# ⚠ FUNDAMENTAL SAFETY INSTRUCTIONS

For carrying out overhead assembly work always use specially designed or otherwise safety-oriented ladders and working platforms. Never use machine parts as a climbing aid.

Wear a safety harness when carrying out maintenance work at greater heights.

Keep all handles, steps, handrails, platforms, landings and ladders free from dirt, snow and ice.

Clean the machine, especially connections and threaded unions, of any traces of oil, fuel or preservatives before carrying out maintenance/repair. Never use aggressive detergents. Use lint-free cleaning rags.

Before cleaning the machine with water, steam jet (high-pressure cleaning) or detergents, cover or tape up all openings which - for safety and functional reasons - must be protected against water, steam or detergent penetration. Special care must be taken with electric motors and switchgear cabinets.

Ensure during cleaning of the machine that the temperature sensors of the fire-warning and fire-fighting systems do not come into contact with hot cleaning agents as this might activate the fire-fighting system.

After cleaning, remove all covers and tapes applied for that purpose.

After cleaning, examine all fuel, lubricant, and hydraulic fluid lines for leaks, loose connections, chafe marks and damage. Any defects found must be rectified without delay.

Always tighten any screwed connections that have been loosened during maintenance and repair.

Any safety devices removed for set-up, maintenance or repair purposes must be refitted and checked immediately upon completion of the maintenance and repair work.

Ensure that all consumables and replaced parts are disposed of safely and with minimum environmental impact.

## Warning of special dangers

### Electric energy

Use only original fuses with the specified current rating. Switch off the machine immediately if trouble occurs in the electrical system.

When working with the machine, maintain a safe distance from overhead electric lines. If work is to be carried out close to overhead lines, the working equipment must be kept well away from them. Caution, danger! Check out the prescribed safety distances.

If your machine comes into contact with a live wire

- do not leave the machine
- drive the machine out of the hazard zone
- warn others against approaching and touching the machine
- have the live wire de-energized
- do not leave the machine until the damaged line has been safely de-energized.

The electrical equipment of machines is to be inspected and checked at regular intervals. Defects such as loose connections or scorched cables must be rectified immediately.

### Gas, dust, steam and smoke

Operate internal combustion engines and fuel-operated heating systems only on adequately ventilated premises. Before starting the machine on enclosed premises, make sure that there is sufficient ventilation.

Observe the regulations in force at the respective site.

Carry out welding, flame-cutting and grinding work on the machine only if this has been expressly authorized, as there may be a risk of explosion and fire.

Before carrying out welding, flame-cutting and grinding operations, clean the machine and its surroundings from dust and other inflammable substances and make sure that the premises are adequately ventilated (risk of explosion).

## Umrechnung von Newtonmeter "Nm" in Foot Pounds "ft.lb."
## Conversion from newtonmeter "Nm" into foot pounds "ft.lb."

| Nm | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| **10** | 7.376 | 8.113 | 8.851 | 9.588 | 10.326 | 11.063 | 11.801 | 12.539 | 13.276 | 14.014 |
| **20** | 14.751 | 15.489 | 16.226 | 16.964 | 17.701 | 18.439 | 19.177 | 19.914 | 20.652 | 21.389 |
| **30** | 22.127 | 22.864 | 23.602 | 24.339 | 25.077 | 25.815 | 26.552 | 27.290 | 28.027 | 28.765 |
| **40** | 29.502 | 30.240 | 30.978 | 31.715 | 32.453 | 33.190 | 33.928 | 34.665 | 35.403 | 36.140 |
| **50** | 36.878 | 37.616 | 38.353 | 39.091 | 39.828 | 40.566 | 41.303 | 42.041 | 42.778 | 43.516 |
| **60** | 44.254 | 44.991 | 45.729 | 46.466 | 47.204 | 47.941 | 48.679 | 49.417 | 50.154 | 50.892 |
| **70** | 51.629 | 52.367 | 53.104 | 53.842 | 54.579 | 55.317 | 56.055 | 56.792 | 57.530 | 58.267 |
| **80** | 59.005 | 59.742 | 60.480 | 61.217 | 61.955 | 62.693 | 63.430 | 64.168 | 64.905 | 65.643 |
| **90** | 66.380 | 67.118 | 67.856 | 68.593 | 69.331 | 70.068 | 70.806 | 71.543 | 72.281 | 73.018 |
| **100** | 73.756 | 74.494 | 75.231 | 75.969 | 76.706 | 77.444 | 78.181 | 78.919 | 79.656 | 80.394 |
| **110** | 81.132 | 81.869 | 82.607 | 83.344 | 84.082 | 84.819 | 85.557 | 86.295 | 87.032 | 87.770 |
| **120** | 88.507 | 89.245 | 89.982 | 90.720 | 91.457 | 92.195 | 92.933 | 93.670 | 94.408 | 95.145 |
| **130** | 95.883 | 96.620 | 97.358 | 98.095 | 98.833 | 99.571 | 100.308 | 101.046 | 101.783 | 102.521 |
| **140** | 103.258 | 103.996 | 104.734 | 105.471 | 106.209 | 106.946 | 107.684 | 108.421 | 109.159 | 109.896 |
| **150** | 110.634 | 111.372 | 112.109 | 112.847 | 113.584 | 114.322 | 115.059 | 115.797 | 116.534 | 117.272 |
| **160** | 118.010 | 118.747 | 119.485 | 120.222 | 120.960 | 121.697 | 122.435 | 123.173 | 123.910 | 124.648 |
| **170** | 125.385 | 126.123 | 126.860 | 127.598 | 128.335 | 129.073 | 129.811 | 130.548 | 131.286 | 132.023 |
| **180** | 132.761 | 133.498 | 134.236 | 134.973 | 135.711 | 136.449 | 137.186 | 137.924 | 138.661 | 139.399 |
| **190** | 140.136 | 140.874 | 141.612 | 142.349 | 143.087 | 143.824 | 144.562 | 145.299 | 146.037 | 146.774 |
| **200** | 147.512 | 148.250 | 148.987 | 149.725 | 150.462 | 151.200 | 151.937 | 152.675 | 153.412 | 154.150 |
| **210** | 154.888 | 155.625 | 156.363 | 157.100 | 157.838 | 158.575 | 159.313 | 160.051 | 160.788 | 161.526 |
| **220** | 162.263 | 163.001 | 163.738 | 164.476 | 165.213 | 165.951 | 166.689 | 167.426 | 168.164 | 168.901 |
| **230** | 169.639 | 170.376 | 171.114 | 171.851 | 172.589 | 173.327 | 174.064 | 174.802 | 175.539 | 176.277 |
| **240** | 177.014 | 177.752 | 178.490 | 179.227 | 179.965 | 180.702 | 181.440 | 182.177 | 182.915 | 183.652 |
| **250** | 184.390 | 185.128 | 185.865 | 186.603 | 187.340 | 188.078 | 188.815 | 189.553 | 190.290 | 191.028 |
| **260** | 191.766 | 192.503 | 193.241 | 193.978 | 194.716 | 195.453 | 196.191 | 196.929 | 197.666 | 198.404 |
| **270** | 199.141 | 199.879 | 200.616 | 201.354 | 202.091 | 202.829 | 203.567 | 204.304 | 205.042 | 205.779 |
| **280** | 206.517 | 207.254 | 207.992 | 208.729 | 209.467 | 210.205 | 210.942 | 211.680 | 212.417 | 213.155 |
| **290** | 213.892 | 214.630 | 215.368 | 216.105 | 216.843 | 217.580 | 218.318 | 219.055 | 219.793 | 220.530 |
| **300** | 221.268 | 222.006 | 222.743 | 223.481 | 224.218 | 224.956 | 225.693 | 226.431 | 227.168 | 227.906 |
| **310** | 228.644 | 229.381 | 230.119 | 230.856 | 231.594 | 232.331 | 233.069 | 233.807 | 234.544 | 235.282 |
| **320** | 236.019 | 236.757 | 237.494 | 238.232 | 238.969 | 239.707 | 240.445 | 241.182 | 241.920 | 242.657 |
| **330** | 243.395 | 244.132 | 244.870 | 245.607 | 246.345 | 247.083 | 247.820 | 248.558 | 249.295 | 250.033 |
| **340** | 250.770 | 251.508 | 252.245 | 252.983 | 253.721 | 254.458 | 255.196 | 255.933 | 256.671 | 257.408 |
| **350** | 258.146 | 258.884 | 259.621 | 260.359 | 261.096 | 261.834 | 262.571 | 263.309 | 264.046 | 264.784 |
| **360** | 265.521 | 266.259 | 266.997 | 267.734 | 268.472 | 269.209 | 269.947 | 270.684 | 271.422 | 272.159 |
| **370** | 272.897 | 273.635 | 274.372 | 275.110 | 275.847 | 276.585 | 277.323 | 278.060 | 278.798 | 279.535 |
| **380** | 280.273 | 281.010 | 281.748 | 282.485 | 283.223 | 283.960 | 284.698 | 285.436 | 286.173 | 286.911 |
| **390** | 287.648 | 288.386 | 289.123 | 289.861 | 290.598 | 291.336 | 292.074 | 292.811 | 293.549 | 294.286 |
| **400** | 295.024 | 295.761 | 296.499 | 297.237 | 297.974 | 298.712 | 299.449 | 300.187 | 300.924 | 301.662 |
| **410** | 302.399 | 303.137 | 303.875 | 304.612 | 305.350 | 306.087 | 306.825 | 307.562 | 308.300 | 309.038 |
| **420** | 309.775 | 310.513 | 311.250 | 311.988 | 312.725 | 313.463 | 314.200 | 314.938 | 315.676 | 316.413 |
| **430** | 317.151 | 317.888 | 318.626 | 319.363 | 320.101 | 320.838 | 321.576 | 322.313 | 323.051 | 323.789 |
| **440** | 324.526 | 325.264 | 326.001 | 326.739 | 327.477 | 328.214 | 328.952 | 329.689 | 330.427 | 331.164 |
| **450** | 331.902 | 332.639 | 333.377 | 334.115 | 334.852 | 335.590 | 336.327 | 337.065 | 337.802 | 338.540 |
| **460** | 339.278 | 340.015 | 340.753 | 341.490 | 342.228 | 342.965 | 343.703 | 344.440 | 345.178 | 345.916 |
| **470** | 346.653 | 347.391 | 348.128 | 348.866 | 349.603 | 350.341 | 351.078 | 351.816 | 352.553 | 353.291 |
| **480** | 354.029 | 354.766 | 355.504 | 356.241 | 356.979 | 357.717 | 358.454 | 359.192 | 359.929 | 360.667 |
| **490** | 361.404 | 362.142 | 362.879 | 363.617 | 364.354 | 365.092 | 365.830 | 366.567 | 367.305 | 368.042 |
| **500** | 368.780 | 369.517 | 370.255 | 370.992 | 371.730 | 372.468 | 373.205 | 373.943 | 374.680 | 375.418 |
| **510** | 376.156 | 376.893 | 377.631 | 378.368 | 379.106 | 379.843 | 380.581 | 381.318 | 382.056 | 382.793 |
| **520** | 383.531 | 384.269 | 385.006 | 385.744 | 386.481 | 387.219 | 387.957 | 388.694 | 389.432 | 390.169 |
| **530** | 390.907 | 391.644 | 392.382 | 393.119 | 393.857 | 394.594 | 395.332 | 396.070 | 396.807 | 397.545 |
| **540** | 398.282 | 399.020 | 399.757 | 400.495 | 401.232 | 401.970 | 402.708 | 403.445 | 404.183 | 404.920 |
| **550** | 405.658 | 406.396 | 407.133 | 407.871 | 408.608 | 409.346 | 410.083 | 410.821 | 411.558 | 412.296 |
| **560** | 413.033 | 413.771 | 414.509 | 415.246 | 415.984 | 416.721 | 417.459 | 418.196 | 418.934 | 419.671 |
| **570** | 420.409 | 421.147 | 421.884 | 422.622 | 423.359 | 424.097 | 424.834 | 425.572 | 426.310 | 427.047 |
| **580** | 427.785 | 428.522 | 429.260 | 429.997 | 430.735 | 431.472 | 432.210 | 432.948 | 433.685 | 434.423 |
| **590** | 435.160 | 435.898 | 436.635 | 437.373 | 438.111 | 438.848 | 439.586 | 440.323 | 441.061 | 441.798 |
| **600** | 442.536 | 443.273 | 444.011 | 444.749 | 445.486 | 446.224 | 446.961 | 447.699 | 448.436 | 449.174 |
| **610** | 449.911 | 450.649 | 451.386 | 452.124 | 452.862 | 453.599 | 454.337 | 455.074 | 455.812 | 456.550 |
| **620** | 457.287 | 458.025 | 458.762 | 459.500 | 460.237 | 460.975 | 461.712 | 462.450 | 463.187 | 463.925 |
| **630** | 464.663 | 465.400 | 466.138 | 466.875 | 467.613 | 468.350 | 469.088 | 469.826 | 470.563 | 471.301 |
| **640** | 472.038 | 472.776 | 473.513 | 474.251 | 474.989 | 475.726 | 476.464 | 477.201 | 477.939 | 478.676 |
| **650** | 479.414 | 480.151 | 480.889 | 481.626 | 482.364 | 483.102 | 483.839 | 484.577 | 485.314 | 486.052 |
| **660** | 486.790 | 487.527 | 488.265 | 489.002 | 489.740 | 490.477 | 491.215 | 491.952 | 492.690 | 493.427 |
| **670** | 494.165 | 494.903 | 495.640 | 496.378 | 497.115 | 497.853 | 498.590 | 499.328 | 500.065 | 500.803 |
| **680** | 501.541 | 502.278 | 503.016 | 503.753 | 504.491 | 505.229 | 505.966 | 506.704 | 507.441 | 508.179 |
| **690** | 508.916 | 509.654 | 510.391 | 511.129 | 511.866 | 512.604 | 513.342 | 514.079 | 514.817 | 515.554 |
| **700** | 516.292 | 517.030 | 517.767 | 518.505 | 519.242 | 519.980 | 520.717 | 521.455 | 522.192 | 522.930 |

## Zulässiges Lagerspiel
## Permissible bearing play

| **Drehverbindung**<br>**Swing bearing** | **EC 130**<br>Nr. / No. 11 701 - |
|---|---|
| Zahnflankenspiel min. Drehverbindung - Schwenkgetrieberitzel<br>Min. flank play swing bearing slew pinion | $0,3^{+0,2}$ mm<br>$0.01^{+0,008}$ inch |

## Anziehdrehmomente
## Tightening torques

| | | **EC 130**<br>Nr. / No. 11 701 - |
|---|---|---|
| Laufrolle<br>Bottom roller | Gewindegröße<br>Thread size | M 16 [1] / 12.9 / SW 24 |
| | Sach-Nr.<br>Part No. | 73171578 |
| | **Anziehdrehmoment**<br>**Tightening torque** | **330 Nm**<br>**243 lbft** |
| Stützrolle<br>Top roller | Gewindegröße<br>Thread size | M 16 / 10.9 / SW 24 |
| | Sach-Nr.<br>Part No. | 73176997 |
| | **Anziehdrehmoment**<br>**Tightening torque** | **250 Nm**<br>**185 lbft** |
| Bodenplatte<br>Track pad | Gewindegröße<br>Thread size | M 14 x 1,5 [1] / 12.9 / SW 22 |
| | | 3-Steg-Bodenplatte<br>Triple-grouser truck-pad |
| | Sach-Nr.<br>Part No. | 73177002 |
| | **Anziehdrehmoment**<br>**Tightening torque** | **235 Nm**<br>**174 lbft** |
| Fahrgetriebe<br>Final drive | Gewindegröße<br>Thread size | M 16 x 45 / 10.9 / SW 24 |
| | Sach-Nr.<br>Part No. | 73172206 |
| | **Anziehdrehmoment**<br>**Tightening torque** | **250 Nm**<br>**184 lbft** |
| Kettenrad-<br>Fahrgetriebe<br>Sprocket-<br>final drive | Gewindegröße<br>Thread size | M 16 x 55 [2] / 10.9 / SW 24 |
| | Sach-Nr.<br>Part No. | 73177037 |
| | **Anziehdrehmoment**<br>**Tightening torque** | **340 Nm**<br>**251 lbft** |

[1] Sechskantschraube, leicht geölt
Hex. hd. screw. lightly oiled

[2] Schrauben mit flüssiger Schraubensicherung z.B. Loctite 242, 243.
Screws with liquid screw fixer, e.g. Loctite 242, 243

## Sprocket

2800529

The sprocket is bolted to the travel gearbox.

- Assembly requirements

  Removal and installation of the sprocket is possible with installed travel gearbox.

- Tightening bolts

  The thread and the contact surface of the bolt head are to be slightly oiled.

- Contact surface

  Check the contact surface of sprocket and travel gearbox for damage and clean with thinner (Part-no. 73171477) from paint and grease.
  All contact surfaces must be cleaned down to the bright metal and be dry and free from grease.

- Thread holes

  All thread holes in the travel gearbox have to be cleaned with compressed air, carefully checked for paint, rust and damage. If required the threads are to be taped again.

- Adhesive

  When the sprocket is prepared for installation apply a thin layer of adhesive (Part-no. 73176144) onto one of the contact surfaces.

  Apply the adhesive appr. 10 mm clear of the thread holes. When assembling the sprocket no adhesive must reach the thread holes. The penetration of adhesive into the thread hole results in increased friction and thus in wrong tightening of the bolts.

- Installation

**⚠ CAUTION**

**Start assembly immediately after application of the adhesive.**

**Hardening of the adhesive begins after joining the metal surfaces under the exclusion of air and is generally completed after approx. 48 hours at an ambient temperature of 68°F.**

**The hardening process begins only after a considerable initial delay so that the fitting operations may extend over a period of 8 hours maximum.**

**At temperatures of -50°F it is necessary to spray an activator (Part no. 73176145) onto the second contact surface, i.e. the one without adhesive.**

The bolts have to be tightened crosswise with the required torque.

## Reassembling the Traveling Gearbox

- Thorougly remove any paint and grease from the seating surfaces (A and B, Fig. 1) of the undercarriage frame, the sprocket and the traveling gearbox with thinner (Item No. 73171477). Then check for damage.
  Seating surfaces must be bright, dry and free of grease.
- Join the sprocket and the traveling gearbox and align them.
- Fix the sprocket to the gearbox by four bolts (2, Fig. 1). Tighten the bolts by hand.
- To make easier joining the traveling gearbox into the frame, screw one M 20 x 1.5 stud bolt into a tapped hole in the longitudinal beam for guidance.
- Apply a ring of adhesive (Item No. 73176144) of about 1 mm in thickness around each tapped gearbox bolt hole.
- Attach lifting tackle to the bore in the sprocket (see arrow, Fig. 3), bring to fitting position and align.
- Secure the traveling gearbox to the frame by turning in a few hexagon bolts (3, Fig. 1 - 3). Place sleeves (4) over all slightly oiled gearbox bolts (3), turn them in and tighten them.

  Proceed crosswise, mark tightened bolts.
- Remove the sprocket bolts (2) and pull off the chain wheel. Apply adhesive (Item No. 73176144) around each tapped hole.

**⚠ CAUTION**

**Apply the adhesive at some distance to the holes so that no adhesive can get to the threads when the parts are joined.**

**Do not apply the adhesive before the sprocket and the gearbox are ready for assembling.**

- Mount the chain wheel.

  Turn the slightly oiled bolts (2, Fig. 4) in and tighten them.

  Proceed crosswise, mark tightened bolts.
- Re-close the track.

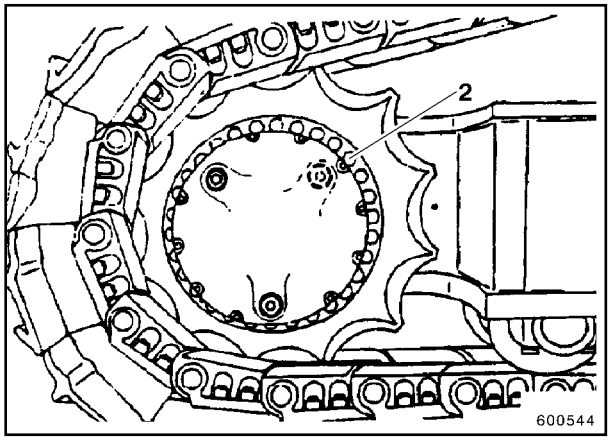


*Fig. 4*

- Re-connect the hydraulic lines (Fig. 2) and re-fit the traveling gearbox guard.
- Bleed the parking brake. □

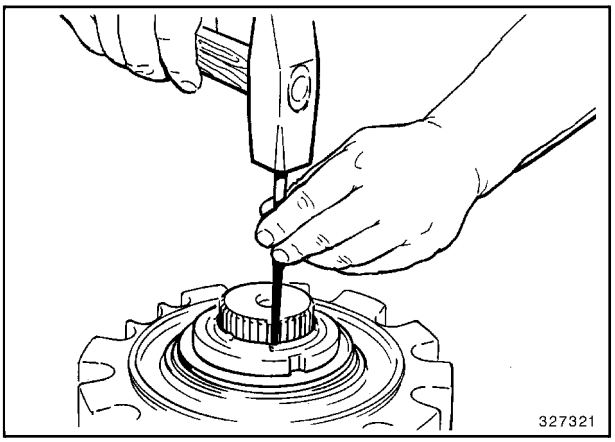


**Fig. 13**
Drive the flange mortised at five places around the circumference to secure the grooved ring nut out of the toothing by means of a pointed punch (scribing iron).

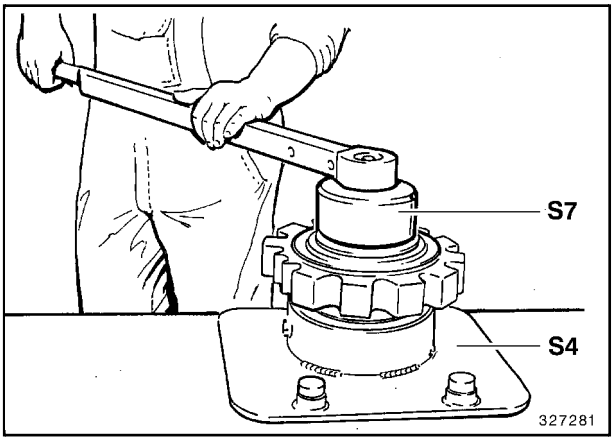


**Fig. 14**
Place the swing pinion with its housing into fitting aid (S4) or clamp it in a vise with protective plates between the jaws and the pinion.
Slacken the grooved ring nut with fitting wrench (S7).

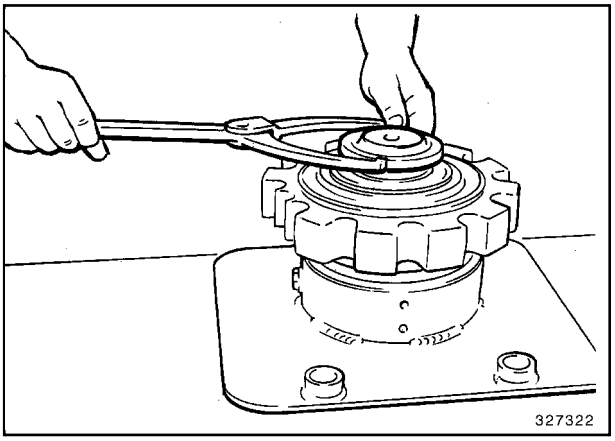


**Fig. 15**
Screw off the grooved nut with a caliper wrench.
Remove the adjusting shims and the Nilos ring.
Withdraw the O-ring from the housing.

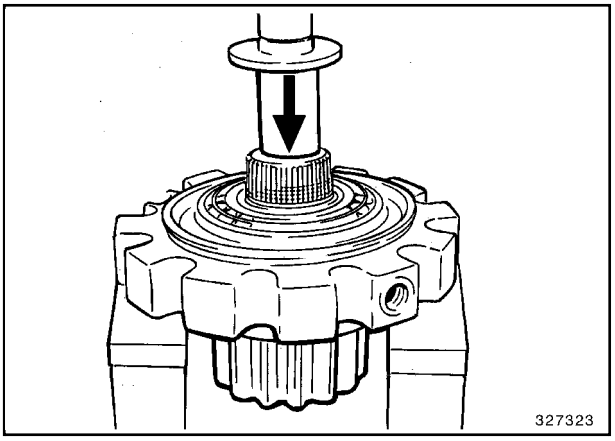


**Fig. 16**
Place the housing on the support and press the pinion shaft out of its bearings.

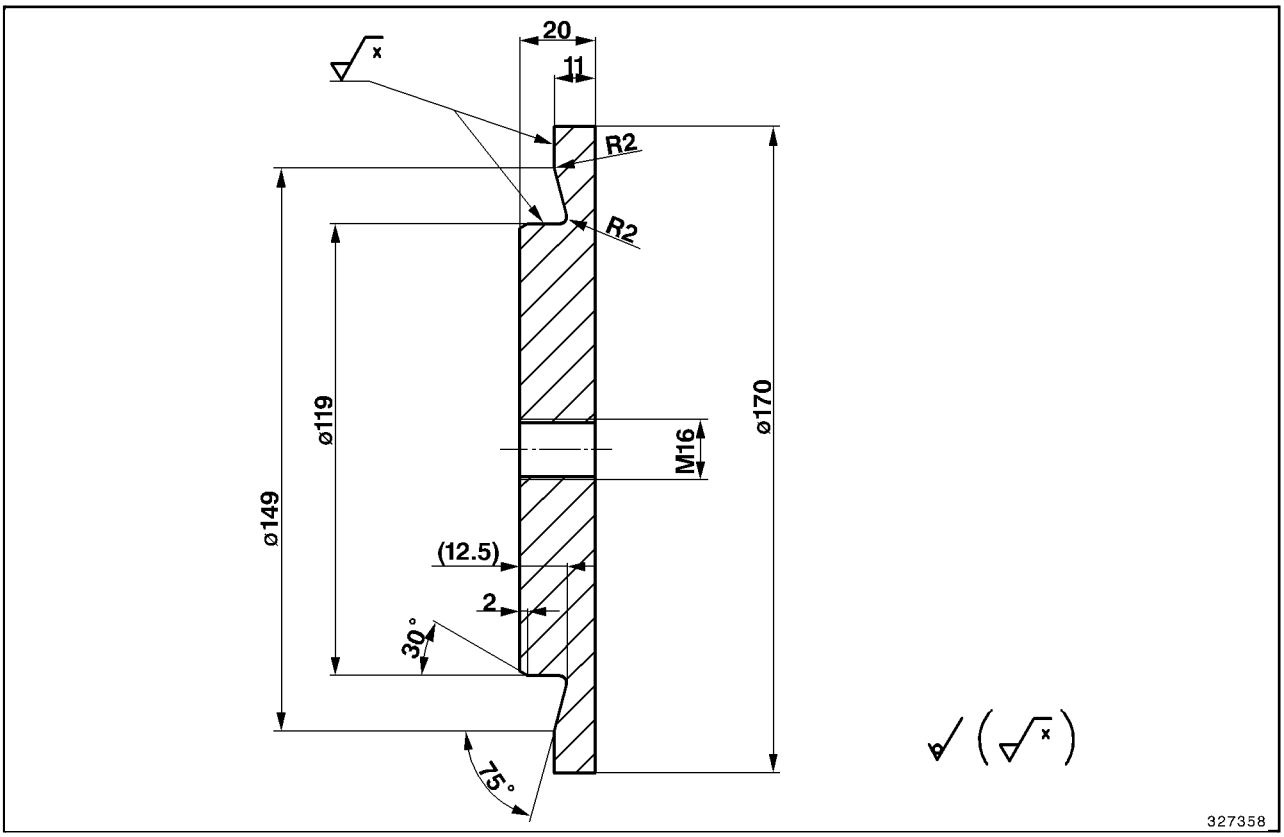


**Fig. 3**

## Cover (S2)

P/N: 73176728

Material: S355J2G3 (St52-3)

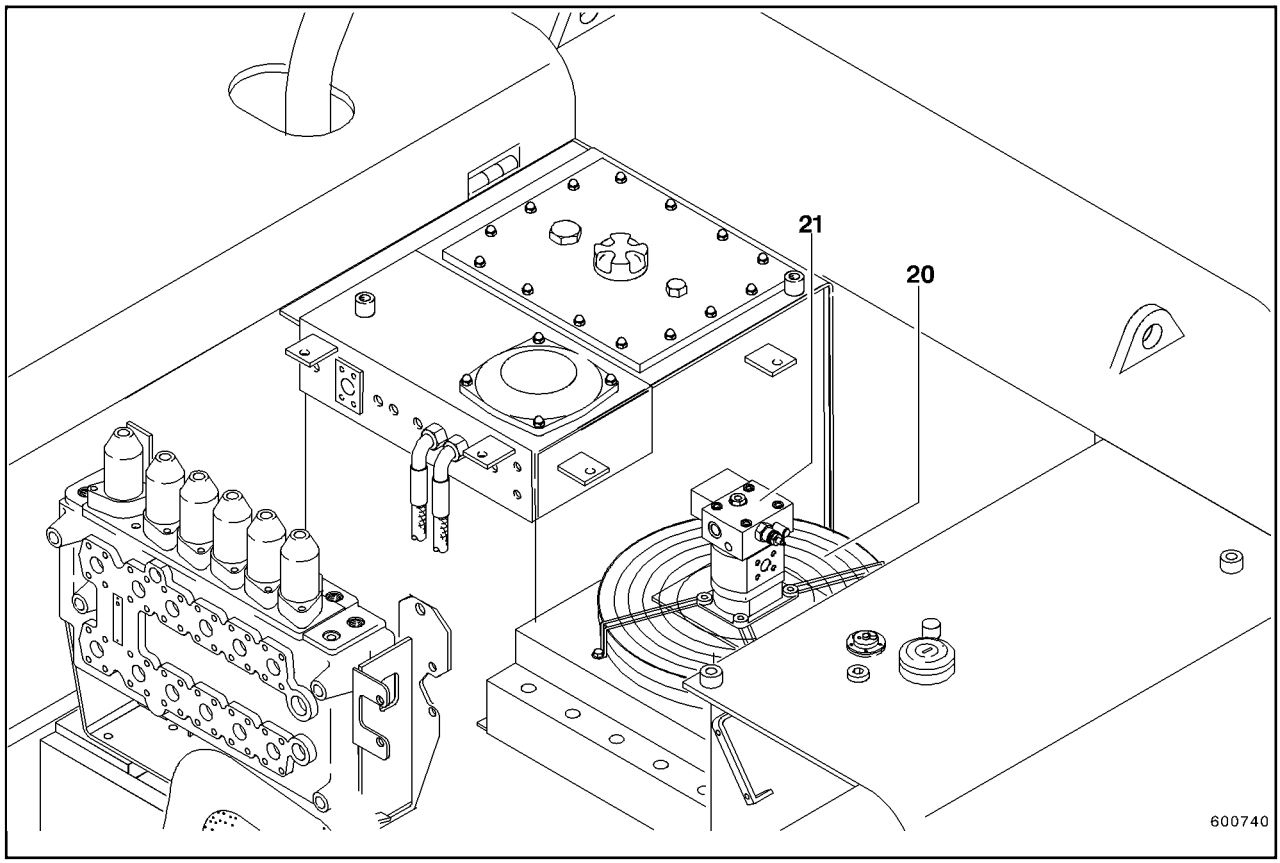


*Fig. 7*

## Oil coolers with fan drive (20, 21, Fig. 7)

The return-flow oil from the working- and travel hydraulics flows through the hydraulic oil cooler (20). Additionally , the return oil from the fan drive unit flows through the oil cooler to the filter chamber in the hydraulic reservoir.

The fan is driven by a gear motor with control valve (21). The fan drive is equipped with a pressure relief and a replenising valve.

□

**Piston rod and piston**

Dismantling and checking:

- Drain hydraulic oil from the cylinder. Collect escaping oil in a suitable recipient.
- Remove bearing eye (1, Fig. 14) and guide (7).

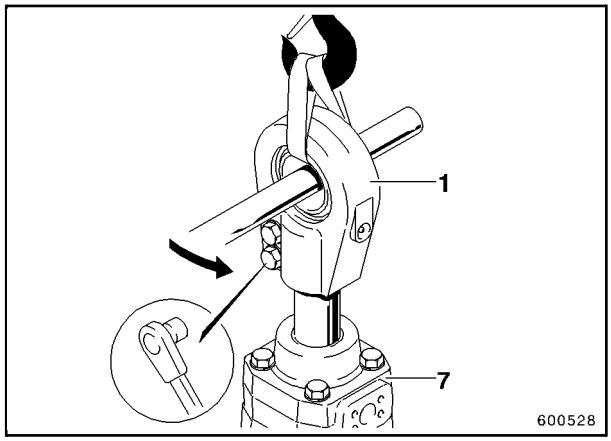


*Fig. 14*

- Attach piston rod (8, Fig. 15) with fitting ring (D) to lifting tackle, withdraw carefully from cylinder barrel and place on a suitable working surface.

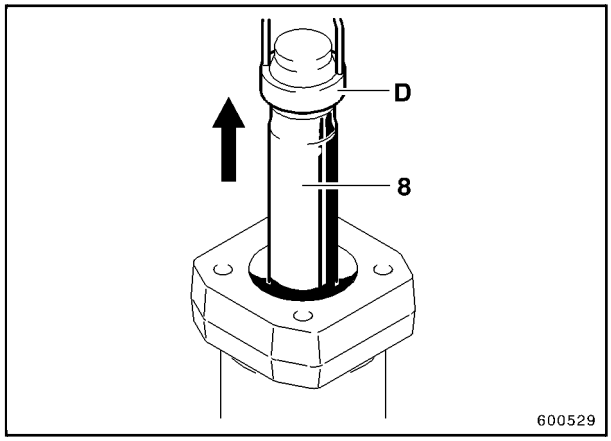


*Fig. 15*

- Remove the plastic guide rings (20, Fig. 16) and the OK piston seal (21).

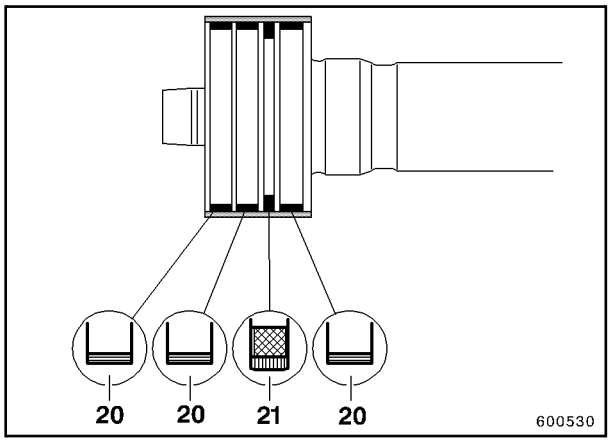


*Fig. 16*

- Check the piston with piston rod and dampeners and the the cylinder barrel carefully for damage and wear. Check the cylinder barrel also for signs of widening. Replace all defective parts. The plastic guide rings, the protective elements and the OK piston seal must always be replaced.

## POWER GENERATION

If the fact is exploited that a magnetic field is formed round a conductor when a current flows through it, it is relatively easy to build an electric generator. The principle is shown in the diagram below. Windings (2) supplied with direct current (3) are mounted on a rotor (1), resulting in a magnetic field (4). The windings (6) mounted on the stator (5) of our theoretical generator are cut by the magnetic field (4) of the rotor as the rotor is turned. This generates electric voltage in the stator winding.

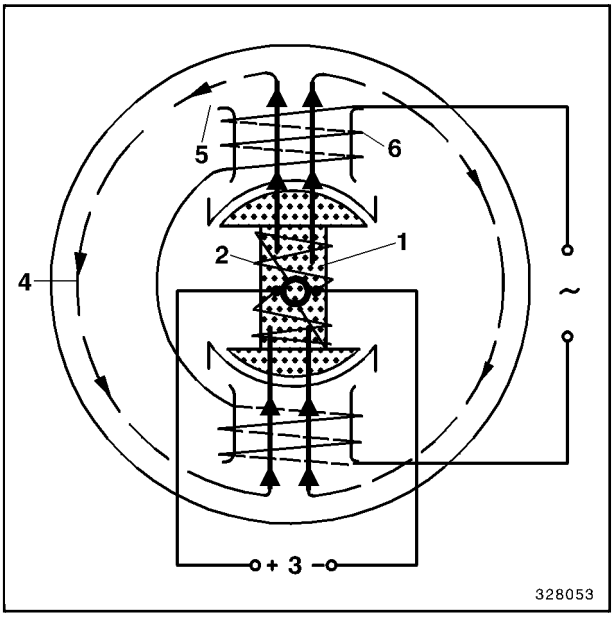


*Fig. 1*

## Power generation in motor vehicles

Some years ago, so-called d.c. generators were installed in motor vehicles. Because of their size and output, they were replaced by a.c. generators.

In an a.c. generator, three alternating currents, each phase-shifted by 120˚, are generated. This alternating current is rectified in the vehicle by means of diodes, and we have direct current. The direct current is regulated to the required charging current with a regulator. The resulting direct current is needed to recharge the battery, i.e. the battery is recharged while the engine is running.

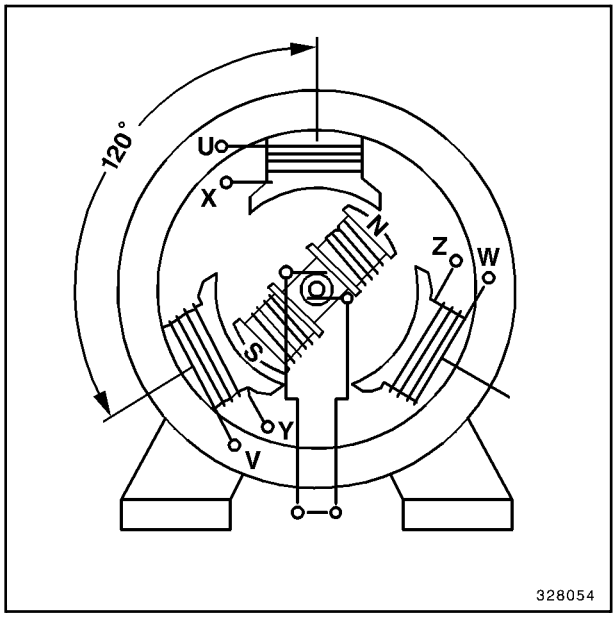


*Fig. 2*

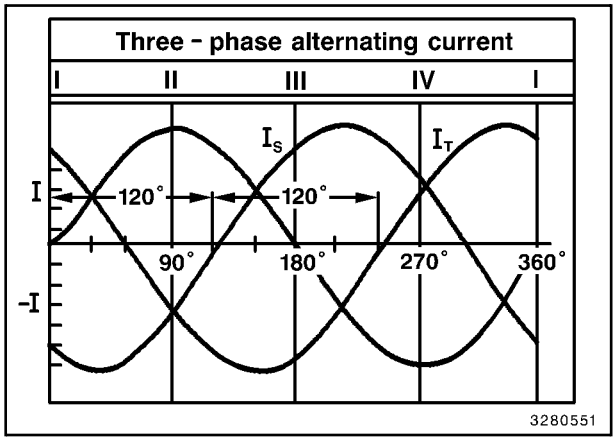


*Fig. 3*

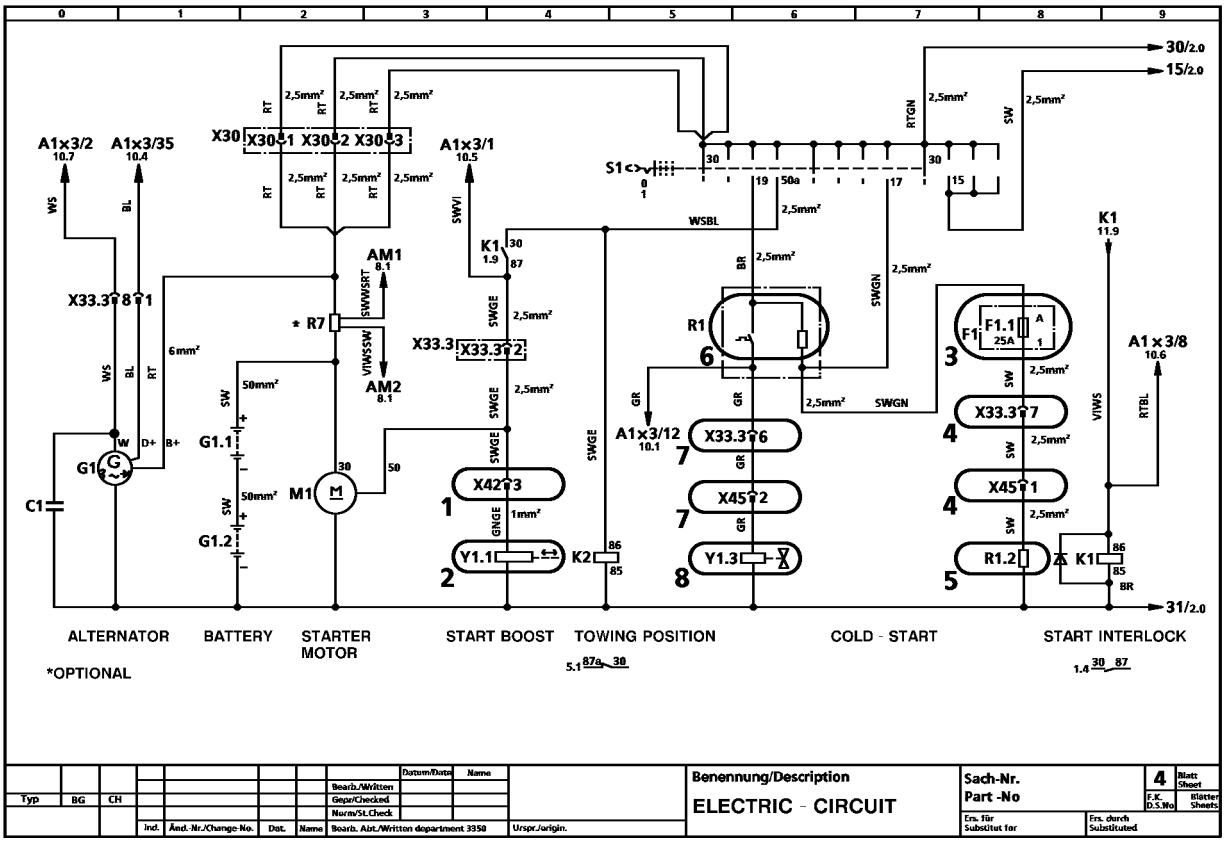


*Fig. 3*

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# FLANGE COUPLINGS WITH SAE BOLT PATTERN

## Flanged pipe couplings - Flanit system (F-system)

These couplings are for pipes between Ø 25 x 3 and Ø 50 x 2.

Fig. 1 shows the components of the F-system; Fig. 2 a finished coupling. The components are:

1 - Connection surface
2 - Seal ring
3 - F-ring (wedge ring)
4 - Flange
5 - Double-hex bolt
6 - Pipe

In the F-system, the wedge ring (F-ring) is pushed onto the pipe.

The secure connection of wedge ring and pipe is achieved by tightening the double-hex bolts. A pre-assembly device is not needed.

Gap dimension "L" is used to check whether the connection has been correctly established.

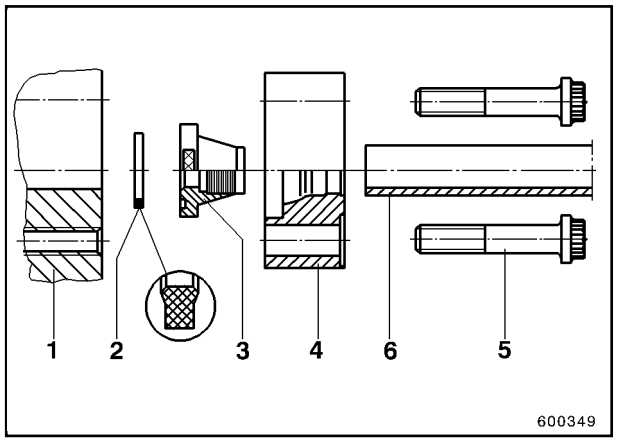


*Fig. 1*

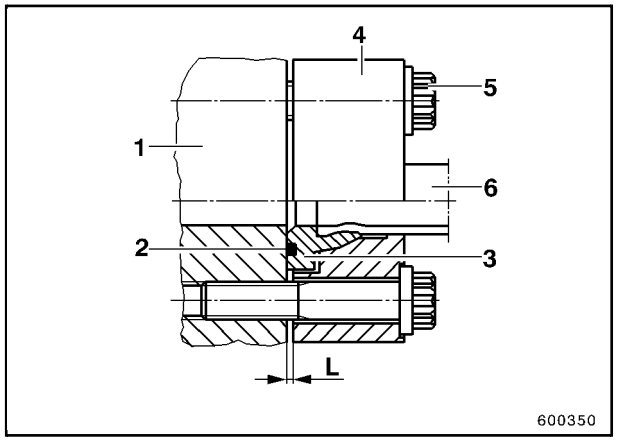


*Fig. 2*

## Flanged pipe couplings - Zako system (Z-system)

These couplings are used for pipes Ø 50 x 6 (1", 6000 psi).

Fig. 1 shows the components of the Z-system; Fig. 2 a finished coupling. The components are:

1 - Connection surface
2 - Seal ring
3 - Z-ring (wedge ring)
4 - Flange
5 - Double-hex bolt
6 - Pipe

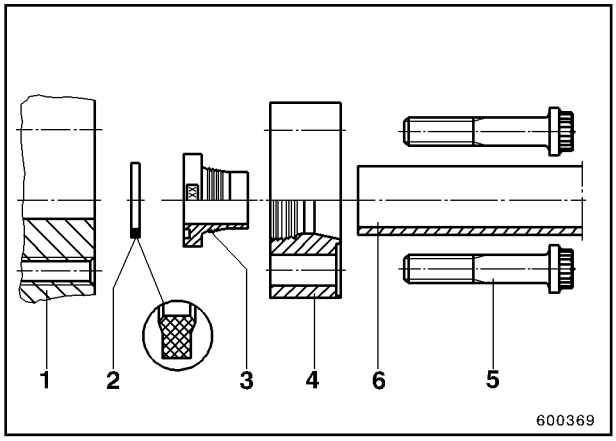


*Fig. 1*

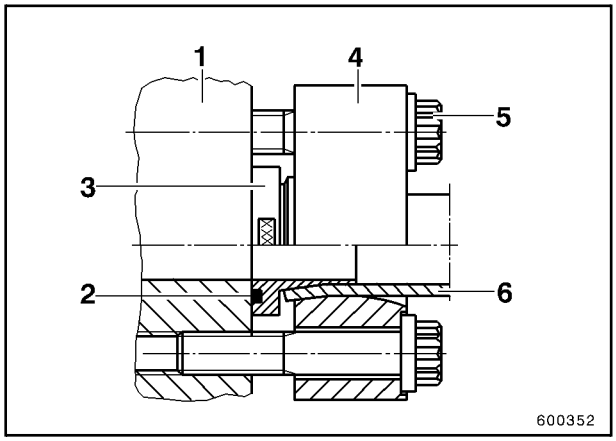


*Fig. 2*

### 1.4.4 Notch effects

Depending on their shape, notches have different notch or influencing factors.

The influence of notch factors on the fatigue strength of a component is shown in the graph (fig. 18).

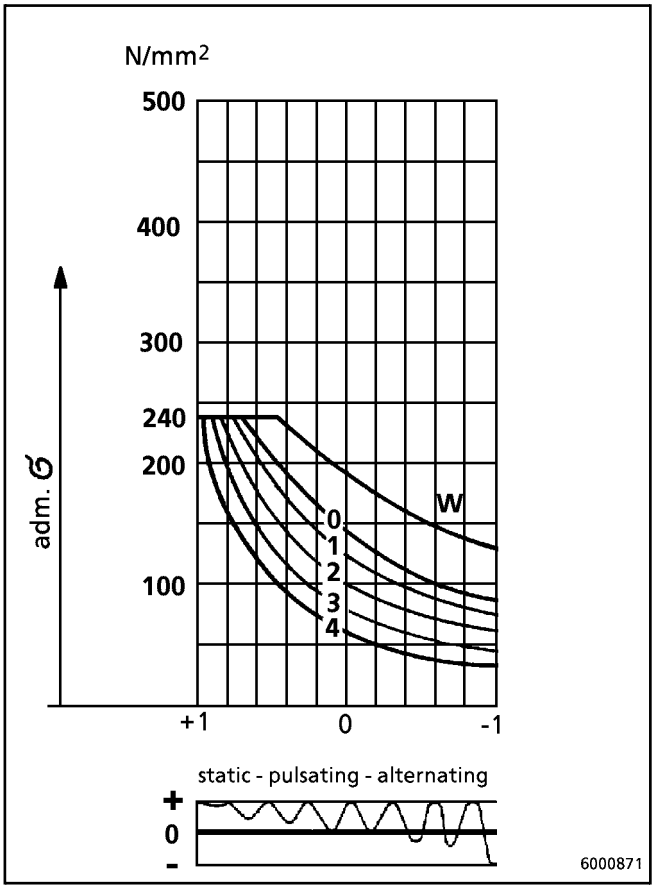


*Fig. 18*

Location and shape of curves W, O, 1, 2, 3 and 4 refer to:

material: EN 10025: S355J2G3

no. of load cycles: $2 \cdot 10^6$ (2 million) i.e. of high fatigue strength

group of stress intensities: small, medium and high stresses with approx. the same frequency

Possible notches (mechanical and metallurgical) in the seams of butt-weld joints:

| Weld seam | Notch factor | Description |
|---|---|---|
| | W | Unaffected material; no weld seam |
| | O | Ideal weld seam; root pass gouged surface levelled, destruction-free tested, stress-relief annealed, preheated for welding (if required) |
| | 1 | Practical weld seam; root pass gouged, surface levelled, preheated for welding (if required) |
| | 2 | Root pass cleaned and capped, otherwise untreated |
| | 2 | Welded on backing strip (cf. para. 3.6.1.3) |
| | 3 | Not capped; root failure probable |
| | 3 | Welded on backing strip (cf. para. 3.4.3) |
| | 4 | Seamwelded from one side; root pass defective |

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For a notch factor of "O", practically the only effects to be expected are from metallurgical notches.

### 6.6 Treatment of filler metals

Filler metals, such as rod electrodes, welding wire coils, welding powder and welding rods, must be stored so as to prevent them from deteriorating.
This is only possible in heated rooms at abt. 30˚C (90˚F) and a relative humidity of below 50 %.

The packages must remain closed until the material is used. Unused filler metals must be repacked and brought back into the storage room.

Why is this necessary?

- Coatings of rod electrodes or welding powders used for submerged-arc welding are hygroscopic, i.e. they absorb ambient humidity. Without protection, these materials get moist or even wet. During welding, the hydrogen and oxygen contained in the water penetrate into the weld metal and make it brittle.

Rod electrodes from new or already opened packages must be redried and stored in a heated box until they are used.

Manufacturers of rod electrodes issue instructions for redrying.

Reference values for electrodes with coating type B:

2h at 350˚C (660˚F)
3h at 250˚C (480˚F)
4h at 200˚C (390˚F)

There is often a failure to take this tiresome but necessary action.

Assistance is now offered by the manufacturers of rod electrodes.

The rod electrodes are supplied in site-resistant, moisture-impermeable special packs.

Redrying and keeping warm are no longer necessary if the rod electrodes are used within 8 hours (1 working shift) of the pack being opened. Hydrogen content < 5 ml/100 g weld metal.

One box (package) therefore contains a number of individual packs suitable for use by one welder. The rod electrodes are vacuum-packed firmly together in shrink film.

Single rods must not be movable if the packaging is intact. Prior to opening the pack, it must have been brought to the ambient temperature at the application site.

Wet rod electrodes must be destroyed. In spite of redrying they can never again be used for welding.

- Wet welding wires or welding rods are subject to corrosion. The copper coating offers only a temporary protection against corrosion.

Rust, a chemical compound of iron and oxygen, introduces unwanted amounts of oxygen into the weld metal, with the result that the material gets brittle.

Corroded welding wire contaminates the wire guide tubes. This leads to an earlier wear of these elements.

Corroded welding wires and welding rods therefore have to be discarded.

### 6.7 Temperature monitoring

For temperature monitoring during heat treatment processes, the following equipment is recommended:

- Electrical temperature probes:

  These are easy to handle and provide an exact temperature reading on an analog or a digital display.

Manufacturers of rod electrodes issue instructions for redrying.

- Adherent thermometers:

  Thermometers with an analog display, which are attached with magnets to the component.

- Temperature-indicating crayons:

  These crayons are used to make a mark on the component to be heated. When the desired temperature range is reached, the colour of the mark changes.

  In principle, this procedure is very simple.
  It requires, however, some experience with the crayons to perceive the changing of the colour.