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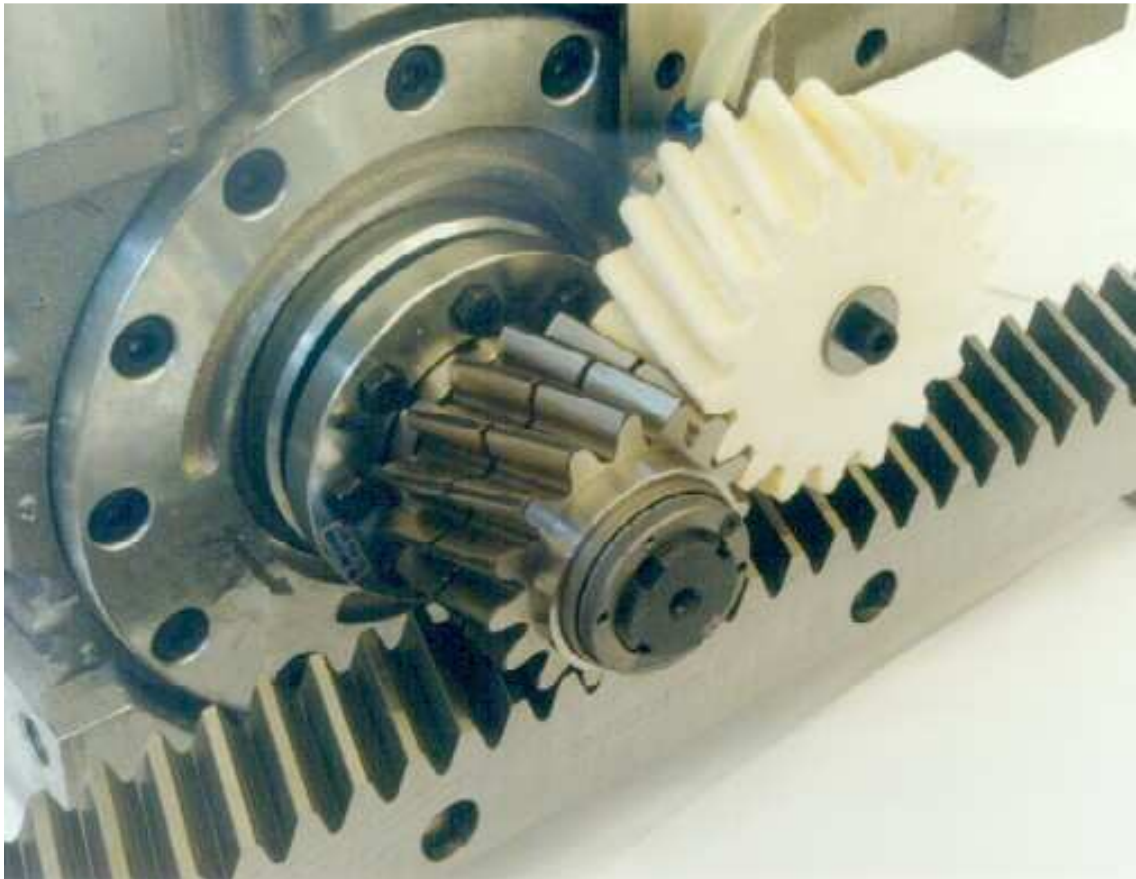
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Drive Systems

Rack and Pinion Drives



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CAUTION! The observance of the instructions in this documented procedure is prerequisite for the undisturbed operation and the contingent acceptance of liability on account of possible defects. Therefore study the operating instructions before starting the assembly.
Make sure that this documented procedure is made accessible to the mounting personnel in legible condition.

Safety notes

The following signal symbols and words are used in the instructions to give you a warning or suggestion.



warns you against high injury hazard.



warns you against possible injury hazard.



warns you against minor injury and/or damage hazards.



Environmental hazard warns you of a pollution hazard for the environment.



Transport warns you of injury hazards during transport and handling of heavy and bulky objects.

Other signs and symbols used in the instructions:



by a „handling instruction“ you are asked to do something.



by a „suggestion“ you are informed of a possible simplification or improvement.



Maintenance: suggests optimal operation.



Identification: shows the description of the rack.

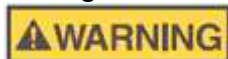


Storage: informs about the correct storage of the racks.

Safety



The racks may be assembled and installed only by skilled personnel having the necessary knowhow and experience.



Always wear safety helmet, goggles, protective gloves, and safety shoes when lifting the rack out of its packing and handling it. For reasons of weight, a second



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person should be called in or a crane be used, if the weight exceeds 8 kg. Always have a second person lend a hand, if the length exceeds 1000 mm in order to prevent bending and injury due to false posture. The crane must always be operated by a crane driver. The rack to be carried must be properly secured and, if necessary, the ends of the rack marked in a clearly visible way. There must always be sufficient safe distance from hanging loads. Make sure that there are no persons present under overhead loads.



Improper handling of heavy loads may lead to serious or even deadly injuries.

☺ The table below shows the masses of the individual racks. The lengths are rounded to round figures. The mass stands for the biggest cross-section.

Module	Mass of the rack in kg												
	1	1.5	1.591	2	2.5	3	3.183	4	5	6	8	10	12
Length (mm)													
200	-	-	-	0.85	-	2.70	-	2.70	3.00	4.40	9.50	10.67	
250	0.41	0.51	0.39	1.00	1.10	1.61	1.55	2.83	3.44	4.83	11.10	-	18
500	0.82	1.03	0.78	2.20	2.21	3.22	3.10	5.65	6.90	10.50	22.38	-	
1000	1.64	2.06	1.55	4.40	4.38	6.44	6.20	11.31	17.10	25.00	44.85	70.60	120
1500	-	-	-	6.15	-	9.66	-	19.97	20.40	30.30	-	-	
2000	-	4.11	-	8.80	8.80	12.88	12.40	22.61	34.20	50.00	89.71	-	
3000	-	-	-	8.49	-	19.32	-	33.93	-	-	-	-	



Mark the swivelling radius of the rack with a warning sign and a barring tape. This area must be blocked during transport and handling so that no persons may be endangered.



Before starting transportation, the path must be inspected for possible slipping hazards or other disturbing influences and, if necessary, made safe.



Before starting transportation it must be ascertained that the overall dimensions of the rack permit safe handling. Possible obstacles are to be removed or bypassed.



Always wear gloves when handling racks, because racks (especially those with helical teeth) have sharp edges.



In order to avoid injury due to false posture the height of the mounting bench must be chosen in such a way that it suits the height of the mechanic. An adjustable



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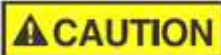
mounting bench would be needed if mechanics of different height were to work at the same bench.



Suitable supports or trestles must be provided in order to prevent hand or fingers from being squeezed and bruised when depositing the unit onto the bench or on a table.



It is also important to consider the point of gravity of the rack when setting it down because otherwise the unit could tilt or fall. Consequences could be heavy contusions of the limbs. A suitable support should also be provided when displacing the elements to avoid bending.



For fitting the screws, a suitable working height should be chosen for the mechanic. Furthermore it is important to choose a suitable screwdriver to avoid shocks within the wrist. The work surroundings must be perfectly prepared for this process in order to avoid becoming bruised while working.



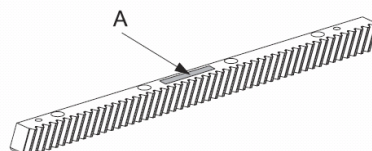
Whenever having touched the rack without gloves, wash your hands after work because the racks are oiled.



In order to avoid micro-sliding all racks must be pinned in addition to being fastened with fixing screws. This additional pinning prevents the rack from changing its position and also the fixing screws from loosening.

Item number

☺ The item number A) is on the rack.



☺ Example: Racks for continuous linking.



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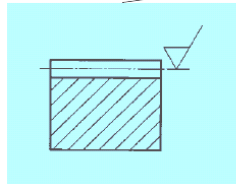
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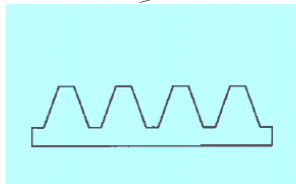
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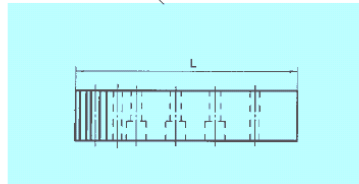
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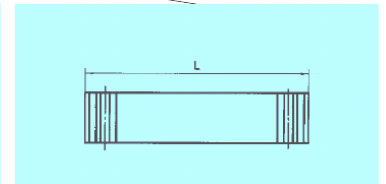
quality and precision



module




with bores



length of rack

Identification

 The rack is identified by item number and order code as well as the manufacturer's logo. This identification also ensures the retraceability of the manufacturing process.

Overview of racks

Class	Helical toothed		Straight toothed		Heat-treatment of teeth	Tolerance of teeth
	Series	Module	Series	Module		
UHPR	48	5; 6; 8; 10; 12	46	5; 6; 8; 10; 12	induction hardened	4
	29	2; 3; 4; 5	28	2; 3; 4; 5	case- hardened	5
HPR	29	2; 3; 4	28	2; 3; 4	carburized- hardened	6 h
	29	1,5; 2; 3; 4; 5; 6; 8; 10; 12	28	2; 3; 4; 5; 6; 8; 10; 12	induction hardened	6 h
	29	2; 3; 4; 5; 6; 8; 10	28	2; 3; 4; 5; 6; 8	induction hardened	7 h
PR	39	2; 3; 4; 5	34	2; 3; 4; 5	induction hardened	8 h
	38	2; 3; 4; 5	33	2; 3; 4; 5	quenched and tempered	8 e 27
BR	47	1,5; 2; 3; 4; 5; 6; 8; 10	25	1; 1,5; 2; 3; 4; 5; 6; 8; 10	soft	9 e 27
	39	1,5; 2; 3; 4; 5; 6; 8; 10; 12	27	1; 1,5; 2; 3; 4; 5; 6; 8; 10	induction hardened	10 e 27
			34	2; 3; 4; 5; 6	induction hardened	10 e 27

Description

Rack and pinion drives convert the rotary motion and torque of a gearwheel into the power-transmitting linear motion of a toothed rack. This takes place when the operating pitch cylinder of the gearwheel meshes with the common pitch surface of the rack without slipping. The rolling axis is thus the instantaneous axis of motion of the gearwheel in relation to the rack. In rack and pinion drives the motion is transmitted by positive connection. The teeth are therefore shaped in such a way that imaginary pitch cylinders can be inscribed in both functional partners rolling on one another without slipping. At the point



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of contact the peripheral speed of both operating pitch circles is identical. Racks are available in different designs to be chosen by the customer to suit the intended use.

Proper use

Toothed racks are used in applications where rotary motions are to be converted into linear motions. The advantage, as compared with other types of gear units with linear motion, is their excellent efficiency, high precision, speed, stiffness, and the possibility of joining them infinitely one behind the other.



Toothed racks may be used exclusively for converting rotary motion with torque into power-transmitting linear motion in machine and plant construction applications under atmospheric conditions from +10 to +60°C.

- ☞ The maximum force values permissible are specified in our catalogue or on our website: <http://www.atlantagmbh.de>
- ☞ The layout must be made strictly in accordance with our instructions. Any deviation requires written approval by Atlanta; otherwise this will be considered non-contractual use.
- ☞ Exceeding the permissible force shall be considered non-contractual use and is therefore forbidden.
- ☞ The maximum permissible force is only transmittable if the screw is tightening with the torque of the table on page 10
- ☞ No changes or modifications of the rack must be made without prior permission by Atlanta.
- ☞ The case-hardened racks (StrongLine) are hardened and ground on all sides. Except at the pin holes they must be consumed in use, this may no reworking can be performed. In the helical rack module 4, only one side to the ongoing assembly can be used. (See catalog servo-drive systems, page ZA - 5).
- ☞ Wrong alignment (see chapter „Final Inspection“ on page 17) of the gearwheel with relation to the rack shall be considered non-contractual use and is therefore forbidden.
- ☞ Improper lubrication, e.g. lack of lubricant and/or use of a wrong lubricant, or insufficient protection against pollution shall be considered non-contractual use and is therefore forbidden.
- ☞ If several racks are linked in line, it must be assured that the pitch lies within the permissible individual pitch error tolerances also at the joints.
- ☞ Atlanta will not assume any liability for any non-contractual use and/or any resulting damage. The responsibility lies with the user.



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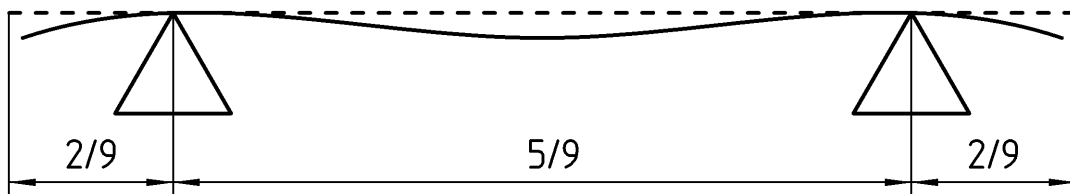
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Transport and handling

CAUTION

- ☞ Observe all safety regulations applying to transport and handling with lifting gear.
- ☞ Make sure that the load is handled and set down slowly and carefully.
- ☞ Especially when transporting and handling long racks (≥ 2000 mm), avoid any leverage upon the rack. Favourable lever arm ratios are as shown in the following drawing:



- ☞ If necessary, have one or more persons lend a hand.
- ☞ Transportation is possible within a temperature range from -10 to $+60^{\circ}\text{C}$.
- ☞ The appropriate kind of packing is chosen dependent on the means of transportation which may be by air, by land or by sea:
 - Airfreight: In boxes
 - By truck: In boxes or on transport pallets
 - By sea: In boxes or containers.
- ☞ For handling pallets or boxes suitable handling equipment should be used.

DANGER

Improper handling of heavy loads may cause serious or even deadly injuries.

CAUTION

Improper handling or transportation may lead to transport damages.

- ☞ Heavy shocks are to be avoided.
- ☞ The packing should be removed only as much as is necessary for further internal transportation.

Storage

If the rack is not going to be installed immediately after delivery, the following measures should be taken:

- ☞ Protect the rack against corrosion. The storerooms must be dry. Remove the anti-corrosive agent only immediately before the installation. When storing for a period of more than one month, renew the anti-corrosive coating.



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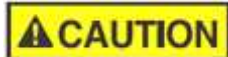
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- ☞ Avoid any unfavourable leverage on the rack during storage (for lever ratios see paragraph “Transport and handling”).
- ☞ Protect the rack against dust or other pollution.
- ☞ Do not damage the teeth or the supporting/contact surfaces.
- ☞ Avoid any metal-to-metal contacts between the racks during storage. Put a layer of protective foil or oil paper between them.

Unpacking

- ☞ Check the delivery for completeness by means of the accompanying documents.



Wear gloves for unpacking the rack because it is oiled and may have sharp edges.

- ☞ Check the rack for damage. Any transport damages should be reported immediately.
- ☞ Dispose of packing materials as required by the local disposal regulations.

Preparing the installation



Lifting gear may be required for the installation of the racks. Make sure that suitable, sufficiently dimensioned equipment is available.

- ☞ Adjust your torque wrench and check its function.
- ☞ Wear gloves while assembling in order to avoid contact corrosion.
- ☞ Inspect the racks for external damage and soiling.
- ☞ A damaged or soiled rack must neither be mounted nor operated.
- ☞ All contact and supporting surfaces of the rack and the machine bed must be degreased and cleaned carefully.
- ☞ The threaded holes in the machine bed must not be degreased since otherwise the friction value would be too high when tightening the screws and the required initial stressing force of the screw would not be reached. Apply a little bit of oil, if necessary.
- ☞ Use screws as supplied (neither oil, nor degrease them).
- ☞ Use only grade 12.9 screws.



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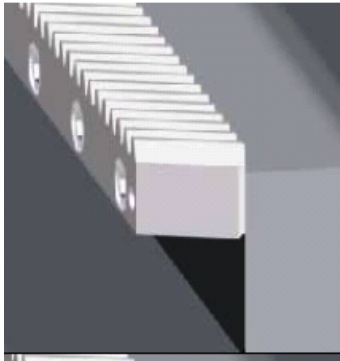
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Mounting instructions

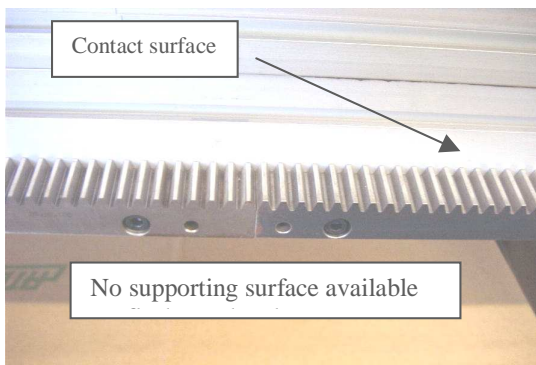
Contact surface



The machine bed should enable easy installation and grease-free mounting of the rack.

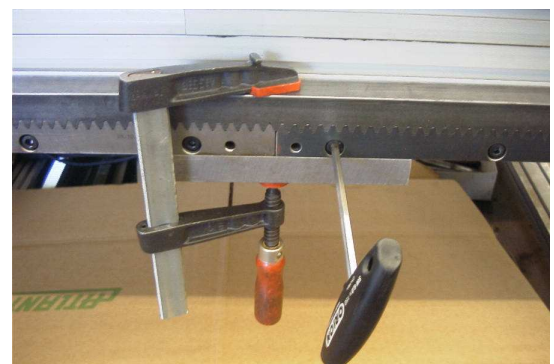
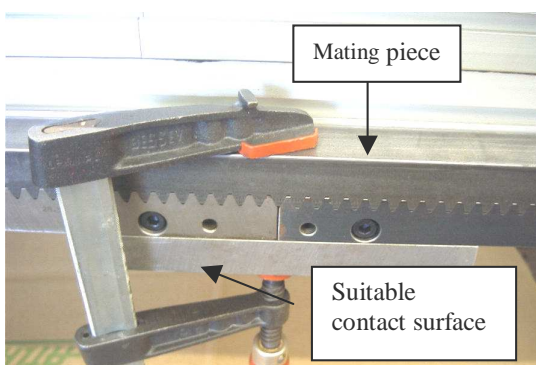
1. Position the first rack on the machine bed, adjust it concentrically, and clamp it to the contact surface with a screw clamp. Insert the hexagon socket screws without fully tightening them yet. Adjust the supporting surface of the rack in relation to the machine guide. Then tighten the hexagon socket screws as shown in the torque table below, beginning in the middle and continuing outwards. The screw clamps may be removed.

Hexagon socket screws 12.9	M6	M8	M12	M16	M20	M30	M36
Tightening torque in Nm	16	40	135	340	660	2300	4100
Tightening torque in lbf in	142	354	1195	3010	5842	20357	36288



Fit the second rack at the joint and clamp it with screw clamps against the contact surface of the machine bed. Insert the hexagon socket screws and tighten them slightly so that aligning is still possible. The screw clamps may be removed.

2. Insert the mating companion piece over the joint so that it meshes with the teeth of the two racks and fix it on the opposite using a suitable contact surface.





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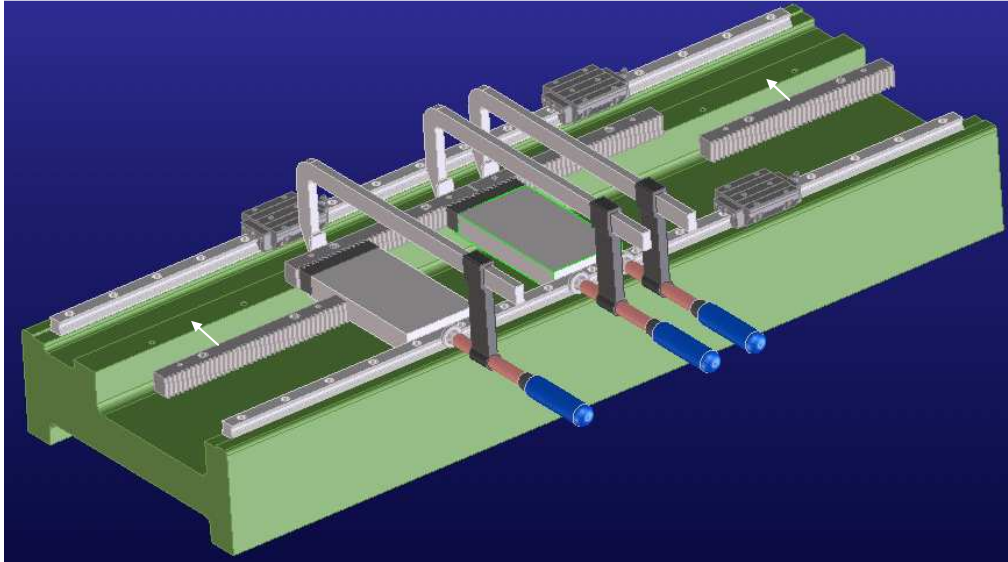
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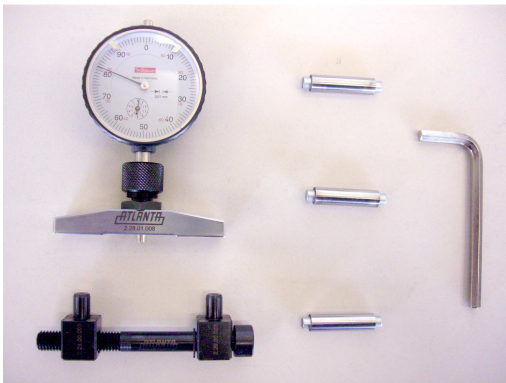
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☺ Mounting example on the machine bed



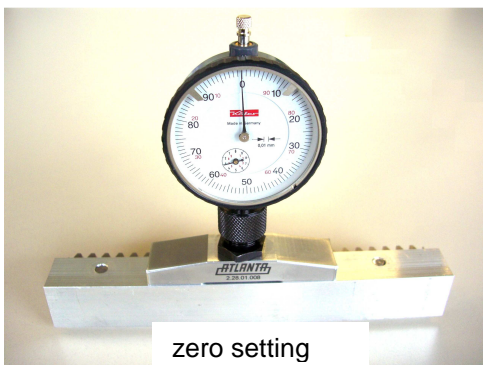
3. Remove the mating companion piece and the auxiliary contact surface.



4. Exact alignment of the racks at the joint is obtained with the aid of a mounting set consisting of a displacement device, three magnetic measuring rolls and a measuring bridge with dial gauge as well as a hexagon wrench.

☺ Suitable sizes and a description can be taken from our servo catalogue or our web-site: <http://www.atlantagmbh.de>.

5. Put the measuring bridge on a smooth-ground surface and set the dial gauge to zero.





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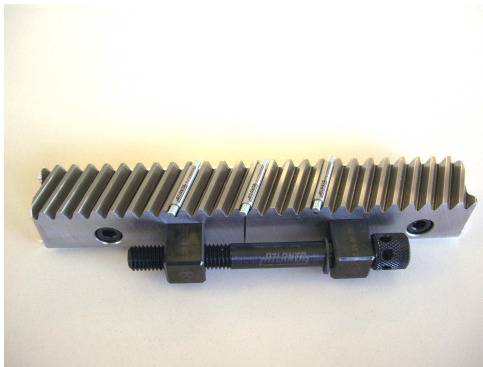
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6. Plug the displacement unit into the pinholes at the joint of the two racks. One measuring roll is laid into the tooth gap at the joint and the other two in a tooth gap left and right of the joint. Position the measuring bridge on the rolls so that the feeler of the dial gauge can feel the medium roll. Now seek the zero point by displacing sideways.



7. Using a hexagon socket wrench adjust the set-screw of the displacing unit in such a way that the rack, which is not yet firmly screwed, can be moved to the left or the right until the dial gauge reaches the zero position again.



Permissible deviations measured with the mounting set:

Q \ m	2	3	4	5	6	8	10	12
4	-	-	-	±0.004	±0.004	±0.004	±0.004	-
5	±0.007	±0.008	±0.008	±0.008	-	-	-	-
6	±0.01	±0.011	±0.011	±0.016	±0.016	±0.014	±0.015	±0.16
7	±0.014	±0.015	±0.023	±0.023	-	-	-	-
8	±0.027	±0.03	±0.032	±0.033	-	-	-	-
9	±0.027	±0.03	±0.032	±0.033	±0.036	±0.038	±0.041	±0.062
10	±0.041	±0.042	±0.045	±0.047	±0.049	-	-	-



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8. Slightly tighten the hexagon socket screws on the not yet fully fixed rack and loosen the set-screws at the displacement unit. Remove the displacement unit from the pinholes of the racks.



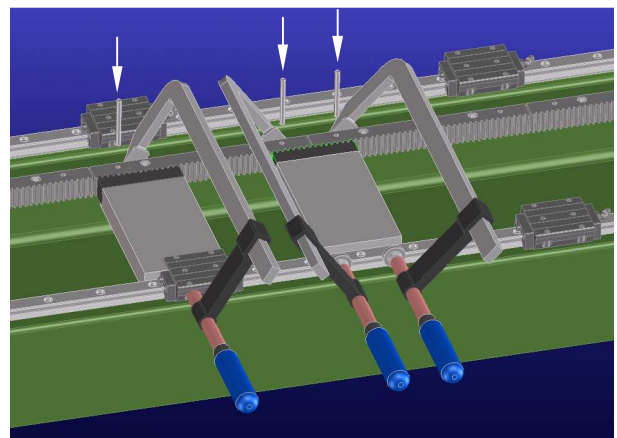
9. Using a torque wrench tighten the hexagon socket screws as shown in the torque table one after the other starting in the middle and continuing outwards.



10. Check the pitch once more and repeat steps 5 to 9, if necessary.
11. Racks shorter than 1 m must be additionally pinned.

Pinning

- ☞ Clamp the rack with screw clamps at all pinholes as shown on the picture.
- ☞ Drill the pinholes into the machine bed to match the holes provided in the rack.
- ☞ Ream each pair of holes simultaneously to the required tolerance fit H7 for the straight pins.





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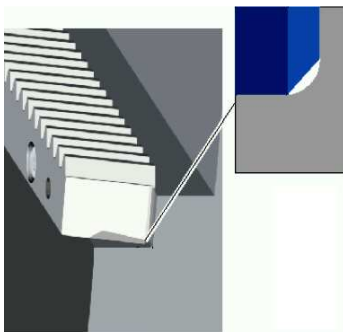
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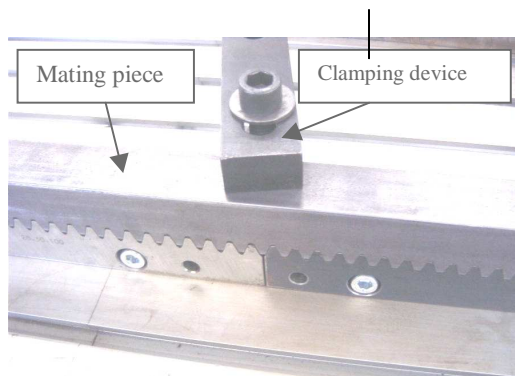
- ☞ Now fix the racks permanently with the straight pins. For this purpose we recommend to use hardened straight pins according to DIN EN ISO 8734.
- ☞ All racks must be pinned in addition to being fastened with fixing screws in order to prevent micro-sliding. This additional pinning prevents the rack from changing its position and also the fixing screws from loosening.
- ☞ Notice applicable to tensioning gearboxes: If the torque is transmitted via a tensioning gearbox or tensioning system where 2 pinions are in mesh on the same rack, the entire torque must not exceed the displacement force of the screws. The rack should be as long as possible but not shorter than 1 meter. Please contact us.

The machine bed has contact and supporting surfaces



The rack has a chamfer between contact surface and supporting surface in order to assure a perfect fit in the machine bed. The machine bed should enable easy mounting of the rack.

1. Position the first rack on the machine bed against the contact surface and the supporting surface, adjust it concentrically and clamp it with screw clamps to these surfaces. Then insert the hexagon socket head screws and tighten them according to the torque table on page 8, starting in the middle and continuing outwards. Position the second rack at the joint and clamp it with screw clamps to the contact and supporting surfaces of the machine bed. Insert the hexagon socket head screws and tighten them slightly so that the racks can still be adjusted. The screw clamps may be removed.



2. Insert the mating companion piece over the joint so that it meshes with the teeth of the two racks and clamp it with a suitable clamping device on the supporting surface.



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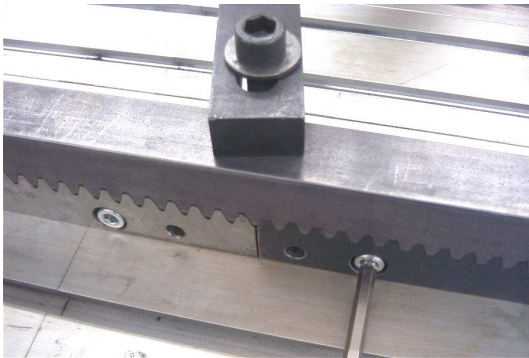
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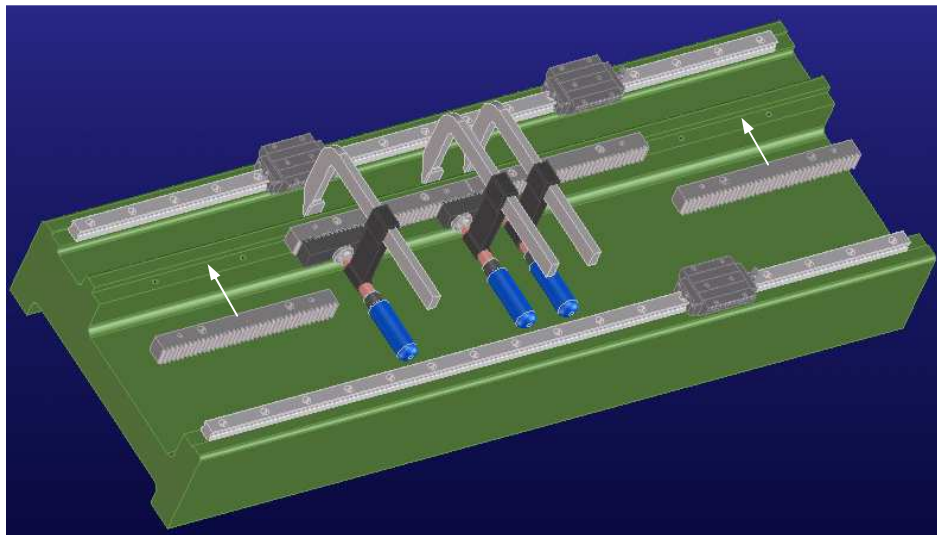
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3. Tighten the hexagon socket screws of the second rack in such a way that adjustment is still possible. Then remove the companion piece.

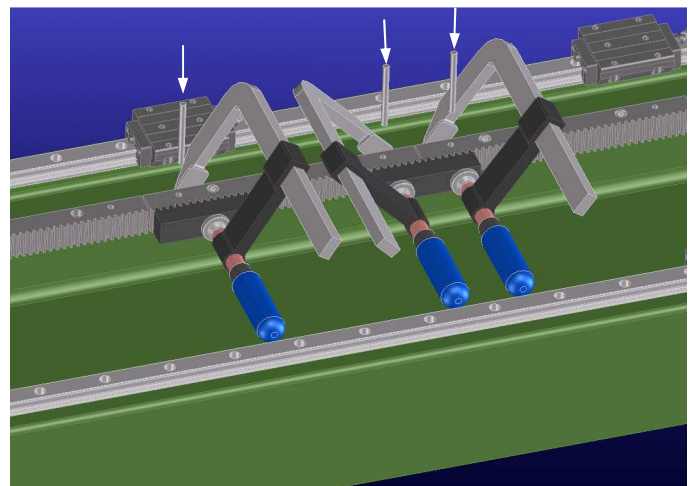
☺ The following is a mounting example on the machine bed



☞ **Steps 4 to 10 are the same as with the mounting instruction without supporting surface.**

Pinning

- ☞ Clamp the rack with screw clamps at all pinholes as shown on the picture opposite.
- ☞ Drill the pinholes into the machine bed according to the holes provided in the rack.
- ☞ Ream the drilled holes together to the tolerance fit H7 for the straight pins.





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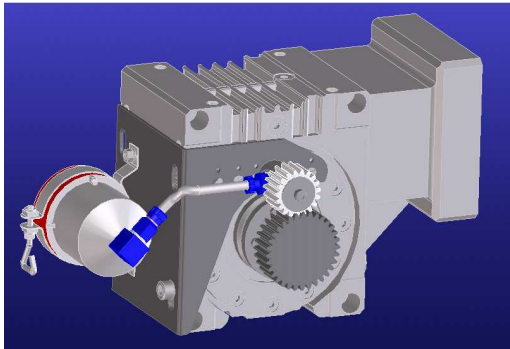
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- ☞ Now secure the rack permanently with straight pins. We recommend to us hardened straight pins acc. to DIN EN ISO 8734.
- ☞ All racks must be pinned in addition to being fastened with fixing screws in order to prevent micro-sliding. This additional pinning prevents the rack from changing its position and also the fixing screws from loosening.
- ☞ Notice applicable to tensioning gearboxes: If the torque is transmitted via a tensioning gearbox or tensioning system where 2 pinions are in mesh on the same rack, the entire torque must not exceed the displacement force of the screws. The rack should be as long as possible but not shorter than 1 meter. Please contact us.

Mounting the gear unit

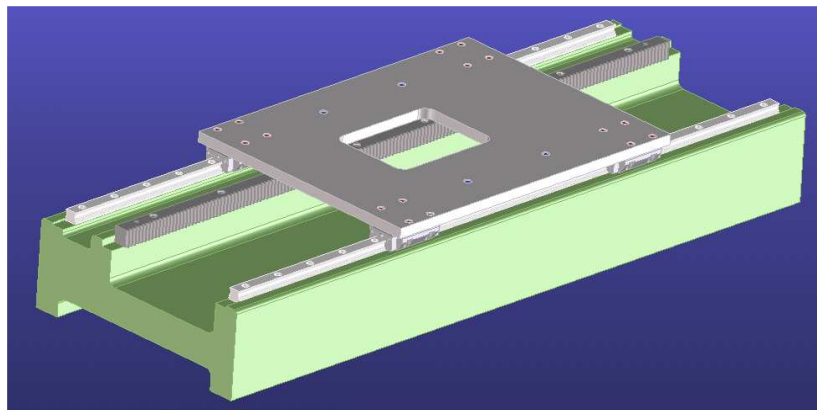


Before mounting the gear unit on the machine table it must be equipped with pinion shaft and lubricator.

(See separate instructions).

The machine table must be designed in such a way that the gear unit can be readily mounted and adjusted.

An example is shown on the picture below.



In the case of Z axes (vertical assembly) the machine table must be properly secured before positive connection with rack and gear unit because otherwise it could roll off due to its own weight and cause personal injury and material damage.

- ☞ Mount the gear unit provisionally on the machine table. Do not yet fully tighten the fixing screws. Mounting example: see picture below.



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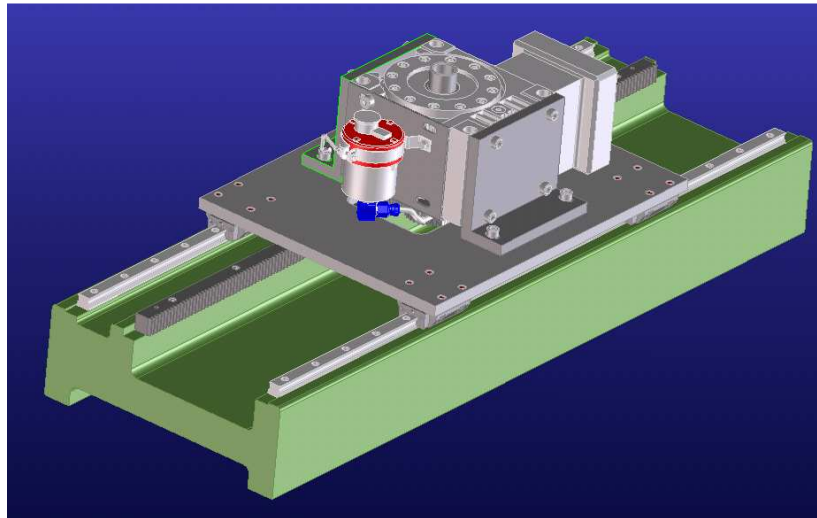
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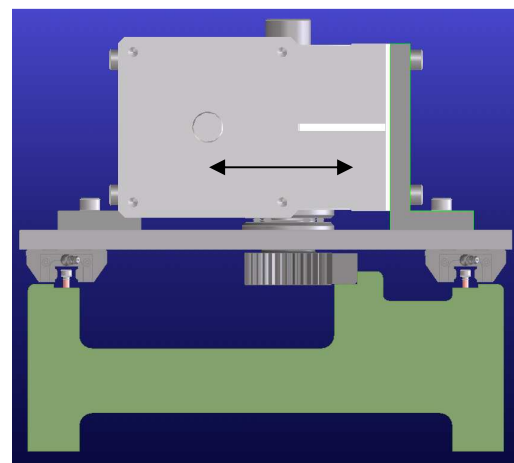
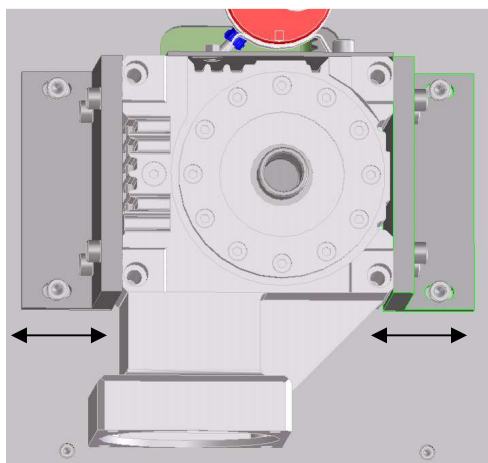
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Engaging the gear unit



- ☞ Push the adjusting unit, consisting for example of the gear unit and two lateral angle irons, manually into the gearing until the pinion meshes with only little backlash with the rack. Then slightly fix the adjusting unit with the screws. Move it over the length of the travelling path and seek the high point. When the pinion is properly engaged in the rack the adjusting unit can be fixed permanently; if not, it must be readjusted. At the low point of the traverse there will be a play of the tooth flanks the size of which depends upon the quality of rack and pinion. Depending upon the quality of the rack the circumferential backlash can vary more or less.



Do not mount the pinion to the rack under tension so as to produce freedom from backlash. This would lead to the failure of the gearing due to wear and tear or rupture of teeth.



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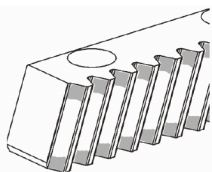
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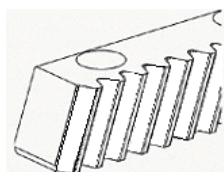
☺ In order to ensure a traversing movement free from play over the whole travelling length we recommend to replace the pinion shaft inside the gearbox by a pre-load pinion shaft. The mounting and adjusting instructions for this item as well as the torque to be transmitted can be seen from the pertinent operation description.

Final inspection

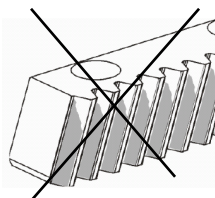
- ☞ If necessary, remove the grease from the tooth flanks.
- ☞ Coat the tooth flanks with marking paint.
- ☞ Shift the machine table several times so that the pinion runs over the paint coated tooth flanks.
- ☞ At the same time check the smooth operation of the gearing. The power required and the running noise must remain the same over the full distance. There must not be any bumps at the joints.
- ☞ Check the area where the paint has been rubbed off from the tooth flanks.
- ☞ Judge the adjustment of the gear unit by checking the tooth contact by means of the contact patterns shown on the following sketches.
- ☞ If necessary, correct the alignment of the gear unit.
- ☞ Check the racks at the joint for precision of pitch.



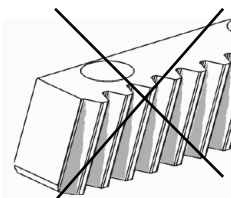
Correct



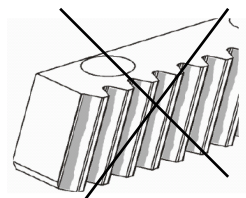
Correct



Not at right angles

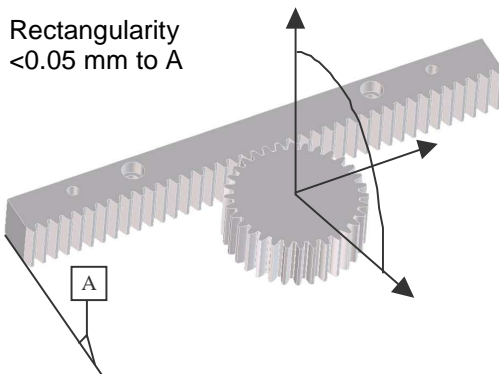


Not parallel

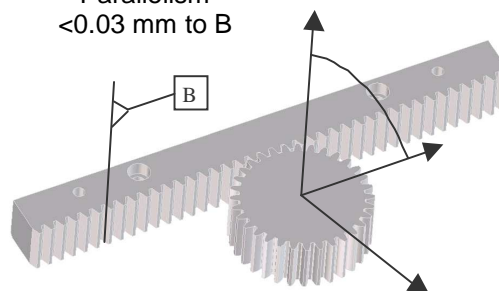


Wrong center distances

Rectangularity
<0.05 mm to A



Parallelism
<0.03 mm to B



The rectangularity and parallelism tolerances are only applicable to crowned ATLANTA gears and pinion shafts.



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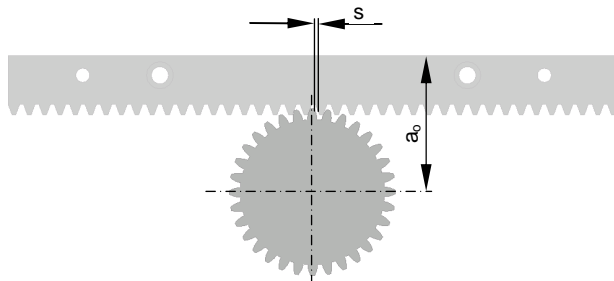
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The center distance "a₀" pinion and rack is set as a function of the tooth-flank backlash "s":

s = min. 0.03 / max. 0.3

For module 1 to 2,5: s = max. 0,1 mm

For module 3 to 4: s = max. 0,2 mm

For module 5 to 12: s = max. 0,3 mm

This value may be doubled for lifting axles.

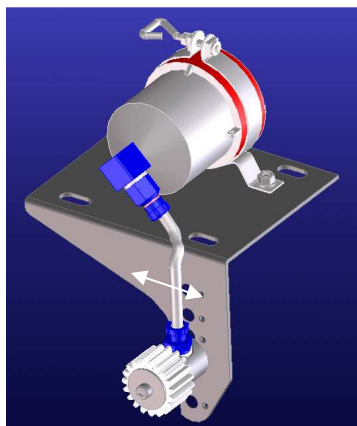
Operating conditions pinion / rack



Lacking or insufficient lubrication leads to damage to the teeth.

- ☞ Ensure proper lubrication and timely replacement of the grease cup.
- ☞ Pay attention to the correct meshing of pinion and rack.
- ☞ In the case of X and Y axes (horizontal installation without gearbox) it should be possible to move the freewheeling machine table by hand uniformly over the full travelling distance (while checking for tension-free installation). In the case of Z axes the machine table must be properly secured.

Starting up the the lubricating unit



- ☺ The lubricating unit consists of a mounting bracket, an electronically controlled lubricator, a set of connecting hoses, a mounting axle, and a felt gearwheel. Depending upon the mounting position on the gearbox, the felt gearwheel can be fixed on the mounting bracket in various positions.

- ☞ When mounting the lubricator on the gearbox, make sure that the teeth of the felt gearwheel mesh perfectly with the teeth of the pinion shaft. Due to the rectangular slots provided in the mounting bracket the lubricating unit can be displaced on the gear unit.

- ☞ Before switching on the lubricator, make sure that the hose is filled without any air bubbles and that the felt gearwheel is filled with suitable lubricant.
- ☺ Information as to the mounting dimensions, possible mounting positions, and type of lubricant can be seen from our catalogue or our web-site <http://www.atlantagmbh.de>.
- ☺ If due to restricted space conditions the lubricator cannot be installed as shown above, the individual components can also be used without the mounting bracket. In this case



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the attachment of the mounting axle with the felt gearwheel and the supply of the lubricant from the grease cup by means of the set of connecting hoses must be adapted to the existing mounting conditions.

- ☞ Please be aware that in the case of grease lubrication the hose must not be longer than 1.5 m. There must not be any kinks, and before starting up the lubricator, the hose must be filled with the suitable lubricant without air bubbles. Furthermore the felt gearwheel must also be soaked with the suitable lubricant.
- ☞ The center distance „a“ between pinion and felt gearwheel is calculated by the following formula:

$$a = \frac{d_R + d_F}{2} \quad d_R - \text{pitch circle of pinion}; \quad d_F - \text{pitch circle of felt gearwheel}$$

- ☞ The center distance „a“ between rack and felt gearwheel is calculated by the following formula:

$$a = h_0 + \frac{d_F}{2} \quad h_0 - \text{pitch height of rack}; \quad d_F - \text{pitch circle felt gearwheel}$$

- ☺ Further suggestions as to the proper start-up of the whole lubricating system are contained in the operating instructions BKI 101; BKI 102; BKI 104, and BKI 105.

Maintenance

Putting out of operation, preparations

- ☞ Mind the instructions in the chapter „Safety“
- ☞ The machine into which the rack and pinion drive is installed must be shut down.
- ☞ Cut off the power supply before starting any maintenance work.
- ☞ In the case of Z axes (vertical installation) the machine table must be properly secured.



When disassembling racks and gear unit, the positive connection to the machine table is interrupted. If, in the case of Z axes the machine table is not properly secured, it can roll off due to its own weight thus causing personal injury and material damage.

- ☞ Use only original spare parts. Atlanta shall not warrant for other parts.
- ☞ When replacing racks, always use new screws (see table p.9) and pins.
- ☞ For pinning, bore the pin holes, which are predrilled in the rack, together with those in the machine bed to the next bigger pin size. Then ream them simultaneously to the required H7 fit for straight pins. Continue through all other installation steps as described in the chapter “Mounting instructions / Pinning”.
- ☞ Racks may be replaced only by authorized people.



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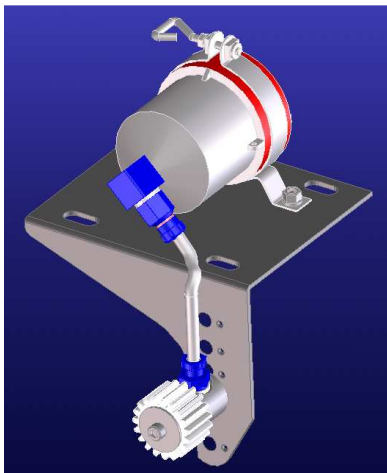
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Visual check

- ☞ The entire drive system must be visually checked for external damage and leakage.
- ☞ Any defective or leaking components are to be repaired immediately. In this connection please also observe the following operating and maintenance instructions:
 - ☺ HT servo high-performance gear units BWS 113
 - ☺ HP servo high-performance gear units BWS 107-10
 - ☺ E servo wormgear units BWS 110
 - ☺ B servo wormgear units BWS 112
 - ☺ BG bevel-gear units BWK 115
- ☞ Clean pinion and rack.
- ☞ Product-related information regarding maintenance questions can be ordered from the ATLANTA technical department.

Inspection of the lubricating system



- ☺ The filling level can be seen through the transparent housing. Optionally available are grease cups monitoring the filling level.
- ☞ Thorough visual inspection for externally visible damage such as loosened, kinked or defective hose, worn or soiled felt gearwheel, and for proper functioning of the lubricator.
- ☞ Any defective, soiled or non-functioning components are to be replaced immediately.
The service life of the felt gearwheel depends upon the ambient conditions.
- ☺ When working under polluted ambient conditions, we recommend to shorten the inspection intervals.
- ☺ The felt gearwheel must never be exposed to ambient temperatures of $>70^{\circ}\text{C}$. Please also observe the operating and maintenance instructions BKI 101; BKI 102; BKI 103; BKI 104; BKI 105; BKI 106 and BKI 109 for the lubricator.

Restarting operation after maintenance

- ☞ Reinstall all safety devices.
- ☞ In the case of Z axes check the connection between machine table, rack and gear unit and unlock the machine table.
- ☞ Before releasing the machine again for operation perform a test run.
- ☞ Look for any forgotten screws and tools and remove them.



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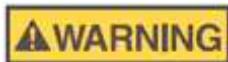
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Error list (troubleshooting)

☞ React immediately whenever you detect unusual loss of lubricant, increased running noises, or unusually high gear temperatures.

Defect	Possible cause	Remedy
No lubrication or insufficient lubrication	Lubricating interval too big	Check technical data
	Dosage too small	Check technical data
	Ambient temperature too high	Check supply temperature of lubricant
	Lubricant dosing device defective	See „Inspection of the lubricating system“
	Lubricant dosing device empty	Replace dosing device
Increased running noise	No lubrication or insufficient lubrication	See remedy in case of no or insufficient lubrication
	Tooth gearing defect	Check installation and load data, replace defective parts
	Wrong installation pinion/rack	See “Final Inspection”
Tooth defects such as wear, pitting, rupture	No lubrication or insufficient lubrication	See remedy in case of no or insufficient lubrication
	Wrong installation of pinion/rack	See „Final inspection“
	Too much stress	Check load data, replace defective parts

Disassembly



Improper performance of the work may cause personal injury and material damage.

☞ The disassembly of rack and gear unit may be carried out only by skilled personnel with the necessary knowhow and experience.

Preparation

- ☞ The machine into which the drive system is installed must be shut down.
- ☞ It must be ensured that the drive system can be removed without danger of damage to the machine .
- ☞ Before starting the work cut off the machine from the power supply.
- ☞ In the case of Z axes (vertical installation) the machine table must be properly secured.



When disassembling the racks and the gear unit the positive connection to the machine table is interrupted. If, in the case of Z axes, the machine table is not properly secured, it can roll off due to its own weight thus causing personal injury and material damage.



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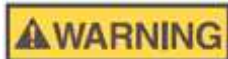
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Disassembling the rack

- ☞ All fixing screws must be loosened before the rack can be removed from the pinned fastening with the aid of suitable tools.
- ☞ Remove the racks carefully in order to avoid damage to the drive system and adjoining components.
- ☞ Use only original spare parts. Atlanta shall not warrant for other parts.
- ☞ When replacing racks, always use new screws (see table p.9) and pins.
- ☞ For pinning, bore the pin holes, which are predrilled in the rack, together with those in the machine bed to the next bigger pin size. Then ream them simultaneously to the required H7 fit for straight pins. Continue through all other installation steps as described in the chapter “Mounting instructions / Pinning”.

Lubricants

Lubrication of rack and pinion drives:



For the continuous lubrication of rack and pinion drives we recommend to use electronically controlled lubricators. Together with the electronically controlled lubricator you can use the felt gearwheel or the sliding brush.

Item numbers and descriptions are contained in our catalogue or the web-site <http://www.atlantagmbh.de>.

Recommended lubricants are the following:

- ☺ Klüber Microlube GB 0
Order code 65 90 002 (1 kg)
- ☺ Klüber Structovis AHD
Order code. 65 90 003 (1 kg)

The following lubricants have also been tested with good results:

- ☺ Oest Langzeitfett LT 200
- ☺ BP Energ grease LS EP 00
- ☺ DEA Glissando 6833 EP 00
- ☺ Fuchs Lubritech Gearmaster ZSA
- ☺ Molykote G-Rapid plus 3694



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Disposal

Lubricants



Environmental hazard

Lubricants are hazardous substances susceptible to pollute soil and water.

- ☞ Dispose of the lubricants as required by national regulations.
- ☞ Never mix polyglycolic substances with mineral oils which are intended for recycling.

Seals

- ☞ Sealing rings are to be disposed of as compound materials (metal/plastics).

Metal

- ☞ The drive components are to be separated as follows:
 - Iron
 - Aluminium (housings, covers)
 - Non-ferrous metal (worm gears; motor windings)

Hoses

- ☞ Hoses are to be disposed of as plastic materials.

Felt gearwheels

- ☞ Felt gearwheels can be disposed of as residual waste.