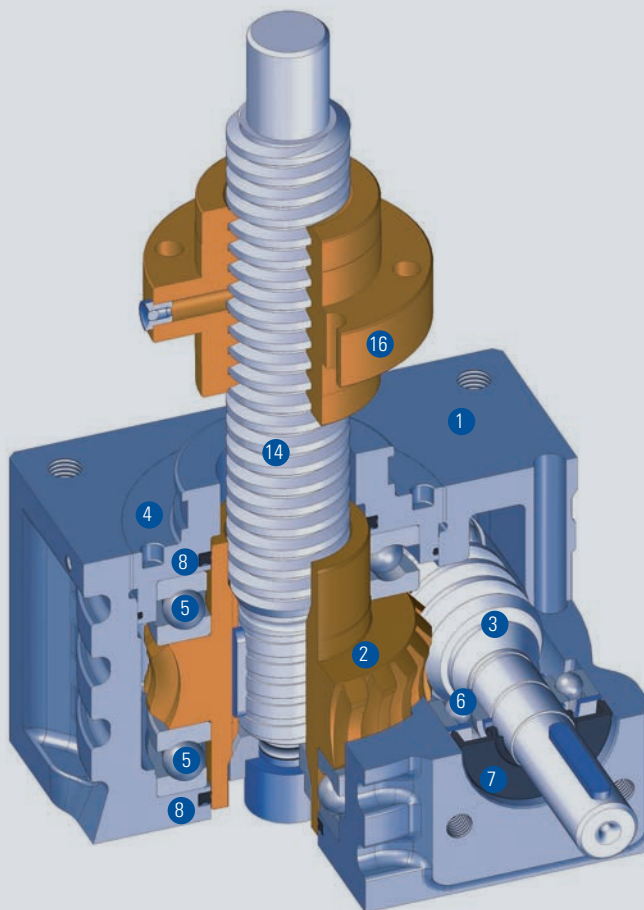
Non-rotating spindle NSE...-S...

The worm wheel is provided with a female thread and converts the rotational movement into an axial movement of the spindle, when the latter is prevented from rotating (through its design or by means of an anti-rotation protection in the protection tube).



Rotating spindle NSE...-R...

The spindle has a fixed connection to the worm wheel and rotates with it. The nut therefore screws itself up and down.



- 1 Housing
- 2 Worm wheel
- 3 Worm
- 4 Bearing cover

- 5 Axial grooved ball bearing
- 6 Grooved ball bearing
- 7 Oilseal
- 8 X-ring/O-ring

- 9 Lubrication nipple for spindle
- 10 Protection tube
- 11 End cover
- 12 Unscrewing protection

- 13 Anti-rotation lock
- 14 Spindle
- 15 Spindle guide
- 16 Duplex nut

This manual is applicable to all screw jacks of the NSE series in the standard versions manufactured by Nozag in the sizes 2, 5, 10, 25, 50 and 100, as well as for special types, in consultation with Nozag.

3. Constructive Installation Directives

3.1 General Design Measures

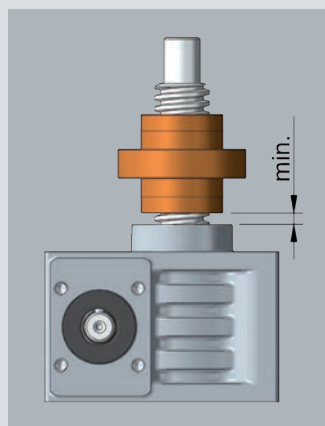
The load bearing capacity of the drives and system components varies widely according to the installation situation and the operating duration. The limits specified in the data sheets must not be exceeded under any circumstances.

Screw jacks are basically not suitable for continuous operation under load. The maximum operating duration depends on the load being moved and must not exceed the limit values according to the ED-diagram on the relevant data sheets.

The duration of operation can be significantly increased by using a ball screw spindle instead of the trapezoid thread spindle. Particular attention must be paid to the evenness, as well as the parallelity and angularity of the mounting face of the gearbox, nut and guides with respect to one another.

Lateral forces must be absorbed by additional guides.

The play between the spindle and the integrated guide bushings is between 0.2 and 0.6 mm depending on the size. This is only a secondary support and does not replace a guiding system.



As a minimum distance of the movable parts to the fixed parts in the direction of lifting, we recommend in the case of trapezoid spindles, the thread pitch times one, and in the case of ball threaded spindles, the thread pitch times two. This distance must not fall below this limit.



A screw jack must never hit a mechanical stop, since the forces that then occur could reach a multiple of the rated load. All warranties as well as all liabilities of Nozag shall be rendered null and void in such a case.



There are various moving parts freely accessible on a screw jack, such as the nut, spindle and shaft ends, which can mean great personal danger while in operation. The systems integrator is responsible for ensuring protection against accidental contact in the course of operation.



The protective cap SK from Nozag can be used for the free end of the driving shaft as protection from accidental contact.

In general, the construction instructions and design procedures listed in our catalogue should be followed.

3.2 Operating Temperatures

The temperature behaviour is dependent on the ambient temperature and on self-heating during operation under load. The self-heating can be reduced through favourable construction measures for fast dissipation of heat.

The jack can quickly become hot during operation under load. Therefore, in such a case, sufficient contact protection should be provided. Please note the following temperature ranges and the corresponding notes:

-40°C to -20°C

low temperature

The standard seals and greases can all be used up to -40°C. However, the breakaway torque and the wear both increase significantly. In general, at low temperatures, all the components should be dimensioned for greater safety. Please contact our technical department.

-20°C to +60°C

normal temperature

The highest heating is normally to be observed at the worm shaft and at the trapezoid threaded nut and it should never go out of this temperature range. The range limits may not be used as the normal operating points.

+60°C to +160°C

high temperature

In case of ambient or operating temperatures in this range, only jacks equipped with high-temperature grease and FPM seals may be used. Please contact our technical department.

3.3 Measures to be Taken in Case of Increased Risk

The trapezoid threaded nut is subject to continuous wear owing to the existing friction. The wear of the trapezoid thread in the worm wheel or in the nut must be checked at suitable intervals depending on the duty cycle.



As soon as the axial distance between the trapezoid thread nut and the spindle is more than 20% of the thread pitch, the gearbox or the worm wheel (S-Version) or the nut (R-Version) must be replaced.

The wear can be checked with a safety trap nut and by monitoring it.



Essentially, a screw jack in the R-Version should not be subjected to tensile loads, since the trapezoid thread spindle is subject to a cyclical bending stress and can break without any warning. If this type of installation cannot be avoided, then, under increased safety requirements (such as in stage construction, suspended loads, ...) the load must without fail be secured by an external trapping device.

Upon request Nozag shall provide suitable solutions for this.

4. Use for the Intended Purpose

The screw jacks of the NSE serve to convert a rotational movement into a linear one, in order to then carry out controlled and regulated pushing and pulling movements. In addition, they can be used in all installation positions in general mechanical engineering, under normal ambient conditions, in compliance with the operating limits and always in consideration of all the technical data, in accordance with the applicable data sheets.

In case of use with suspended loads, special additional measures must be taken in order to ensure sufficient protection for persons and property at all times.

Other uses, or any use over and above those described a proper usage, shall be considered as improper and can result in dangerous situations.



Adjustments may be necessary in case of special requirements, such as those existing, for example in the food industry, or where extreme ambient conditions prevail. In such cases, it is necessary to clarify all specific details with Nozag.



A screw jack may only be brought into operation when it is ensured that the machine or plant, in which it has been installed, conforms to the EU Machinery Directive's regulations and to corresponding national standards and specifications.



Screw jacks in ATEX design are special versions and should be discussed with Nozag.

5. Assembly

5.1 Guide Values for Screw Tightening Torques

Information based on VDI 2230, edition 2003: Maximum permissible tightening torques for hexagon socket screws ISO4762 and screws with similar head strength and head bearing surface, of the strength class 8.8 at 90% exploitation of the elastic limit $R_{el} / 0.2\%$ -yield point $R_{p0.2}$. The table shows the permissible maximum values and does not contain any further safety factors. It assumes a knowledge of the relevant directives and design criteria.

Maximum tightening torques (Nm) for strength class 8.8 and a total coefficient of friction $\mu_{ges} = 0.12$:

| Thread size | Tightening torque M_A |
|-------------|-------------------------|
| M4 | 3 |
| M5 | 6 |
| M6 | 10 |
| M8 | 25 |
| M10 | 48 |
| M12 | 84 |
| M16 | 206 |

Dealing with the guide values

Friction μ_{ges}

The friction coefficient shows scatter, since it is depending upon many factors, such as the material pairing, the surface quality (roughness depth) and the surface treatment. If the total friction is less, a smaller tightening torque should be selected. The main cause of fractures is an overestimation of total friction factors.

Strength class

The strength class refers only to the screw and is determined according to ISO 898/1.

Tightening torque M_A

These are guide values and do not substitute a recalculation according to VDI2230. In case of additional tensile forces acting centrally or eccentrically, as well as statically or dynamically on the screws, the tightening torques and/or loading forces should be reduced to such an extent that the maximum permissible load on the screws is not exceeded.

Screw-in depth

These guide values assume a screw-in depth of $1.4 \times$ nominal diameter (of the screws) in the aluminium housing.

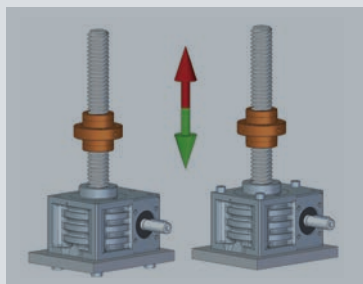
5.2 Housing



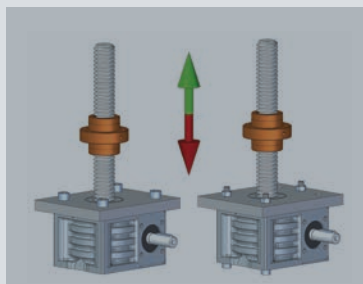
Should the specified screw-in depths not be exploited for fastening the housing or the prescribed tightening torques not be complied with, the certainty of the screws getting pulled out under tractional stress is reduced. If the screws are stressed to more than 50% of the rated tensile load, the screw connection must be recalculated according to VDI2230. A decision can thus be made whether the existing safety is adequate in the relevant application.

In order to avoid a tensile load of the screws, the bearing surface must be arranged as follows, depending on the load:

Main load: Pressure from top > support below



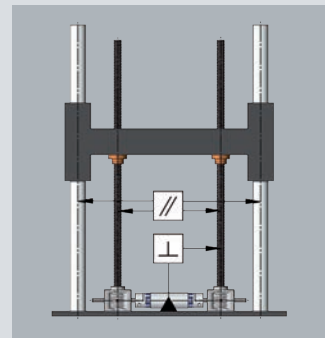
main load: tension upwards > support above



The 4 threaded holes or the 3 through holes in the housing can be used for fastening.

5.3 Spindle

While assembling the spindle and fastening the spindle end, care must always be taken, first, that the spindle is in alignment with the nut, second, that the housing is at right angles to the resting surface of the housing and third, that it is parallel to any guide-way that may be present. This must be ensured during the entire operation, so that the jack does not have to absorb lateral forces in any situation.



In the R-version, the spindle can be installed in the housing from both sides. Thus, depending on the loading direction, the load can be ideally transmitted into the housing and not into the bearing cover.



In the R-version, the central screw or nut for spindle fastening must be installed with a suitable thread adhesive (e.g. Loctite 243) and the correct torque. Otherwise, in case of tensile loading, there is a danger that the spindle might be pulled out of the housing!

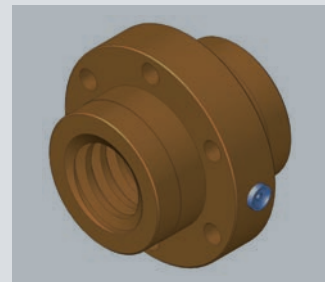
In this context, the instructions of the thread adhesive manufacturer must be followed without fail.

Tightening torques (Nm) for spindle central screw or nut in the R-version:

| NSE2 | NSE5 | NSE10 | NSE25 | NSE50 | NSE100 |
|------|-------|--------|--------|---------|---------|
| 2 | 5 | 10 | 15 | 50 | 100 |
| nut | screw | screw | screw | screw | screw |
| M6 | M8×20 | M10×30 | M14×40 | M20×50 | M42×3 |
| 4-6 | 9-14 | 19-30 | 55-90 | 150-240 | 550-990 |

5.4 Nut

The nut must be mounted concentrically with the spindle, and the bearing surface must be at right angles to the spindle axis, so that uniform resting in all thred turns is ensured. The calotte disks NSE...-KS can be used for compensating angle errors up to $\pm 3^\circ$.



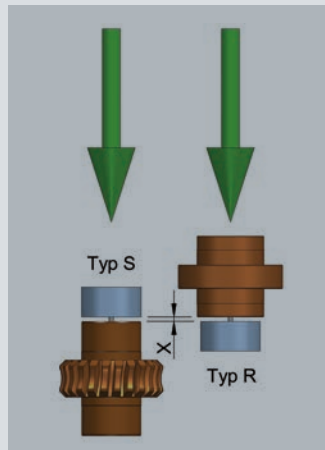
Lateral loads and alignment errors should be avoided, since they can have a very negative effect on the life of the support nut.



In order not to subject the screws to tensile loads as far as possible, the load must always be supported against the nut flange. Should this not be possible, the threaded joint must be designed in accordance with VDI2230 and constructed accordingly.

5.5 Safety trap nut

The gap X between the nut and the safety trap nut corresponds to half the trapezoid thread pitch (= tooth thickness) in the new state. The wear of the nut causes a corresponding reduction of the gap, which can be monitored.



The safety trap nut works in one direction only and therefore, attention must be paid to the correct arrangement!

R-Version: viewed in the direction of the load after the nut
S-Version: viewed in the direction of the load, before the nut

5.6 Ball Screw KGT

The same points as described in 6.6.3 and 6.6.4 have to be followed.



The delivery is always in the form of an assembled spindle/nut unit and it must not be taken apart under any circumstance, otherwise the balls will fall out.



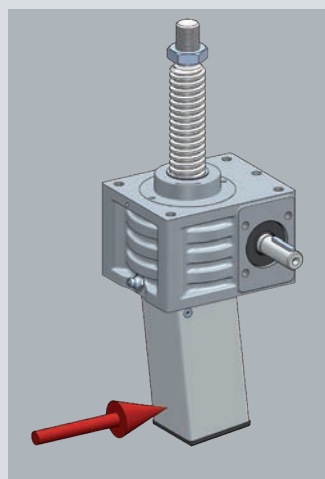
If dismantling is necessary, in the R-version, the nut can be removed by using a mounting sleeve. The sleeve is used like an extension of the spindle and prevents the balls from falling out.

Ball screws are not self-locking, which is why a braking motor or a spring-loaded brake FDB is necessary. A ball screw in the S-version is generally assembled with an unscrewing protection AS by default.

5.7 Protection Tube



The protection tube cannot absorb any lateral force in the standard version. The same applies during transportation: the jack must not be supported at the protection tube end.



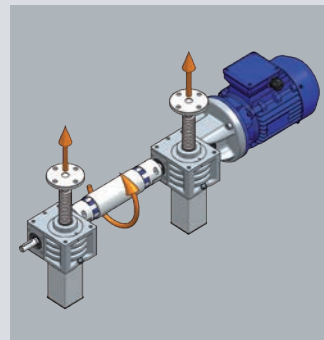
5.8 Lubrication

Screw jacks are supplied in an operationally ready state and are lubricated for life under standard conditions.

Nozag provides the spindles in the S-version pre-greased ready for use, with a protection tube. Without a protection tube, or in the case of the R-version, the spindles are delivered without grease owing to the danger of soiling.

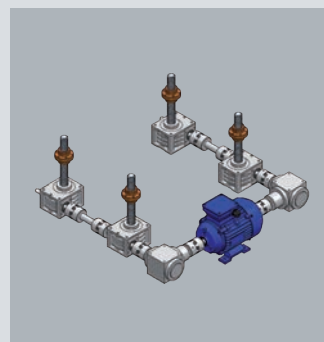


Before the first trial run, the ungreased spindles must be cleaned and generously lubricated over their entire length with a grease that adheres well. For a long life, use the greases that are suggested by Nozag.



5.9 Direction of Rotation and Movement

Before a motor trial run, a check should first be carried out as to whether all the coupled screw jacks have the same direction of movement. When using bevel gearboxes, the direction of movement of the screw jacks can be changed, simply by turning the bevel gear (however, this only applies to the D-version with 3 shafts).



5.10 Levelling and Trial Run

In the case of coupled screw jacks, the individual gearboxes can be levelled with the help of couplings or connecting shafts. The levelling is done under load by loosening and turning the coupling or the shaft through 120°. For continuous (stepless) variable height settings, a clamping hub coupling KNK or a connecting shaft VW can be used.



Screw jacks equipped with ball screws or multi-start trapezoid thread spindles are not self-locking and must therefore be secured during assembly.

During the trial run, the assembly quality can be indirectly checked by a continuous measurement of the motor current drawn. If an increased drawn current is determined, the fastening screws should be loosened and a new trial run initiated. Non-uniform force requirements and wear tracks on the spindle indicate the presence of alignment errors.



Before and after the trial run, all the screwed joints must be checked and tightened correctly.

6.1 Screw Jack



The jack must never hit against a mechanical stop (such as an unscrewing protection, end stop, ...), since the forces hereby generated could reach a multiple of the rated load. Any damage caused by the violation of the latter rule shall not be covered by warranty obligations or render the manufacturer to be liable in any way whatsoever.

We recommend the following safety distances between the movable and the fixed parts:

| | |
|---------------------------|-------------------------------------|
| Trapezoid thread spindle: | Safety distance = 1 x spindle pitch |
| Ball screw: | Safety distance = 2 x spindle pitch |

During operation, the named safety distance must be ensured through customer-side measures or by using our limit switches ESM / ESI.

For uniform starting and braking ramps, we recommend the use of a frequency transformer. This prolongs the life of the system and minimises the starting noises.

The positioning accuracy mainly depends on the type of drive used. In case of more stringent requirements, a three-phase servomotor with frequency transformer and rotary pulse transmitter or a servomotor with resolver etc. can be used.

6.2 Rotational Speeds

The maximum rotational speed advised in the data sheet may not be exceeded. When R-gearboxes (with rotating spindles) are used, the bending-critical rotational speed of the spindle must be taken into consideration.

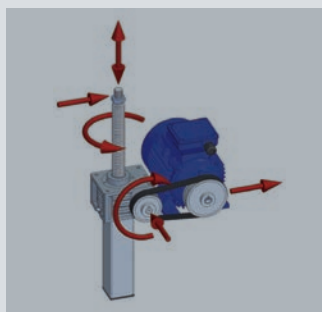


Long, thin spindles can squeak despite complying with the bending-critical rotational speed. Therefore, your calculations should include a sufficient safety factor.

6.3 Maximum Forces / Torques

The power usage of the machine in operation must not exceed the limit data specified in the catalogue (not even temporarily). Permanent damage may result, even if the limits are exceeded just once.

Regarding the maximum drive torque, it should be remembered that the starting torque is approx. 50% above the operating torque.



Depending on the motor type, the short-circuit torque can be a multiple of the rated torque!

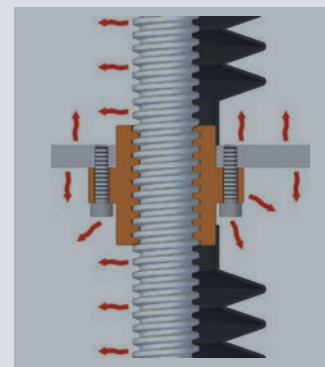
Where several gearboxes are coupled to one another, if one gearbox is blocked, the full energy of the motor can act on that gearbox!

6.4 Measures for Minimising Noise

The motor is usually the biggest source of noise. With a uniform acceleration ramp, starting and braking noises can be minimised. The gearbox and motor should not be mounted on resonant bodies.

6.5 Heat balance

In the case of screw jacks with trapezoidal thread spindles, only a small part of the drive power is converted into lifting force. There are losses in the worm drive and at the trapezoidal thread, which have to be dissipated as heat. In the case of the version with the non-rotating spindle, the gearbox power loss and the spindle power loss occur in the gearbox and are dissipated outwards through the gearbox housing.



In the case of the rotating spindle, the gearbox power loss originates in the gearbox and is dissipated through the gearbox housing; the spindle power loss originates between the spindle and the nut and must be dissipated via the surface of the nut, the spindle and the support plate. When bellows are used with rotating spindles, particular attention must be paid to the heat balance. Experience has shown that the heat can only dissipate about 50% due to the bellows. Therefore, the possible duty cycle is reduced by 50% as compared to an identical design without bellows. In the case of gearboxes with non-rotating spindles, the bellows are not a problem, since the heat is mostly dissipated via the housing. If the ambient temperature is higher than 20°C, the load must be reduced, since the higher heat level cannot be dissipated. For every 10 °C increase in ambient temperature above 20 °C, the load must be reduced by approx. 15–20 %.



Air holes must be made by the customer, depending on the speed.

6.7.6 Electrical Connection

Regarding the electrical connections of the drive motor, attention must be paid to the following specifications and directives:

| | |
|-------------|-----------------------|
| 2004/108/EG | EMC Directive |
| 2006/95/EG | Low-voltage Directive |



The electrical installation work must only be carried out by a technician who is qualified according to the situational requirements. Attention must be paid to the local laws and to the specialists recommendations.

The electrical connections must be done in accordance with the specifications on the rating plate with regard to the frequency, voltage, current and connections. Connections must be made in such a way that a continuous, safe electrical contact is maintained. A secure protective conductor connection should be set up.



Before electrical commissioning, any possible impact against any hard mechanical stop must be ruled out. Very high forces and torques can be generated by impacting against hard mechanical stops, which could result in enormous damage and have a very adverse impact on safety.

The drive motor must be protected from overload through suitable measures.

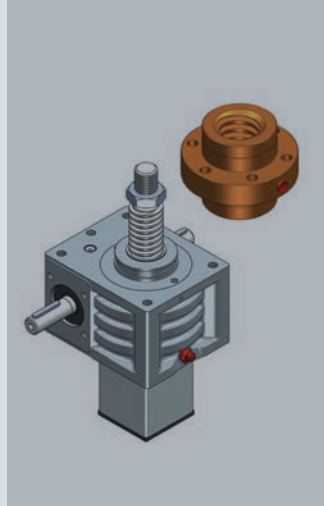
At the time of electrical initiation, the first thing to be checked is the direction of rotation.



There must not be any foreign bodies, dirt or moisture in the connection box. Cable ducts that are not required should be closed tightly.

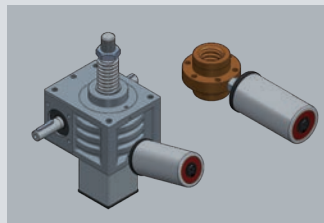
6.1 Lubrication

The worm gearboxes are lubricated for life under standard conditions. The lubrication consumption is concentrated above all, on the trapezoidal screw. It should be re-lubricated regularly, depending on the duty cycle. Since the lubrication requirement of a trapezoidal screw depends on very many factors, no general guidevalues can be specified for the required lubrication intervals. We recommend that the user starts with a weekly interval; a weekly inspection of the spindle should then be carried out. The lubrication intervals can thus be individually matched to the prevailing conditions.



During dry running, the nut is subjected to intense wear and can, in addition, become extremely hot very quickly.

Ball screws KGT should be re-lubricated after every 300 hours of effective operating time. A guideline value of 1 ml per cm spindle diameter can be taken for the grease quantity.



After about 5 years, the grease loses its lubricating properties. Dust and dirt increases this effect. Therefore in the case of long-life systems, a complete cleaning and re-greasing is necessary after 5 years. If the spindle is dirty, it must be cleaned and regreased to avoid excessive wear and damage.

Recommended grease Blasolube 306
(other lubricants on request)

Grease amount per gearbox

| | | | |
|-------|--------------------|--------|---------------------|
| NSE2 | 20 cm ³ | NSE25 | 100 cm ³ |
| NSE5 | 25 cm ³ | NSE50 | 420 cm ³ |
| NSE10 | 40 cm ³ | NSE100 | 800 cm ³ |



Our lubricant dispenser SSG can be used for automatic lubrication. The lubricant dispenser is screwed on in place of the grease nipple and continuously supplies grease to the lubrication point. The dispensing duration can be set continuously variable from 1 to 12 months and the grease quantity varies according to the SSG-size between 0.08 – 8.3 ml/day.

6.2 Checking Wear

The trapezoid thread in the worm wheel or in the nut is subject to continuous wear owing to the existing friction, which depends on many factors and cannot be predicted. We recommend that at the beginning, the axial play should be checked after just a few hours of effective deployment. Thereafter, the inspection interval can be gradually adjusted depending on the results.



As soon as the axial play in the trapezoid thread nut corresponds to more than 20 % of the thread pitch, the gearbox respectively the worm wheel (S-Version) or the nut (R-Version) must be replaced.

The wear can be checked with a safety trap nut and by monitoring it. For simplified monitoring, Nozag offers, upon request, mechanical (manual buttons) and electrical (inductive sensor) aids.

Except for standard machine elements that are commonly available commercially, Nozag original spare parts must be used. Warranty entitlements as well as liability commitments shall be rendered null and void if third-party, imitation or non-approved components are used instead.

In order to prevent unwanted production downtimes, during long duty cycles or high loads, it is recommended to keep a complete gearbox (incl. threaded spindle, nut, ...) on standby. New seals must always be used for repair.



Repair work is usually most economically achieved by completely replacing of the jack.

9.1 Bellows

The ZD-dimension must not be underrun and the AZ-dimension must not be exceeded. These dimensions can be viewed in our main catalogue.



It must be remembered that the bellows may not touch the spindle, otherwise, there is a danger of the bellows getting destroyed.



Air holes must be made by the customer, depending on the speed.

Our support rings STR can be used to prevent contact between the spindle and bellows in case of longer strokes or horizontal installation.



The maximum duty cycle of a jack with rotating spindle (R-Version) is reduced by about 50% owing to the heat-insulating action of a bellows.

9.2 Spiral Spring



The spiral spring is subject to a great deal of tension and is tied up with a securing wire. This securing wire may only be opened with extreme care, once the spiral spring has been pushed onto the spindle and the movable part of the machine has been compressed to such an extent, that both ends of the spiral spring are almost in contact.

Centring flanges should be provided for positioning the two ends of the spiral spring, which permit the rotational movements of the springs. The spring must be able to move freely and must not be fastened under any circumstances. In case of vertical deployment of the spiral spring, the large diameter should be at the top, so that, as far as possible, no foreign bodies (e.g. chips) can enter the coil openings.

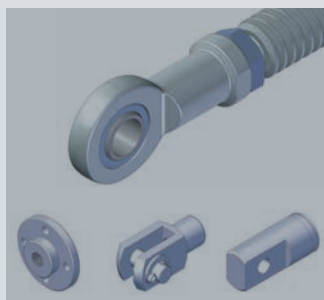
In case of a horizontal installation of the spiral spring, for the same reason, the large diameter should be in the area where the chips are most prevalent. Regular maintenance is necessary. Depending upon the degree of contamination, the spiral spring should be cleaned daily or weekly and then coated with a light film of oil. We recommend the Longlife Spray Oil W44T, which you can also obtain from us.



Spiral springs must preferably be used in oil-containing environments. If fine particles or dust are generated (especially in case of grinding dust), spiral springs are not suitable. For these cases, the use of bellows is recommended.

9.3 Spindle End Attachments: BF, GK, KGK and SLK

Fastening flanges, fork heads, ball joints and pivot bearing heads for the S-gearbox are screwed onto the spindle ends. After setting the position, these attachments should be fixed by means of a lock nut, stud screw and a suitable thread adhesive (e.g. Loctite 243). The securing must be done carefully and checked.



The fixations are not tightened at the time of delivery. This gives the user the possibility for exact positioning.

When tightening the lock nut and the stud screw, the following maximum tightening torques in Nm should be maintained:

| | NSE2 | NSE5 | NSE10 | NSE25 | NSE50 | NSE100 |
|-------------|-----------|-------------|-------------|--------------|--------------|----------------|
| Locking nut | 6 Nm (M8) | 20 Nm (M12) | 45 Nm (M14) | 140 Nm (M20) | 440 Nm (M30) | 700 Nm (M42x2) |
| Stud screw | 1 Nm (M3) | 2.5 Nm (M4) | 5 Nm (M5) | 5 Nm (M5) | 8 Nm (M6) | 20 Nm (M8) |



Owing to the low efficiency of a trapezoidal spindle and the ratio of the gearboxes, the twisting torque reaches a multiple of the motor torque. With enhanced safety requirements, a positive anti-rotation lock is recommended as being indispensable.

9.4 Flange Bearing FL



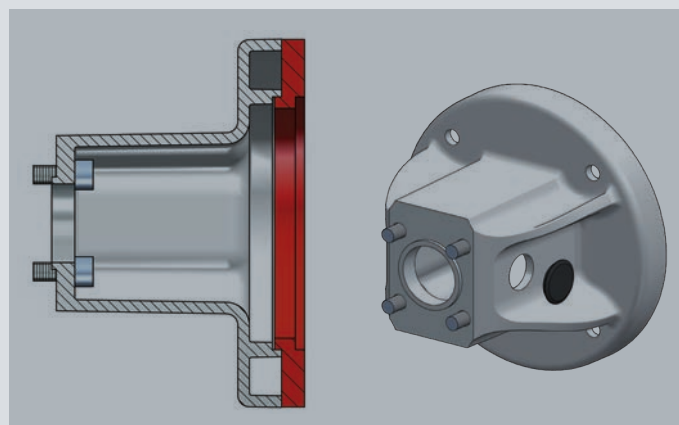
When assembling the flange bearing at the spindle end, care must be taken that it aligns with the gearbox/spindle/nut, otherwise, the spindle is subject to a cyclical bending stress and can break without previous warning.



The flange bearing is not suitable for absorbing radial forces. At the time of assembly, it must be ensured that there is enough axial play, so that the spindle can expand freely when it heats up.

9.5 Motor Adapter MOA

Check the length of the fastening screws for the motor. The motor can get damaged if excessively long screws are used! The coupling can be checked through the viewing hole and fixed.



In the following motor-gearbox combinations, with Nozag standard couplings, an additional motor adaptor ring MOAR is necessary:

NSE10 - IEC80
NSE25 - IEC90
NSE50 - IEC100 - IEC112

The motor adapter ring can be dispensed with when using a rotary encoder DIG.

9.6 Three-phase Motor

The motors normally have a terminal board with 6 terminals and an earth lead terminal in the terminal box. By shifting the connecting link, the stator winding can be connected in star or delta formation.

The star/delta starting process is not suitable for lifting jack systems, since the full torque is required right from the start.



Basically, we recommend the use of 4-pole motors with a maximum rotational speed of 1400 rpm. Higher rotational speeds are only possible with the expressed permission of Nozag.

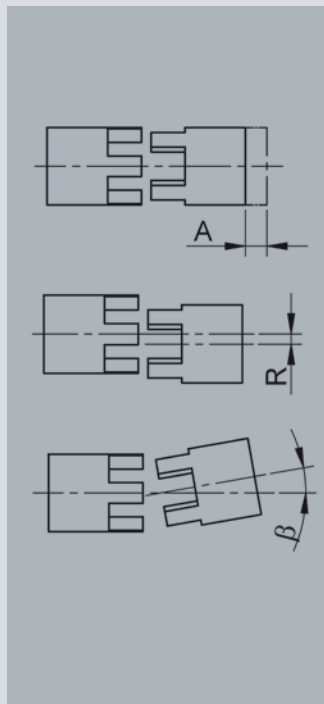


The maximum motor torque can reach a multiple of the rated torque for a short time. If required, this must be limited using a frequency converter.

When operating with a frequency converter, it must be remembered that for prolonged operation below 25 Hz, an external fan is required for sufficient cooling of the motor. The separate documentation for the motor must be followed without fail.

9.7 Coupling/Connecting Shaft

Beware of the axial alignment of the shafts being connected. Despite a certain elasticity of the coupling or the connecting shaft, the deviations should be kept to a minimum. The maximum errors allowed can be seen in our catalogue. The standard couplings 035 to 190, as well as the connecting shafts LJ and GX must be pushed onto a shaft end with feather keys and thereafter, secured against axial displacement by tightening the threaded pin over the feather key. The clamping hub coupling KNK and the connecting shaft VW can be radially mounted through the partitioned clamping hubs and the feather key can be omitted. The clamping screws are not allowed to be replaced by a different quality, and for securing torque transmission, must be tightened according to the following table:

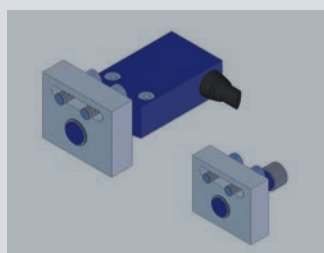


Tightening torques (Nm) for clamping bolts:

| | KNK02 | KNK06 | KNK15 | KNK30 | KNK45 | KNK80 |
|------|-------|-------|-------|-------|-------|-------|
| VW28 | VW35 | VW50 | VW60 | VW76 | VW90 | VW120 |
| 4 | 8 | 15 | 35 | 70 | 120 | 290 |

9.8 Limit Switch: ESM, ESI

The working of the controller in conjunction with the limit switches must be so designed that a mechanical stop is completely avoided. Test the limit switch function before the motor trial run. If the after-running of the motor does not ensure a com-



plete stillstand, a braking motor should be used. This can especially take place in the case of multi-start threaded spindles and ball screws.

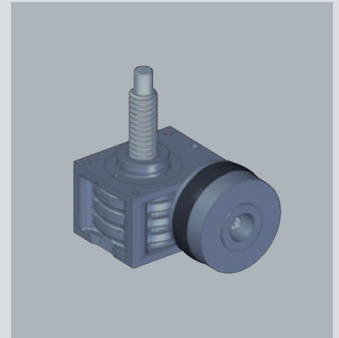


The protection tube has a wall thickness of only 2 mm, depending on the gearbox size. Therefore, the M5-fastening screws may be tightened with a maximum of 2Nm, so that the thread in the tube is not destroyed. In no case should screws longer than those supplied be used, since screws reaching too far into the protection tube could collide with the unscrewing protection.

9.9 Spring-loaded Brake FDB



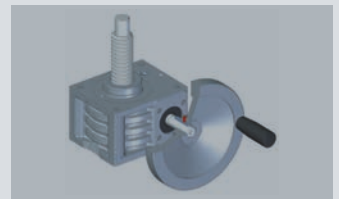
When re-lubricating the spindle, the friction surface of the spring-loaded brake must be protected from dirt without fail. Under no circumstances may oil or grease reach the friction pad. Small amounts of dirt can adversely affect the working of the brake.



The maximum permissible limiting temperature of the spring-loaded brake is 145°C. When using a spring-loaded brake or a braking motor in combination with a frequency converter, activate the brake separately. The separate documentation for the spring-loaded brake must be followed without fail.

9.10 Handwheel HR

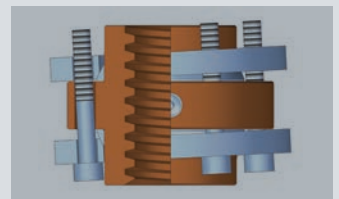
The handwheel is pushed onto the shaft with a feather key, at least to the extent that it is flush with the shaft end, and must be secured with a stud screw over the feather key or with a cross-hole and pin.



If a handwheel is combined with a motor, no handle must be screwed in because of the imbalance. During motor operation, the handwheel must under no circumstances be accessible.

9.11 Calotte disks KS for Duplex Nuts DMN

If the joint surface for the nuts is not at right angles to the spindle axis, the calotte disks KS can be used to compensate an error of up to $\pm 3^\circ$ on the fastening surface.



When tightening the screws, care must be taken that the two large disks are parallel to one another, in order to avoid excessive tilting torque of the screw heads.



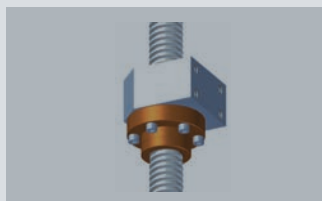
The calotte disks are not suitable if the angle can change during operation. Parallelism errors of spindles to one another and to guides cannot be compensated.

9.12 Carrier Flange TRMFL

The carrier flange serves for an eccentric fastening of a load, where by this load must have its own stable linear guide, so that solely an axial force acts on the nut and the carrier flange.



The torques that occur must be absolutely absorbed by an external guide, since the fastening screws could get overloaded with an additional tilting torque and the nut would be subject to significant wear.

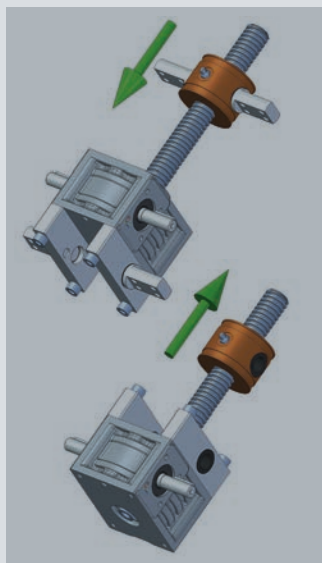


9.13 Cardan Adapter for Gearbox KAL, KAK and cardan Nut KM

The swivelling axis should preferably be arranged parallel to the drive axis, so that no additional torque acts on the spindles owing to the motor weight. Particular attention must be given in case of non-horizontally placed spindle axis, long strokes and large motors, otherwise, increased wear at the nut and the spindle will have to be expected. The pivot bearing bushings are maintenance-free and need not be lubricated. However, a one-off lubrication at the time of assembly improves the running-in characteristics as well as the friction coefficient. For the shaft, a tolerance zone h9 and a surface roughness of $Ra=0.8$ is recommended.

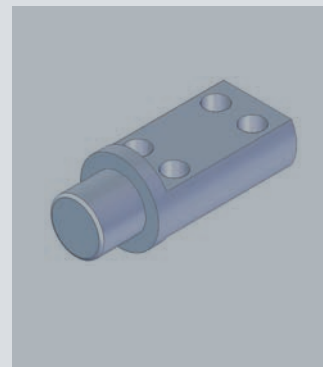


The cardan adapter must always be mounted in such a way that the fastening screws are not stressed in the main load direction. If this is not possible, the load that occurs may not exceed 50% of the rated load. Otherwise, calculations for the screwed joint will have to be carried out again with the conditions applicable in the respective application, in accordance with VDI2230.



9.14 Cardan Pin KB

The interface for the cardan pin must be made as rigid as possible, so that the pin cannot give way under load and the pins, always to be used in pairs, must be arranged coaxially, otherwise, a uniform positioning in the bearing bushes is not ensured, which results in excessive wear. The pins should be fastened in such a way that there is only a minimal play to the bearing bushes on the face side.



Above all, in combination of cardan pins with cardan adapter plates at the gearbox, a rigid positioning construction for the cardan pins is important. The pins must also remain coaxial ($\pm 0.3^\circ$) under load, since otherwise, the fastening screws of the cardan adapter plates do no longer provide the same safety under the additional forces that occur.



The screw joint of the cardan pins must be designed with particular care and recalculated according to VDI2230. The resting contact surfaces should be so designed that shearing forces are avoided as far as possible.

9.15 Support Tube STR



With a support tube, large additional forces can act on the gearbox and the spindle, and therefore, for a swivel bearing solution, whenever possible, the cardan adapter should be preferred!

A horizontal arrangement is the least favourable, since almost the entire dead weight has to be absorbed by the short spindle guide in the gearbox. Therefore, the following maximum stroke lengths in mm apply:



| NSE2 | NSE5 | NSE10 | NSE25 | NSE50 | NSE100 |
|------|------|-------|-------|-------|--------|
| 100 | 200 | 250 | 400 | 500 | 600 |



The kink length calculation must be carried out without fail despite the already restricted stroke lengths. If the load is a pressure load, the maximum stroke length can be even shorter.

10.1 Modifications

The screw jack and the accessories may not be modified without Nozag's agreement, neither from a technical safety standpoint, nor a constructive standpoint. Any violation of the latter rule shall free Nozag from all warranty or liability obligations whatsoever.

11.1 Dismantling and Disposal

At the time of dismantling, before loosening any screws, please ensure that all the loads have been secured. The local community waste disposal regulations must be observed.

12.1 Document Index

Product data sheets and catalogues are downloadable in PDF format from our website www.nozag.ch or can be obtained free of charge from Nozag.

Declaration of incorporation

for incomplete machine according machinery directive 2006/42/EC

Pfäffikon, 1th Octobre 2011

The manufacturer :

Nozag AG, Barzloostrasse 1, CH-8330 Pfäffikon/ZH

of the incomplete machine as below hereby declares:

- > Product: Screw jack
- > Type: NSE
- > Size: 2, 5, 10, 25, 50, 100

The following basic safety and health protection requirements according to Annex I of the Directive 2006/42/EC have been applied and complied with:

- > General Principles no. 1
- > No. 1.1.2, 1.1.3, 1.1.5, 1.3.2

The conformity with the regulations in the following additional directives:

- > 2004/108/EC (EMC directive)
- > EN ISO 12100 (Safety of machinery)
- > EN 626-1 (Fundamental principles, hazardous materials)

The special technical documentation according to annex VII B of the directive 2006/42/EC were generated. They will be dispatched by post to the authorities of individual governments upon receipt of justifiable requests.

Authorised person for the compilation of the aforementioned special technical documents:

Adrian Hugentobler, Nozag AG, Barzloostrasse 1, CH-8330 Pfäffikon/ZH

The incomplete machine may only be made operational if it is found, for example, that the machine in which the incomplete machine was installed, conforms to the basic requirements of the machinery directive 2006/42/EC.



Adrian Hugentobler, CEO

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