

MASTER

Flexibele automatisering van de productie van striponderdelen

Hoens, H.P.J.

Award date:
1985

[Link to publication](#)

Disclaimer

This document contains a student thesis (bachelor's or master's), as authored by a student at Eindhoven University of Technology. Student theses are made available in the TU/e repository upon obtaining the required degree. The grade received is not published on the document as presented in the repository. The required complexity or quality of research of student theses may vary by program, and the required minimum study period may vary in duration.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain

Bijlagen

bij rapportnr. WPB 0134

INHOUD.

- Bijlage 1. Machinepark onderdelenmakerij
- Bijlage 2. Ponseenheid
- Bijlage 3. Stripverbruik 1983
- Bijlage 4. Tekeningenstudie
- Bijlage 5. DIN 1017
- Bijlage 6. Uitgangsmaterialen
- Bijlage 7. Bewerkingstechnieken
- Bijlage 8. Sabelkromheidsmetingen
- Bijlage 9. Offertes
- Bijlage 10. Bepaling projectkosten
- Bijlage 11. Capaciteitsberekeningen
- Bijlage 12. Rendementsberekeningen
- Bijlage 13. Nauwkeurigheidbepaling
- Bijlage 14. Meetliniaal
- Bijlage 15. Hydraulische ponseenheid
- Bijlage 16. Berekeningen en gegevens ponsunit
- Bijlage 17. Bepaling knipkracht
- Bijlage 18. Hydraulische schaar
- Bijlage 19. Bepaling positioneersnelheid schaar

| | | | |
|--------|----|---|------------|
| (0100) | 2 | 01 ONDERDELENMAKERIJ ALGEMEEN | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 3 | 01100 CIRKELZAGEN | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 4 | | ?????????? |
| (0100) | 5 | 01102 CIRKELZAAG KALTENSACH KKS350 | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 6 | 01103 CIRKELZAAG KALTENSACH KKS400H | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 7 | 01200 LINTZAAG | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 8 | 01201 LINTZAAG AUTOMAAT PEHAKA | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 9 | 01300 HYDR. EN MECH. SCHAREN OND. MAK. | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 10 | 01301 HOEKIJZERSCHAAR MUHR U BENDER | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 11 | 01302 HYDR. AFKORTPERS MOOI 30 TON | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 12 | 01303 HYDR. AFKORTPERS AUTOMAAT | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 13 | 01400 UITKAPMACHINES | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 14 | 01401 UITKAPMACHINE MUHR U BENDER '68 | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 15 | 01402 UITKAPMACHINE MUHR U BENDER '72 | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 16 | 01403 UITKAPMACHINE MUHR U BENDER '78 | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 17 | 01404 UITKAPMACHINE EDEL '76 | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 18 | 01500 BUISMACHINES ONDERDELENMAKERIJ | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 19 | 01501 ELEKTR. HYDR. BUISBANK MOOI 12 TN | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 20 | 01502 ELEKTR. HYDR. BUISBANK MOOI 12 TN | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 21 | 01503 ELEKTR. HYDR. BUISBANK MOOI 16 TN | ?????????? |
| (0100) | | ???????????????? | |
| (0100) | 22 | 01504 HYDR. ZETBANKEN LAN 60-600 TON | ?????????? |
| (0100) | | ???????????????? | |

23 (0100) 01601ELEKTR. HYDR. ZETBANK MOOI 60TON????????
????????????????

24 (0100) 01602ELEKTR. HYDR. ZETBANK MOOI 80TON????????
????????????????

25 (0100) 01603ELEK. HYDR. ZETBANK MOOI 120TON????????
????????????????

26 (0100) 01604ELEK. HYDR. ZETBANK MOOI 120TON????????
????????????????

27 (0100) 01605ELEKTR. HYDR. PERS. MOOI 600TON?? ????-?
???????????????? *Hoozeveld*

28 (0100) 01700EXCENTERPERS EN VAN 40-100 TON ??-??????
????????????????

29 (0100) 01701EXCENTERPERS SCHULER 40 TON ??????????
????????????????

30 (0100) 01702EXCENTERPERS SO ENEN 60 TON ??????????
????????????????

31 (0100) 01703EXCENTERPERS MUREA 60 TON ??????????
????????????????

32 (0100) 01704EXCENTERPERS MULLER 60 TON ??????????
????????????????

33 (0100) ~~01705EXCENTERPERS GOSMETA 80 TON ??????????~~
~~????????????????~~

34 (0100) 01706EXCENTERPERS GOSMETA 80 TON ??????????
???????????????? *Hoozeveld*

35 (0100) 01707EXCENTERPERS GOSMETA 100TON ??????????
????????????????

36 (0100) 01800EORMACHINES ??????????
????????????????

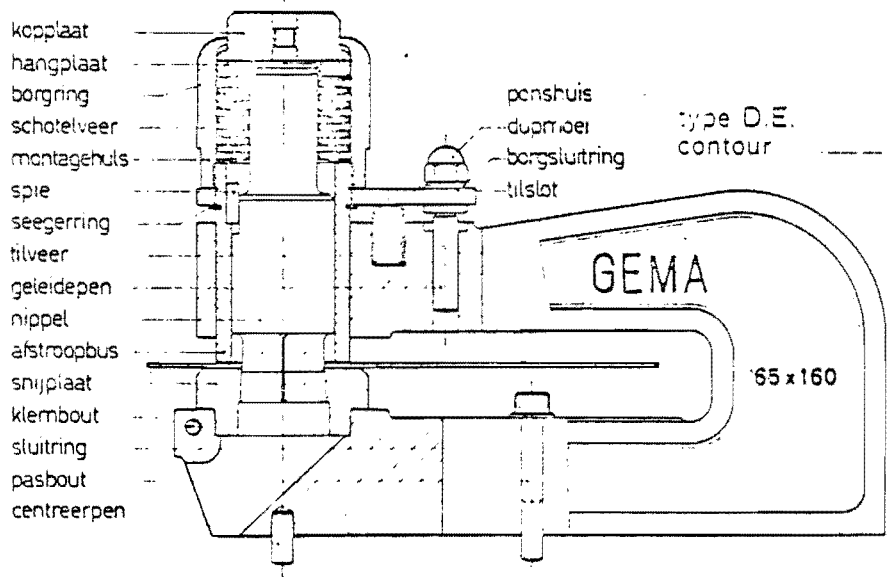
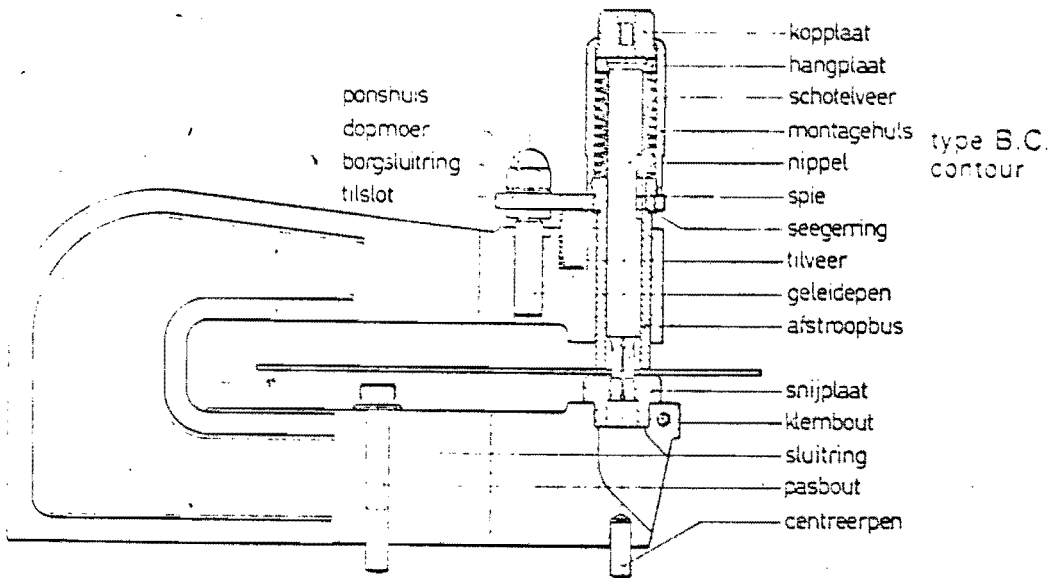
37 (0100) 01801EORMACHINE FAKUP 35 1-2 SPIL ??????????
????????????????

38 (0100) 01802EORMACHINE BIJAK 4 SPILLIG ??????????
???????????????? *Hoozeveld*

39 (0100) 01900AFBRAAMTRONNEN ??????????
????????????????

Speciala profielen volgens tekening op aanvraag
 Spezialprofile nach Zeichnung auf Anfrage
 Sur demande, profilés spéciaux sur devis
 Special sections as per drawing available on request

Benaming onderdelen universele ponsseenheden
 Dénomination des pièces de poinçonnage universelles
 Bezeichnung von Einzelteilen für Universal-Stanzseinheiten
 Part names of universal hole punching units



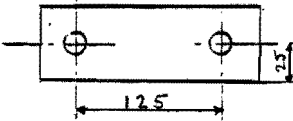
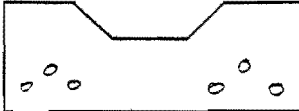
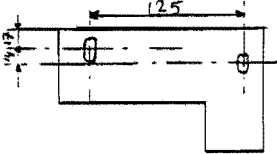

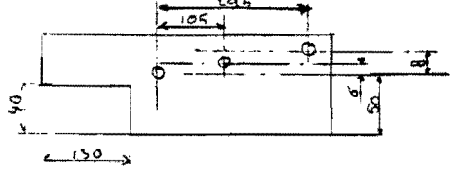


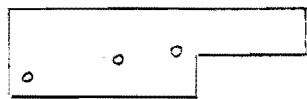
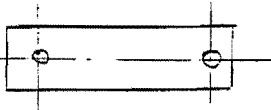
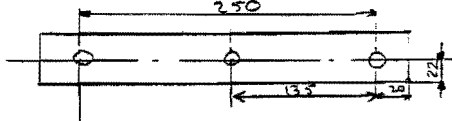
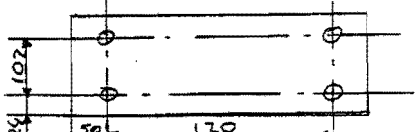
DATUM 23 DEC 83 (83357) ONDERDELENLIJST VOOR DE PERIODE VAN 01.01.83 TOT 31

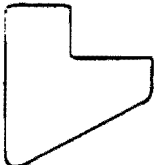
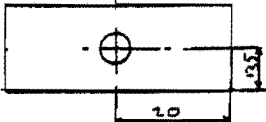
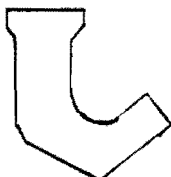

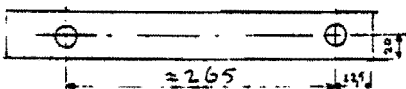


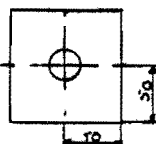
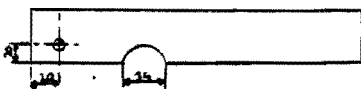

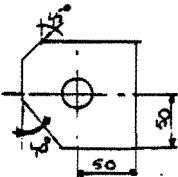
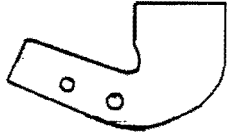
| ART.NR | OMSCHRIJVING | 12 X 5 | AANTAL | EENH. |
|--------|--------------------|----------|--------|-------|
| 102008 | WARMGEW. PLATSTAAL | 20 X 8 | 125 | MT |
| 102010 | WARMGEW. PLATSTAAL | 20 X 10 | 220 | MT |
| 102505 | WARMGEW. PLATSTAAL | 25 X 5 | 3400 | MT |
| 102506 | WARMGEW. PLATSTAAL | 25 X 6 | 1211 | MT |
| 102508 | WARMGEW. PLATSTAAL | 25 X 8 | 2811 | MT |
| 102510 | WARMGEW. PLATSTAAL | 25 X 10 | 82 | MT |
| 102515 | WARMGEW. PLATSTAAL | 25 X 15 | 303 | MT |
| 103205 | WARMGEW. PLATSTAAL | 30 X 5 | 20122 | MT |
| 103206 | WARMGEW. PLATSTAAL | 30 X 6 | 5389 | MT |
| 103208 | WARMGEW. PLATSTAAL | 30 X 8 | 15072 | MT |
| 103210 | WARMGEW. PLATSTAAL | 30 X 10 | 366 | MT |
| 103805 | WARMGEW. PLATSTAAL | 40 X 5 | 8449 | MT |
| 103806 | WARMGEW. PLATSTAAL | 40 X 6 | 8086 | MT |
| 103808 | WARMGEW. PLATSTAAL | 40 X 8 | 23409 | MT |
| 103810 | WARMGEW. PLATSTAAL | 40 X 10 | 2709 | MT |
| 104505 | WARMGEW. PLATSTAAL | 45 X 5 | 105 | MT |
| 105005 | WARMGEW. PLATSTAAL | 50 X 5 | 20964 | MT |
| 105006 | WARMGEW. PLATSTAAL | 50 X 6 | 18522 | MT |
| 105008 | WARMGEW. PLATSTAAL | 50 X 8 | 13968 | MT |
| 105010 | WARMGEW. PLATSTAAL | 50 X 10 | 715 | MT |
| 105012 | WARMGEW. PLATSTAAL | 50 X 12 | 121 | MT |
| 105015 | WARMGEW. PLATSTAAL | 50 X 15 | 41 | MT |
| 106005 | WARMGEW. PLATSTAAL | 60 X 5 | 589 | MT |
| 106008 | WARMGEW. PLATSTAAL | 60 X 8 | 3891 | MT |
| 107008 | WARMGEW. PLATSTAAL | 70 X 8 | 747 | MT |
| 107505 | WARMGEW. PLATSTAAL | 75 X 5 | 12211 | MT |
| 107506 | WARMGEW. PLATSTAAL | 75 X 6 | 7886 | MT |
| 107508 | WARMGEW. PLATSTAAL | 75 X 8 | 12214 | MT |
| 107510 | WARMGEW. PLATSTAAL | 75 X 10 | 77 | MT |
| 108008 | WARMGEW. PLATSTAAL | 80 X 8 | 68 | MT |
| 110005 | WARMGEW. PLATSTAAL | 100 X 5 | 11273 | MT |
| 110006 | WARMGEW. PLATSTAAL | 100 X 6 | 14060 | MT |
| 110008 | WARMGEW. PLATSTAAL | 100 X 8 | 5712 | MT |
| 110010 | WARMGEW. PLATSTAAL | 100 X 10 | 87 | MT |
| 110012 | WARMGEW. PLATSTAAL | 100 X 12 | 0 | MT |
| 111012 | WARMGEW. PLATSTAAL | 110 X 12 | 6 | MT |
| 112005 | WARMGEW. PLATSTAAL | 120 X 5 | 2110 | MT |
| 112006 | WARMGEW. PLATSTAAL | 120 X 6 | 4468 | MT |
| 112008 | WARMGEW. PLATSTAAL | 120 X 8 | 4471 | MT |
| 113005 | WARMGEW. PLATSTAAL | 130 X 5 | 3748 | MT |
| 113006 | WARMGEW. PLATSTAAL | 130 X 6 | 2855 | MT |
| 113008 | WARMGEW. PLATSTAAL | 130 X 8 | 487 | MT |
| 115005 | WARMGEW. PLATSTAAL | 150 X 5 | 9374 | MT |
| 115006 | WARMGEW. PLATSTAAL | 150 X 6 | 4628 | MT |
| 115008 | WARMGEW. PLATSTAAL | 150 X 8 | 3419 | MT |
| 115010 | WARMGEW. PLATSTAAL | 150 X 10 | 6 | MT |
| 118006 | WARMGEW. PLATSTAAL | 180 X 6 | 511 | MT |

ONDERZOCHE HAKEN

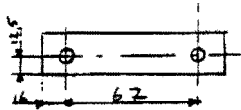
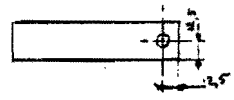
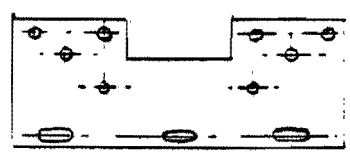
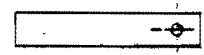
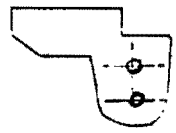
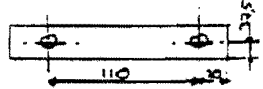
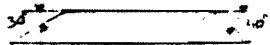
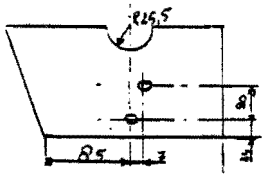
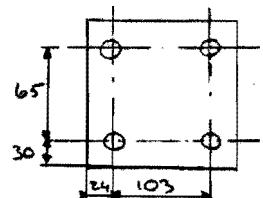
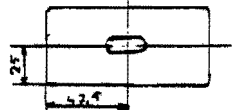
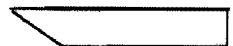
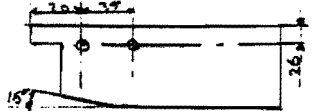


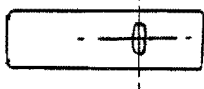
| typenr. | aantal | omzet |
|---------|--------|--------|
| 1009 | 9714 | 771833 |
| 1169 | 6759 | 657240 |
| 1259 | 5224 | 423304 |
| 720 | 4424 | 334883 |
| 1281 | 4243 | 423254 |
| 1226 | 4080 | 517167 |
| 1203 | 3853 | 401518 |
| 951 | 3351 | 271238 |
| 1153 | 3156 | 389019 |
| 1015 | 3052 | 207672 |
| 1090 | 2978 | 263340 |
| 1011 | 2911 | 283703 |
| 1213 | 2876 | 230106 |
| 1038 | 2475 | 208890 |
| 1224 | 2447 | 213423 |
| 600 | 2390 | 195244 |
| 1170 | 2231 | 181283 |
| 1230 | 2192 | 202256 |
| 1088 | 2077 | 266305 |
| 728 | 1989 | 189428 |
| 1221 | 1972 | 189573 |
| 1276 | 1901 | 196115 |
| 1105 | 1879 | 167505 |
| 754 | 1872 | 172933 |
| 1156 | 1806 | 169583 |
| 1278 | 1631 | 119227 |
| 907 | 1624 | 173682 |
| 1273 | 1612 | 175198 |
| 1197 | 1571 | 113066 |
| 1253 | 1464 | 153304 |
| 918 | 1464 | 130469 |
| 1147 | 1456 | 132440 |
| 855 | 1428 | 137234 |
| 1251 | 1421 | 136313 |
| 1116 | 1389 | 157564 |
| 1279 | 1367 | 125836 |
| 1070 | 1293 | 103943 |
| 1269 | 1274 | 122743 |
| 780 | 1268 | 119190 |
| 886 | 1134 | 97429 |
| 1179 | 1114 | 84743 |
| 982 | 1095 | 96273 |
| 1181 | 1079 | 117191 |
| 1178 | 1078 | 104082 |
| 1239 | 1039 | 129156 |
| 1261 | 949 | 97325 |
| 1266 | 939 | 89585 |
| 1262 | 929 | 90728 |
| 595 | 926 | 98587 |
| 1167 | 918 | 98489 |

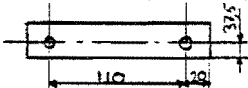
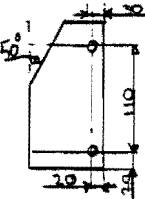
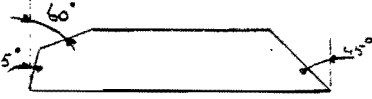
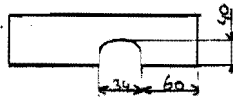
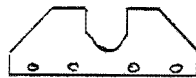
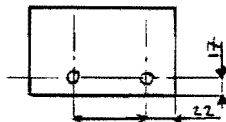
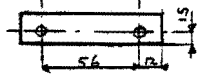
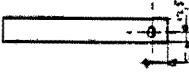
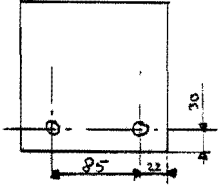
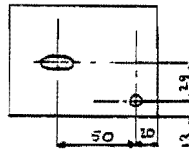
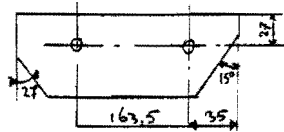
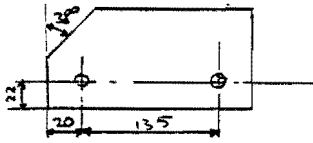
| typenr. | aantal | omzet |
|--------------|--------|----------|
| 608 | 911 | 76820 |
| 1302 | 876 | 80682 |
| 1227 | 849 | 80413 |
| 1155 | 845 | 97773 |
| 1210 | 822 | 82744 |
| 1165 | 745 | 96552 |
| 1286 | 688 | 59631 |
| 890 | 685 | 64067 |
| 1121 | 675 | 76291 |
| 1255 | 673 | 66089 |
| 360 | 658 | 55602 |
| 599 | 656 | 63915 |
| 977 | 647 | 62692 |
| 1251 | 633 | 72441 |
| 1072 | 624 | 55524 |
| 241 | 615 | 53529 |
| 1243 | 608 | 71336 |
| 1040 | 591 | 67942 |
| 1159 | 587 | 49462 |
| 1075 | 586 | 55254 |
| 1168 | 584 | 65564 |
| 1098 | 582 | 61668 |
| 1280 | 579 | 62886 |
| 1207 | 572 | 54348 |
| 1046 | 552 | 46702 |
| 1026 | 543 | 51347 |
| 513 | 506 | 43967 |
| 1188 | 487 | 43103 |
| 944 | 481 | 47246 |
| 1010 | 479 | 44190 |
| 389 | 478 | 41622 |
| 932 | 474 | 44360 |
| 1171 | 473 | 51471 |
| 860 | 472 | 50878 |
| 476 | 468 | 40804 |
| 646 | 465 | 42801 |
| 1231 | 460 | 31708 |
| 1332 | 455 | 42927 |
| 1326 | 454 | 43148 |
| 1180 | 454 | 48157 |
| 1125 | 453 | 47528 |
| 776 | 431 | 40755 |
| 203 | 427 | 31917 |
| 966 | 425 | 39929 |
| 1091 | 422 | 35699 |
| 1089 | 420 | 56079 |
| 862 | 417 | 42498 |
| 638 | 405 | 28893 |
| 1030 | 401 | 44166 |
| SUB TOTAAL | 141580 | 13293494 |
| % v/h Totaal | 73% | 69% |

| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|-----------------|-------|---------|--------|---|--------|--|
| 1009 | 5 | 50 | 155 |  | 2 | 2x \emptyset 10,5 volgsnijstempel |
| | 5 | 127 | 310 |  | 1 | 2x \emptyset 10,5 4x \emptyset 9 inkoop LV |
| | 5 | 150 | 190 |  | 2 | 1x \emptyset 10,5x15 1x \emptyset 10,5x25 |
| | 8 | 130 | 235 |  | 2 | 4x \emptyset 10,5 gesneden |
| 1169 | 6 | 100 | 480 |  | 1 | 3x \emptyset 10,5 knippen, daarna uit- besteed |
| | 8 | 120 | 405 |  | 1 | 5x \emptyset 10,5 gesneden |
| | 8 | 120 | 365 |  | 1 | 5x \emptyset 10,5 gesneden |
| | 6 | 100 | 475 |  | 1 | 3x \emptyset 10,5 knippen, daarna uit- besteed |
| | 8 | 60 | 120 |  | 2 | 2x \emptyset 10,5 |
| | 8 | 40 | 300 |  | 1 | 3x \emptyset 10,5 |
| | 5 | 150 | 220 |  | 1 | 4x \emptyset 12,5 |

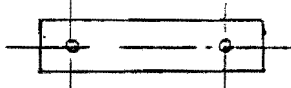
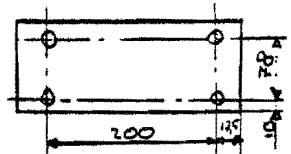
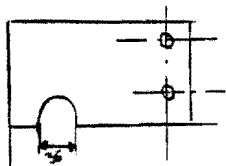
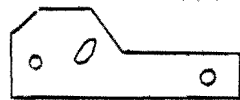
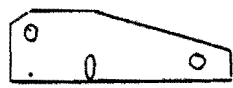
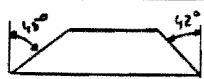
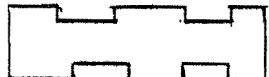

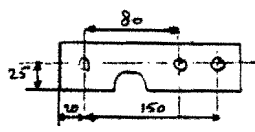
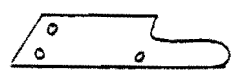

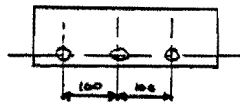
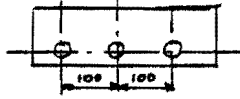
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|-----------------|-------|---------|--------|---|--------|-----------------------------------|
| 1169 | 6 | 75 | 100 |  | 2 | stempel |
| 1259 | 5 | 25 | 40 |  | 2 | 1x \varnothing 9 |
| | 8 | 252 | 273 |  | 2 | gesneden |
| | 3 | 55 | 650 |  | 2 | 3x \varnothing 10,5 |
| 720 | 6 | 40 | 310 |  | 1 | 2x \varnothing ? |
| | 8 | 30 | 203 |  | 1 | |
| | 4 | | |  | 1 | inkoop LV |
| 1281 | 5 | 100 | 100 |  | 1 | 1x \varnothing 10,5 |
| | 6 | 50 | 305 |  | 2 | 1x \varnothing 13 |
| | 8 | 50 | 250 |  | 1 | stempel |
| | 5 | 100 | 100 |  | 1 | 1x \varnothing 10,5 |
| | 8 | 103 | 136 |  | 2 | 2x \varnothing 10,5 gesneden |

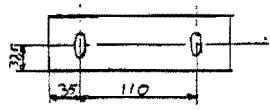
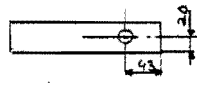
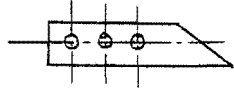
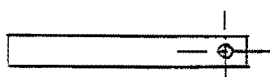
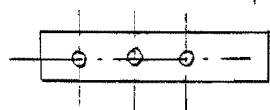
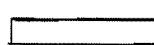
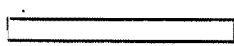
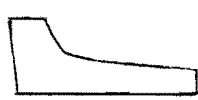
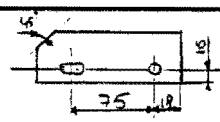
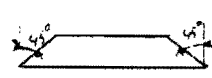
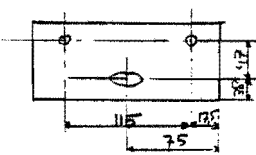
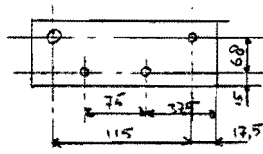
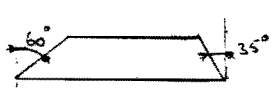
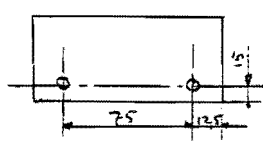
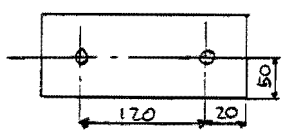
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|-----------------|-------|---------|--------|---------|--------|---|
| 1203 | 6 | 40 | 100 | | 2 | 2x \emptyset 10,5 |
| | 5 | 50 | 70 | | 2 | 1x \emptyset 10,5 |
| | 8 | 60 | 120 | | 4 | 2x \emptyset 10,5 |
| | 5 | 40 | 40 | | 2 | 1x \emptyset 10,5 |
| | 2 | 25 | 235 | | 2 | 1x \emptyset 10,5 |
| 95† | 6 | 30 | 105 | | 2 | 1x \emptyset 8 2x \emptyset 10,5x15 inkoop LV |
| | 8 | 30 | 90 | | 2 | |
| | 6 | 30 | 50 | | 1 | |
| | 3 | 65 | 120 | | 2 | |
| 1153 | 5 | 100 | 300 | | 2 | stempel |
| | 8 | 75 | 140 | | 1 | |
| | 6 | 50 | 650 | | 2 | 3x \emptyset 10,5x15 |
| | 5 | 100 | 330 | | 2 | 3x \emptyset 10,5 |
| | 8 | 30 | 125 | | 2 | 2x \emptyset 10,5 |
| | 3 | 40 | 110 | | 2 | 2x \emptyset 10,5x15 inkoop LV |
| | 10 | 40 | 75 | | 2 | |

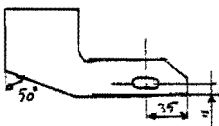
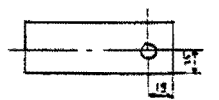

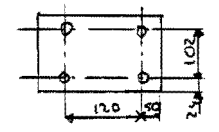
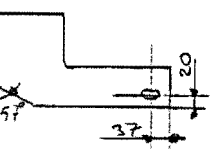
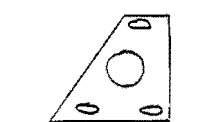
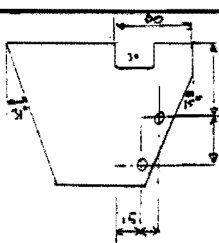



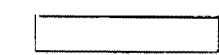
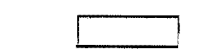
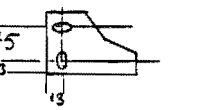
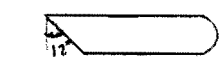
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|--------|---|--------|--|
| 1015 | 6 | 25 | 100 |  | 1 | 1x \emptyset 10,5 |
| | 5 | 25 | 65 |  | 2 | 2x \emptyset 10,5 |
| | 5 | 260 | 300 |  | 1 | 8x \emptyset 10,5 3x \emptyset 9x14 inkoop |
| | 14 | 50 | 200 |  | 2 | 1x \emptyset 10,5 |
| | 8 | 130 | 235 |  | 2 | gesneden |
| 1090 | 5 | 75 | 150 |  | 2 | 2x \emptyset 10,5 |
| | 5 | 30 | 210 |  | 1 | |
| | 6 | 150 | 215 |  | 1 | 2x \emptyset 13 |
| 1011 | 8 | 130 | 150 |  | 1 | 4x \emptyset 9 |
| | 5 | 50 | 95 |  | 1 | 1x \emptyset 13x17 |
| | 5 | 40 | 165 |  | 2 | |
| | 5 | 130 | 215 |  | 1 | 2x \emptyset 10,5 |
| | 5 | 50 | 180 |  | 2 | |
| | 3 | 110 | 1230 |  | 1 | inkoop LV |
| | 4 | 60 | 110 |  | | |


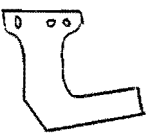
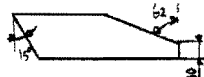
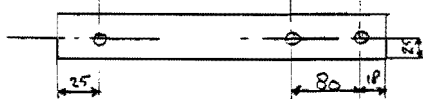
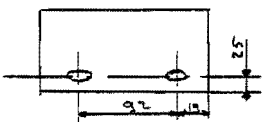

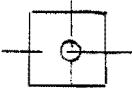
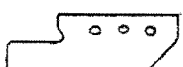
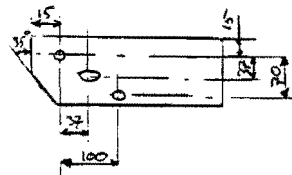
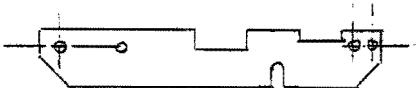
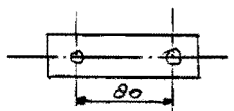
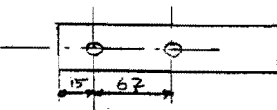
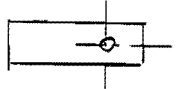
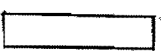

| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|-----------------|-------|---------|--------|---|--------|--------------------------------------|
| 1213 | 5 | 75 | 150 |  | 2 | 2x \emptyset 10,5 |
| | 8 | 150 | 135 |  | 2 | 2x \emptyset 10x15 |
| | 6 | 30 | 230 |  | 2 | |
| | 5 | 50 | 154 |  | | |
| | 5 | 200 | 220 |  | 2 | gesneden |
| 1038 | 5 | 100 | 115 |  | 1 | 2x \emptyset 9 |
| | 5 | 30 | 80 |  | 2 | 2x \emptyset 9 |
| | 5 | 25 | 100 |  | 1 | 1x \emptyset 13 |
| | 6 | 130 | 130 |  | 1 | 2x \emptyset 13 |
| | 5 | 100 | 135 |  | 1 | 1x \emptyset 9 1x \emptyset 9x14 |
| 1224 | 8 | 130 | 215 |  | 1 | gesneden |
| | 8 | 130 | 175 |  | 1 | gesneden |

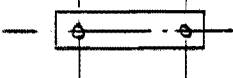
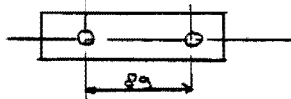
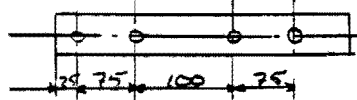
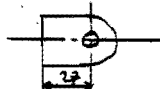
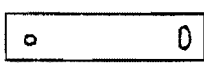
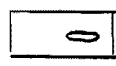

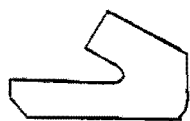
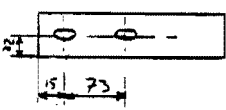
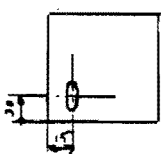
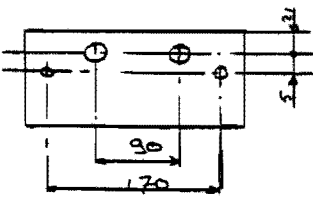
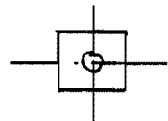
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|-----------------|-------|---------|--------|---------|--------|---------------------------------|
| 1224 | 5 | 100 | 230 | | 1 | 2x \emptyset 10,5 |
| | 5 | 100 | 185 | | 1 | 2x \emptyset 10,5 |
| | 5 | 50 | 150 | | 1 | |
| | 5 | 200 | 220 | | 2 | 1x met vierkante gaten gesneden |
| 600 | 8 | 50 | 170 | | 1 | 2x \emptyset 10,5 |
| | 6 | 120 | 230 | | 1 | 4x \emptyset 10,5 |
| | 3 | 90 | 110 | | 1 | |
| 1170 | 5 | 100 | 275 | | 1 | 2x \emptyset 10,5 |
| | 5 | 150 | 220 | | 1 | 4x \emptyset 12,5 |
| | 5 | 100 | 220 | | 1 | 2x \emptyset 10,5 |
| | 6 | 150 | 260 | | 1 | |
| | 10 | 50 | 150 | | 1 | |
| | 8 | 150 | 250 | | 1 | gesneden |
| | 8 | 100 | 180 | | 1 | gesneden |
| 1230 | 6 | 100 | 200 | | 1 | 3x \emptyset 10,5 |

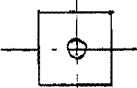
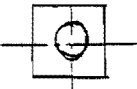
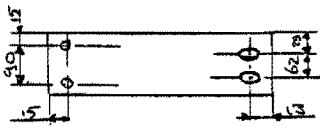
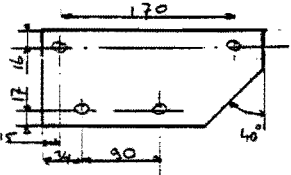
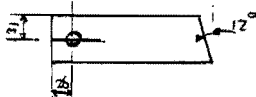
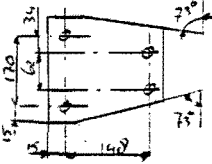
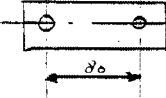
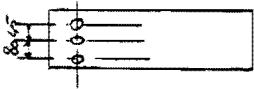



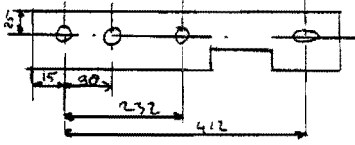
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|--------|---|--------|--|
| 1230 | 5 | 40 | ? |  | 1 | 2x \emptyset 10,5 |
| | 6 | 100 | 275 |  | 1 | 4x \emptyset 10,5 |
| | 8 | 120 | 135 |  | 2 | 2x \emptyset 10,5 |
| | 5 | 100 | 270 |  | 1 | gesneden |
| | 5 | 100 | 245 |  | 1 | gesneden |
| 1088 | 6 | 75 | 270 |  | 2 | |
| | 5 | 100 | 300 |  | 2 | stempel |
| | 5 | 30 | 100 |  | 1 | |
| | 5 | 40 | 190 |  | 1 | 2x \emptyset 15 1x \emptyset 17 |
| | 8 | 75 | 145 |  | 2 | gesneden |
| | 8 | 190 | 230 |  | 2 | gesneden |
| 728 | 8 | 50 | 230 |  | 1 | 3x \emptyset 10,5 |
| | 5 | 50 | 230 |  | 1 | 3x \emptyset 10,5 |

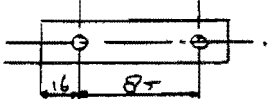
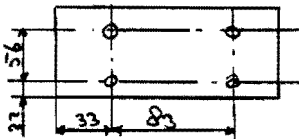
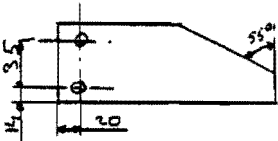





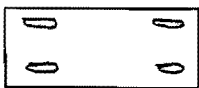
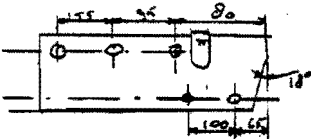




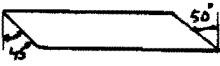
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|-----------------|-------|---------|--------|---|--------|----------------------|
| 728 | 5 | 75 | 225 |  | 2 | 2x O 9x14 |
| | 8 | 40 | 110 |  | 2 | 1x Ø 10,5 |
| | 8 | 50 | 195 |  | 1 | 3x Ø 10,5 |
| | 6 | 40 | 370 |  | 2 | 1x Ø 10,5 |
| | 5 | 75 | 360 |  | 1 | 3x Ø 10,5 |
| | 5 | 40 | 75 |  | 1 | |
| | 8 | 30 | 220 |  | 1 | |
| | 8 | 100 | 225 |  | 1 | gesneden |
| 1221 | 5 | 50 | 100 |  | 2 | 1x Ø 9 1x 9x14 |
| | 8 | 25 | 200 |  | 1 | |
| | 8 | 100 | 150 |  | 1 | 1x O 22x35 2x Ø 10,5 |
| | 8 | 100 | 150 |  | 1 | 4x Ø 10,5 |
| | 6 | 30 | 65 |  | 2 | |
| | 8 | 100 | 110 |  | 1 | 2x Ø 10,5 |
| 1276 | 5 | 100 | 160 |  | 2 | 2x Ø 11 |

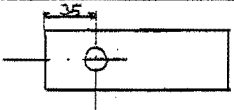
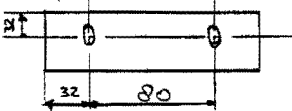
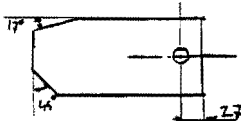
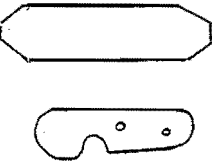
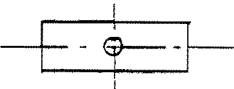
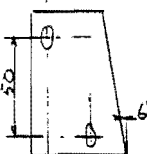
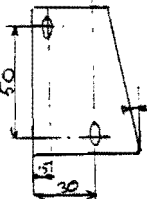
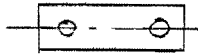
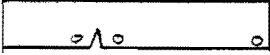
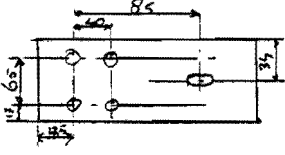
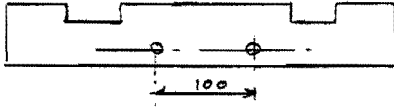
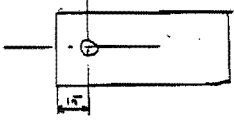
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|--------|---|--------|---|
| 1276 | 8 | 80 | 150 |  | 1 | 1x \emptyset 13x17 |
| | 8 | 70 | 120 |  | 2 | 1x \emptyset 11 |
| | 8 | 75 | 100 |  | 2 | |
| | 5 | 150 | 220 |  | 1 | 4x \emptyset 13 |
| | 8 | 50 | 140 |  | 1 | 1x \emptyset 13x17 |
| | 3 | 120 | 157 |  | 2 | inkoop LV |
| 1105 | 5 | 130 | 180 |  | 2 | 2x \emptyset 10,5 |
| | 5 | 50 | 215 |  | 2 | 2x \emptyset 10,5x15 |
| | 5 | 50 | 315 |  | 2 | 1x \emptyset 10,5 |
| 754 | 5 | 75 | 950 |  | 1 | 3x \emptyset 9 2x \emptyset 9x15 |
| | 8 | 40 | 240 |  | 2 | |
| | 8 | 40 | 100 |  | 2 | |
| | 6 | 100 | 95 |  | 2 | 2x \emptyset x |
| | 6 | 50 | 225 |  | 2 | |

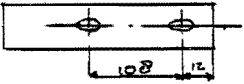
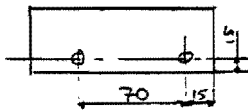
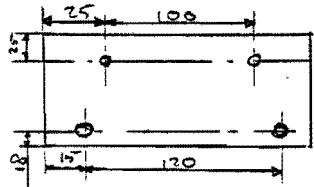
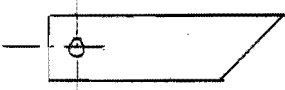
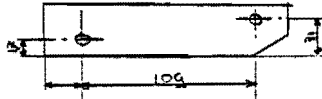
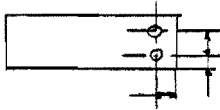


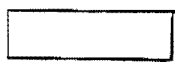
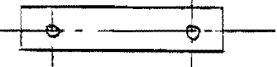
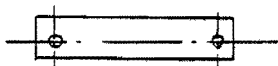

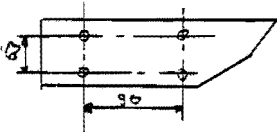


| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|--------|---|--------|---------------------|
| 1156 | 8 | 30 | 336 |  | 2 | stempel |
| | 8 | 246 | 274 |  | 2 | gesneden |
| 1278 | 5 | 50 | 140 |  | 2 | |
| | 8 | 50 | 395 |  | 2 | 3x \emptyset 10,5 |
| | 6 | 100 | 130 |  | 2 | 2x \emptyset 9x13 |
| | 8 | 20 | 20 |  | 2 | 1x \emptyset 10,5 |
| | 5 | 50 | 50 |  | 2 | 1x \emptyset 10,5 |
| | 6 | ... | ... |  | 2 | gesneden |
| 907 | 5 | 100 | 180 |  | 2 | |
| | 5 | 100 | 600 |  | 2 | 4x \emptyset 10,5 |
| | 5 | 20 | 120 |  | 2 | |
| | 8 | 75 | 210 |  | 2 | |
| | 5 | 40 | 20 |  | 2 | |
| | 8 | 50 | 165 |  | 2 | |
| | 6 | 100 | 210 |  | 1 | |

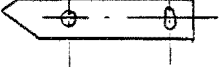
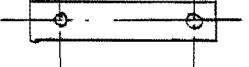
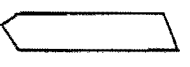
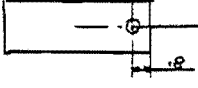

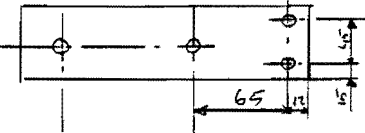
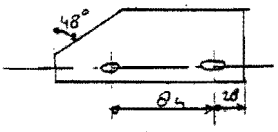


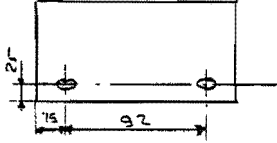
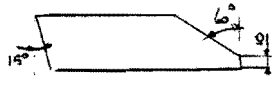
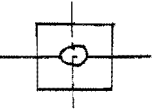
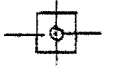
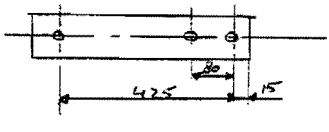

| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|-----------------|-------|---------|--------|---|--------|---|
| 1197 | | | |  | 1 | |
| | 10 | 50 | 150 |  | 1 | 2x $\varnothing 10,5$ |
| 1253 | 5 | 75 | 300 |  | 2 | 4x $\varnothing 10,5$ |
| | 5 | 47,5 | 55 |  | 2 | 1x $\varnothing 10,5$ |
| | 2 | 40 | 187 |  | 2 | |
| | 3 | 20 | 56 |  | 2 | |
| | 8 | 70 | 120 |  | 2 | gesneden |
| | 6 | 135 | 140 |  | 2 | gesneden |
| 918 | 6 | 50 | 170 |  | 2 | 2x $\varnothing 10,5 \times 15$ |
| | 6 | 75 | 70 |  | 2 | $\varnothing 9 \times 14$ |
| | 6 | 120 | 185 |  | 1 | 2x $\varnothing 13$ 2x $\varnothing 10,5$ |
| | 5 | 50 | 50 |  | 2 | 1x $\varnothing 10,5$ |

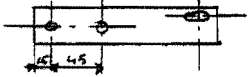
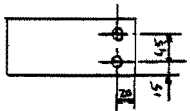
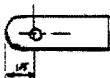
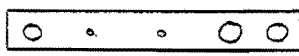
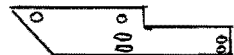
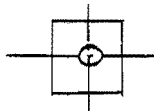
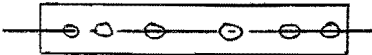

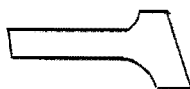
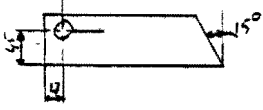
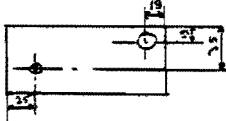
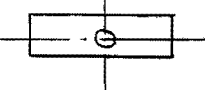
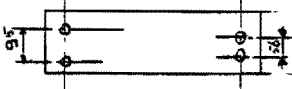
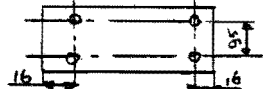
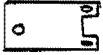
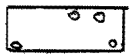
| trekhaak nummer | dikte | breedte | lengte | product | santal | opmerkingen |
|-----------------|-------|---------|--------|---|--------|---|
| 1147 | 5 | 40 | 40 |  | 2 | 1x \emptyset 10,5 |
| | 5 | 40 | 40 |  | 2 | 1x \emptyset 13 |
| | 5 | 120 | 225 |  | 1 | 2x \emptyset 10,5 2x \emptyset 10,5x15 |
| | 5 | 130 | 200 |  | 1 | 4x \emptyset 10,5 |
| | 8 | 75 | 98 |  | 2 | 1x \emptyset 13 |
| | 5 | 180 | 200 |  | 1 | 4x \emptyset 10,5 |
| 855 | 5 | 75 | 210 |  | 1 | 2x \emptyset 10,5 |
| | 8 | 150 | 290 |  | 1 | 3x \emptyset 10,5 |
| | 6 | 130 | 450 |  | 1 | |
| | 8 | 150 | 110 |  | 2 | |
| | 8 | 150 | 215 |  | 1 | gesneden |
| | 5 | 75 | 450 |  | 1 | 3x \emptyset 10,5 1x \emptyset x |

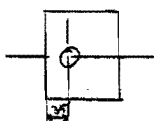
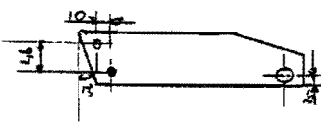
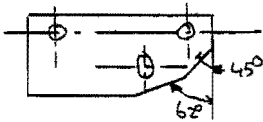
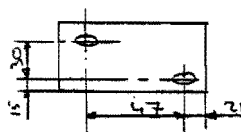
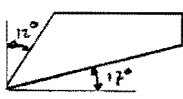
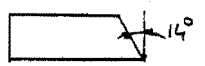

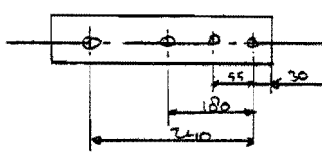

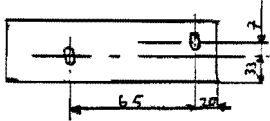
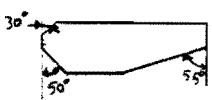
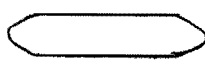

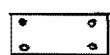

| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|-----------------|-------|---------|--------|---|--------|-----------------------|
| 1215 | 5 | 40 | 120 |  | 1 | 2x \varnothing 9 |
| | 8 | 100 | 150 |  | 1 | 4x \varnothing 10,5 |
| | 5 | 75 | 150 |  | 1 | 2x \varnothing 9 |
| | 5 | 20 | 85 |  | 1 | |
| | 6 | 50 | 50 |  | 1 | |
| | 3 | 30 | 115 |  | 1 | |
| | 4 | 75 | 160 |  | 2 | inkoop LV |
| | 3 | 80 | 122 |  | 1 | inkoop LV |
| | 3 | 75 | 110 |  | 1 | |
| 1116 | 6 | 120 | 350 |  | 2 | 5x \varnothing 10,5 |
| | 5 | 13 | 50 |  | 2 | |
| | 6 | 13 | 340 |  | 1 | |
| | 4 | 95 | 130 |  | 1 | inkoop LV |
| | 6 | 196 | 340 |  | 2 | gesneden |
| | 8 | 30 | 220 |  | 1 | |

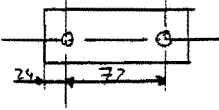

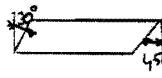
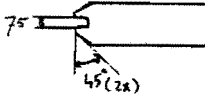
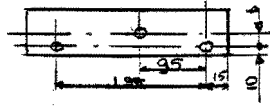
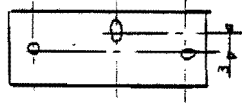

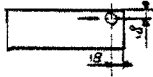
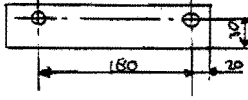

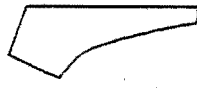
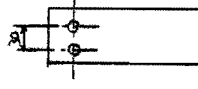
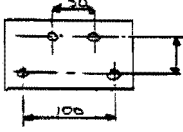


| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|-----------------|-------|---------|--------|---|--------|----------------------------|
| 1279 | 5 | 40 | 80 |  | 2 | ∅ 10,5 |
| | 8 | 70 | 120 |  | 2 | 2x ∅ 10,5x15 |
| | 8 | 120 | 150 |  | 2 | |
| | 8 | 76 | 220 |  | 2 | gesneden |
| 1070 | 6 | 20 | 50 |  | 2 | ∅ 10,5 |
| | 5 | 100 | 95 |  | 1 | 2x ∅ 9x14 |
| | 5 | 100 | 95 |  | 1 | 2x ∅ 9x14 |
| | 3 | 30 | 80 |  | 2 | inkoop |
| | 3 | 77 | 747 |  | 1 | inkoop |
| 1269 | 6 | 100 | 178 |  | 2 | 4x ∅ 10,5x15 1x ∅ 13x17 |
| | 5 | 100 | 320 |  | 1 | 2x ∅ 10,5 |
| | 6 | 50 | 50 |  | 2 | ∅ 10,5 |

| trekhaak nummer | dikte | breedte | lengte | product | santal | opmerkingen |
|--------------------|-------|---------|--------|---|--------|--|
| 1269 | 6 | 50 | 220 |  | 2 | 2x \emptyset 10,5x15 |
| | 6 | 100 | 50 |  | 2 | 2x \emptyset 12 |
| | 8 | 150 | 170 |  | 1 | 2x \emptyset 10,5 2x \emptyset 12 |
| 780 | 5 | 30 | 150 |  | 1 | |
| | 5 | 40 | 150 |  | 1 | |
| | 5 | 75 | 105 |  | 1 | |
| | 8 | 40 | 140 |  | 1 | |
| | 6 | 50 | 185 |  | 2 | |
| | 5 | 30 | 90 |  | 1 | |
| | 5 | 30 | 110 |  | 1 | |
| | 5 | 30 | 110 |  | 1 | |
| | 5 | 30 | 110 |  | 1 | |
| | 5 | 75 | 175 |  | 1 | |
| | 6 | 75 | 185 |  | 1 | 4x \emptyset 10,5x15 |
| | 5 | 30 | 165 |  | 1 | |

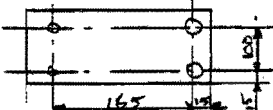
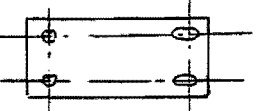
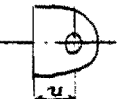

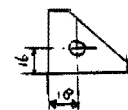
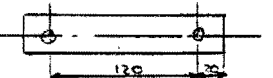
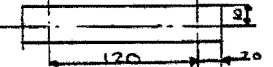
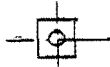
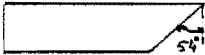

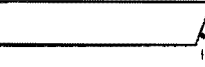
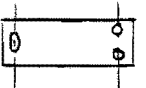


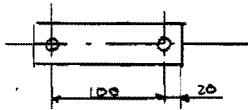
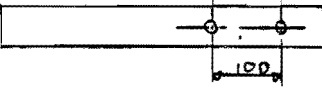
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|-----------------|-------|---------|--------|---|--------|--------------|
| 780 | 5 | 40 | 175 |  | 1 | |
| | 8 | 40 | 155 |  | 1 | |
| | 8 | 40 | 140 |  | 1 | |
| 886 | 6 | 75 | 100 |  | 1 | Ø 10,5 |
| | 6 | 75 | 90 |  | 1 | 3x Ø 10,5 |
| | 6 | 75 | 260 |  | 2 | 4x Ø 10,5 |
| | 5 | 75 | 140 |  | 1 | 2x Ø 10,5x15 |
| | 5 | 50 | 50 |  | 2 | Ø 10,5 |
| | 4 | 70 | 110 |  | 1 | |
| 1179 | 6 | 100 | 130 |  | 2 | 2x Ø 9x13 |
| | 5 | 50 | 140 |  | 2 | |
| | 5 | 30 | 50 |  | 2 | Ø 10,5 |
| | 8 | 20 | 20 |  | 2 | Ø 10,5 |
| | 8 | 50 | 465 |  | 2 | |
| | 6 | 130 | 305 |  | 2 | gesneden |


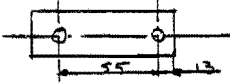
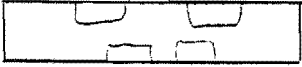


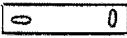
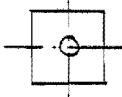

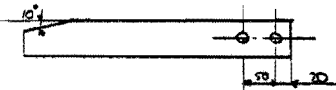
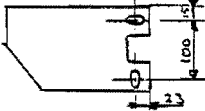
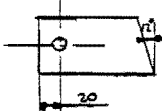

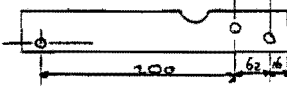
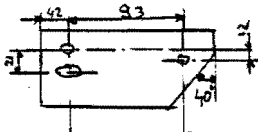
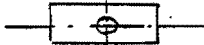
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|--------|---|--------|---|
| 982 | 5 | 40 | 145 |  | 2 | 2x \varnothing 10,5 1x \varnothing 10,5x15 |
| | 5 | 75 | 100 |  | 2 | 2x \varnothing 10,5 |
| | 5 | 25 | 85 |  | 1 | \varnothing 10,5 |
| | 10 | 40 | 615 |  | 2 | |
| | 4 | 135 | 240 |  | 2 | inkoop |
| 1181 | 5 | 50 | 50 |  | 2 | \varnothing 10,5 |
| | 8 | 40 | 620 |  | 1 | 6x \varnothing 10,5 |
| | 8 | 90 | 260 |  | 2 | gesneden |
| | 8 | 110 | 220 |  | 2 | gesneden |
| 1178 | 8 | 75 | 110 |  | 2 | \varnothing 13 |
| | 8 | 60 | 100 |  | 2 | 1x \varnothing 10,5 1x \varnothing 13 |
| | 5 | 20 | 40 |  | 2 | \varnothing 10,5 |
| | 5 | 120 | 200 |  | 1 | 4x \varnothing 10,5 |
| | 6 | 120 | 140 |  | 1 | 4x \varnothing 10,5 |
| | 3 | 100 | 160 |  | 2 | inkoop |
| | 3 | 120 | 145 |  | 1 | inkoop |

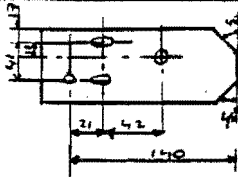

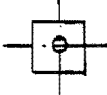



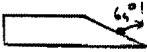
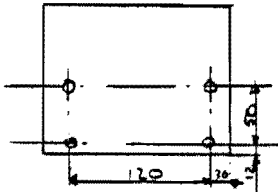
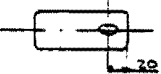
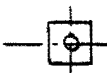
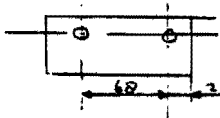
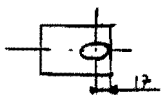
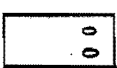
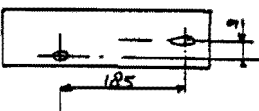
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|--------|---|--------|-------------------------------------|
| 1239 | 5 | 100 | 85 |  | 2 | Ø12,5 lasmoer erop |
| | 8 | 75 | 315 |  | 2 | 3x Ø 11 |
| | 6 | 170 | 122 |  | 1 | 2x Ø 12,5 1x O 22x35 gesneden |
| | 5 | 60 | 85 |  | 2 | 2x O 9x14 |
| | 8 | 75 | 112 |  | 2 | |
| | 5 | 20 | 60 |  | 1 | |
| | 8 | 150 | 242 |  | 1 | gesneden |
| | 8 | 40 | 240 |  | 1 | 4x Ø 11 |
| | 30 | 30 | 60 |  | 1 | |
| 1261 | 8 | 70 | 115 |  | 1 | 2x O 10,5x15 |
| | 8 | 70 | 128 |  | 1 | |
| | 8 | 50 | 210 |  | 1 | stempel |
| | 5 | 150 | 238 |  | 2 | gesneden |
| | 3 | 85 | 141 |  | 1 | inkoop |
| | 8 | 150 | 130 |  | 1 | gesneden |

| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|-----------------|-------|---------|--------|---|--------|---|
| 1266 | 6 | 75 | 120 |  | 2 | |
| | 8 | 40 | 125 |  | 1 | |
| | 8 | 40 | 130 |  | 1 | |
| | 8 | 150 | 145 |  | 1 | |
| 1262 | 5 | 50 | 220 |  | 1 | 3x \varnothing 9 |
| | 6 | 120 | 220 |  | 1 | 2x \varnothing 9 1x \varnothing 9x14 |
| | 5 | 50 | 195 |  | 1 | 2x \varnothing 9x14 |
| | 8 | 50 | 82 |  | 2 | \varnothing 12 |
| | 8 | 50 | 220 |  | 1 | 2x \varnothing 13 |
| | 5 | 55 | 475 |  | 2 | \varnothing 12 stempel ($\frac{1}{2}$) |
| | 8 | 90 | 165 |  | 2 | gesneden |
| 595 | 6 | 150 | 180 |  | 2 | |
| | 8 | 75 | 160 |  | 1 | |
| | 6 | 32 | 100 |  | 2 | |
| | 8 | 150 | 160 |  | 1 | |

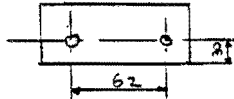
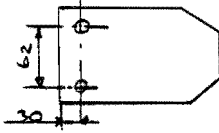

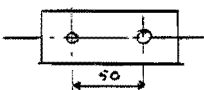
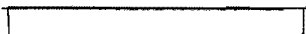
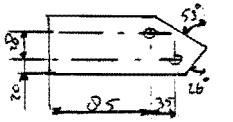
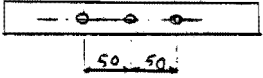
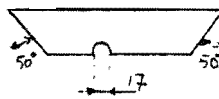


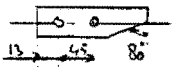
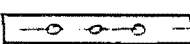
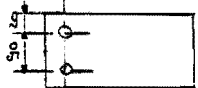

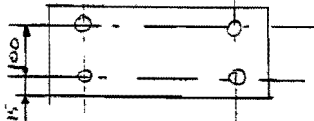
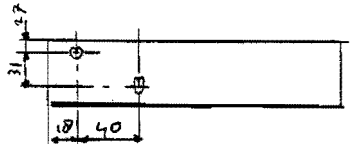
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|--------|---------|--------|-------------|
| 1167 | 5 | 50 | 105 | | 1 | Ø 10,5x15 |
| | 5 | 100 | 300 | | 2 | |
| | 8 | 120 | 220 | | 2 | 4x Ø 10,5 |
| | 8 | 120 | 200 | | 1 | 4x Ø 10,5 |
| | 5 | 40 | 150 | | 1 | Ø 10,5x15 |
| | 3 | 120 | 160 | | 2 | inkoop |
| 608 | 5 | 38 | 750 | | 1 | |
| | 6 | 150 | 470 | | 1 | |
| | 5 | 13 | 35 | | 4 | |
| | 5 | 38 | 150 | | 1 | |
| | 5 | 20 | 35 | | 2 | |
| | 5 | 100 | 155 | | 1 | |
| | 6 | 38 | 70 | | 2 | |
| 1302 | 8 | 70 | 90 | | 2 | |
| | 8 | 40 | 200 | | 1 | 2x Ø 13 |

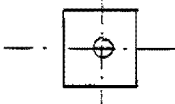


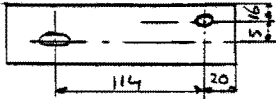


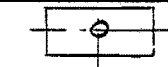

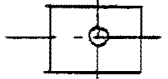
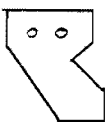
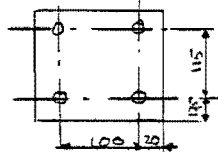
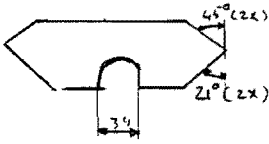
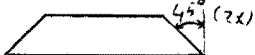
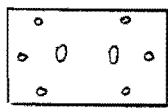

| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|--------|---|--------|--|
| 1302 | 5 | 130 | 180 |  | 1 | 2x \varnothing 9 2x \varnothing 11 |
| | 5 | 130 | 180 |  | 1 | 2x \varnothing 9 2x \varnothing 10,5x13 |
| | 5 | 48 | 55 |  | 1 | \varnothing 13 |
| | 5 | 130 | 150 |  | 1 | 4x \varnothing 9 |
| | 8 | 40 | 54 |  | 2 | \varnothing 15 |
| 1227 | 5 | 30 | 160 |  | 1 | 2x \varnothing 10,5 |
| | 8 | 30 | 130 |  | 1 | 2x \varnothing 10,5 |
| | 5 | 25 | 25 |  | 4 | \varnothing 10,5 |
| | 6 | 40 | 115 |  | 2 | |
| | 8 | 40 | 225 |  | 2 | |
| | 8 | 40 | 230 |  | 2 | |
| | 2 | 50 | 153 |  | 4 | |
| | 3 | 25 | 60 |  | 2 | inkoop |
| | 3 | 60 | 345 |  | 2 | |
| 1155 | 5 | 50 | 140 |  | 2 | 2x \varnothing 10,5 |
| | 8 | 50 | 470 |  | 2 | 1x \varnothing 12 1x \varnothing 10,5 |


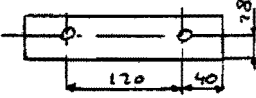
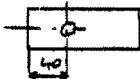
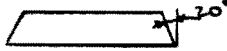
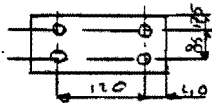

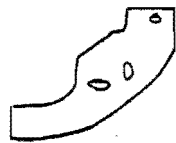
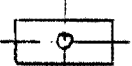
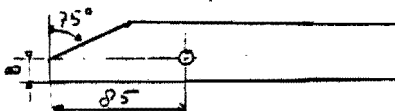
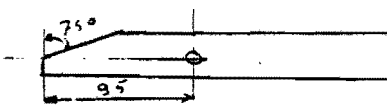
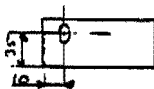

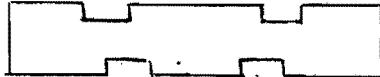

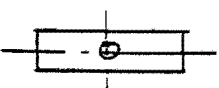
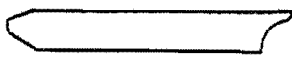
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|-----------------|-------|---------|--------|---|--------|--|
| 1155 | 8 | 100 | 120 |  | 2 | |
| | 8 | 25 | 80 |  | 2 | 2x \emptyset 10,5 |
| | 5 | 100 | 300 |  | 2 | |
| | 8 | 80 | 140 |  | 1 | |
| | 10 | 40 | 75 |  | 2 | |
| | 3 | 40 | 110 |  | 2 | 2x \emptyset 10,5x22 |
| 1210 | 5 | 100 | 100 |  | 2 | \emptyset 10,5 |
| | 8 | 50 | 355 |  | 1 | 2x \emptyset 10,5 |
| | 8 | 50 | 400 |  | 1 | 2x \emptyset 10,5 |
| | 8 | 130 | 200 |  | 2 | 2x \emptyset 10,5x15 |
| | 8 | 75 | 90 |  | 2 | \emptyset 10,5 |
| | 6 | 80 | 155 |  | 2 | gesneden |
| 1165 | 8 | 40 | 300 |  | 2 | 3x \emptyset 10,5 |
| | 8 | 150 | 125 |  | 1 | 2x \emptyset 10,5 1x \emptyset 9x14 |
| | 5 | 50 | 100 |  | 2 | \emptyset 10,5 |

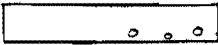


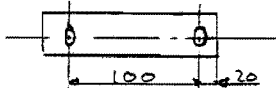
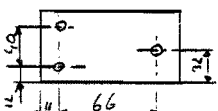
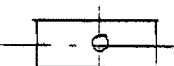


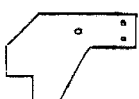

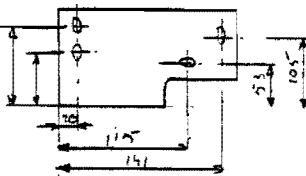
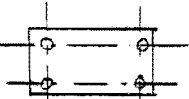
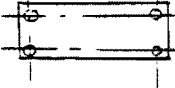
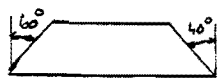
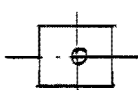
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|--------|---|--------|---|
| 1165 | 8 | 100 | 160 |  | 1 | 1x \emptyset 9 1x \emptyset 10,5 2x \emptyset 9x14 |
| | 8 | 75 | 85 |  | 2 | gesneden |
| | 5 | 75 | 75 |  | 2 | \emptyset 10,5 |
| | 5 | 100 | 300 |  | 2 | stempel |
| | 8 | 146 | 116 |  | 2 | gesneden |
| 1286 | 8 | 75 | 160 |  | 1 | 4x \emptyset 11 |
| | 6 | 30 | 120 |  | 2 | |
| | 6 | 180 | 200 |  | 1 | 4x \emptyset 11 inkoop |
| | 6 | 50 | 85 |  | 1 | \emptyset 9x14 |
| | 6 | 40 | 40 |  | 1 | \emptyset 9 |
| | 6 | 75 | 110 |  | 1 | 2x \emptyset 11 |
| | 6 | 50 | 55 |  | 1 | \emptyset 11x15 |
| | 3 | 80 | 90 |  | 1 | inkoop |
| 890 | 6 | 50 | 285 |  | 2 | \emptyset 8 \emptyset 9x14 |




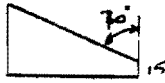

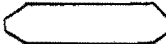

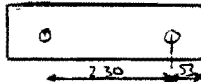
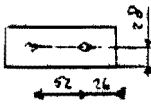
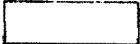

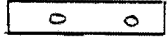

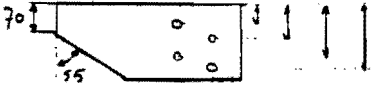
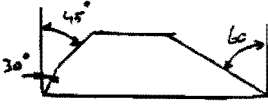
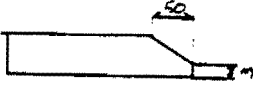
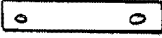

| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|-----------------|-------|---------|--------|---------|--------|---|
| 890 | 5 | 40 | 110 | | 2 | 2x \bigcirc 9x14 |
| | 5 | 40 | 170 | | 2 | |
| | 5 | 15 | 55 | | 2 | |
| | 8 | 192 | 272 | | 1 | 2x \emptyset 9 1x \bigcirc 9x14 |
| 1121 | 5 | 40 | 100 | | 2 | |
| | 8 | 40 | 140 | | 2 | |
| | 8 | 120 | 200 | | 2 | 4x \emptyset 12 |
| 1255 | 5 | 75 | 240 | | 2 | 3x \emptyset 10,5 1x \bigcirc 10,5x15 |
| | 5 | 25 | 120 | | 2 | 2x \emptyset 10,5 |
| | 6 | 75 | 110 | | 2 | 2x \emptyset 10,5 |
| | 6 | 40 | 190 | | 2 | |
| | 5 | 150 | 180 | | 1 | 2x \emptyset 10,5 2x \bigcirc 10,5x15 |
| | 8 | 50 | 60 | | 1 | |
| | 3 | 25 | 55 | | 2 | \emptyset 12,5 inkoop |
| | 3 | 140 | 140 | | 1 | 4x \emptyset 10,5 inkoop |
| | 3 | 150 | 190 | | 1 | 2x \emptyset 10,5 1x \emptyset 17 2x \bigcirc 10,5x15 |


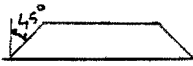



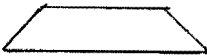
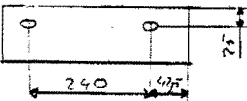
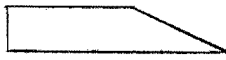
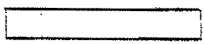
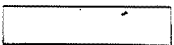

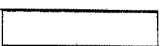
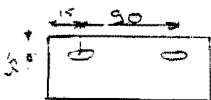
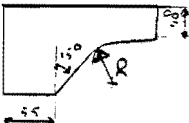
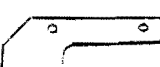

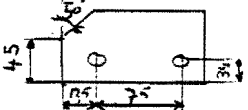
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|--------|---|--------|-------------------------------------|
| 360 | 5 | 25 | 100 |  | 1 | 2x \emptyset 10,5 |
| | 6 | 100 | 190 |  | 1 | |
| | 8 | 50 | 90 |  | 2 | |
| | 5 | 75 | 100 |  | 2 | 2x \emptyset 10,5 |
| | 5 | 50 | 300 |  | 1 | |
| 599 | 6 | 75 | 140 |  | 2 | 2x \emptyset 10,5 |
| | 6 | 30 | 280 |  | 1 | |
| | 8 | 50 | 250 |  | 1 | |
| | 6 | 30 | 150 |  | 2 | |
| | 5 | 20 | 100 |  | 2 | |
| | 5 | 30 | 110 |  | 2 | 2x \emptyset 10,5 |
| | 10 | 30 | 200 |  | 1 | |
| 977 | 6 | 120 | 125 |  | 1 | |
| | 6 | 50 | 165 |  | 2 | |
| | 5 | 130 | 215 |  | 1 | gebogen |
| | 8 | 100 | 300 |  | 2 | \emptyset 13x18 \emptyset 13 |

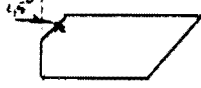
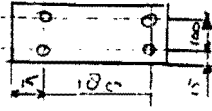

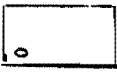


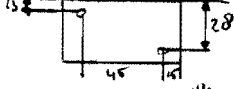

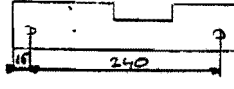


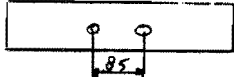
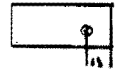
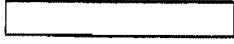

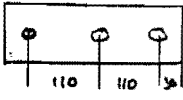
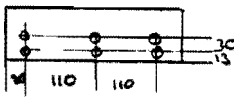

| trekhaak nummer | dikte | breedte | lengte | product | santal | opmerkingen |
|-----------------|-------|---------|--------|---|--------|----------------------------------|
| 1072 | 5 | 30 | 30 |  | 2 | Ø 10,5 |
| | 8 | 30 | 90 |  | 2 | |
| | 6 | 30 | 60 |  | 1 | |
| | 5 | 40 | 150 |  | 2 | Ø 10,5 O 10,5x16 |
| | 6 | 30 | 110 |  | 2 | |
| | 3 | 120 | 65 |  | 2 | 2x O 10,5x16 1x Ø 8 inkoop |
| 241 | 8 | 75 | 100 |  | 2 | |
| | 5 | 13 | 40 |  | 2 | |
| | 8 | 75 | 75 |  | 2 | |
| | 8 | 150 | 250 |  | 1 | 2x Ø 12 gesneden |
| 1243 | 5 | 150 | 140 |  | 2 | 4x Ø 9 |
| | 6 | 130 | 230 |  | 1 | |
| | 6 | 75 | 300 |  | 2 | |
| | 5 | 163 | 200 |  | 1 | 6x Ø 9 2x O 13x17 |
| | | | |  | | |






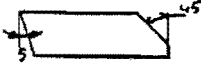
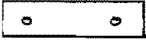
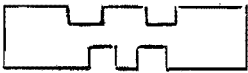







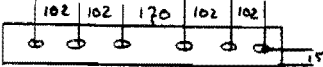


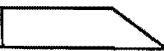
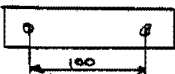
| trekhaak nummer | dikte | breedte | lengte | product | santal | opmerkingen |
|--------------------|-------|---------|--------|---|--------|--|
| 1251 | 5 | 100 | 150 |  | 1 | 2x \varnothing 11 |
| | 5 | 50 | 200 |  | 2 | 2x \varnothing 13 |
| | 5 | 75 | 100 |  | 1 | \varnothing 11 |
| | 5 | 20 | 135 |  | 2 | |
| | 8 | 120 | 200 |  | 1 | 4x \varnothing 12,5 moeren opgelast |
| | 5 | 50 | 70 |  | 2 | |
| | 8 | 285 | 275 |  | 2 | \varnothing 10,5 2x \varnothing 10,5x15 gesneden |
| 1040 | 8 | 25 | 45 |  | 2 | \varnothing 9 |
| | 8 | 25 | 270 |  | 2 | \varnothing 9 |
| | 8 | 25 | 270 |  | 2 | \varnothing 9 |
| | 5 | 50 | 80 |  | 2 | \varnothing 10,5x15 |
| | 8 | 80 | 140 |  | 1 | |
| | 5 | 100 | 300 |  | 2 | |
| | 8 | 75 | 365 |  | 2 | gesneden |
| 1159 | 5 | 25 | 40 |  | 2 | \varnothing 9 |
| | 8 | 30 | 336 |  | 2 | stempel |

| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|--------|---|--------|--|
| 1159 | 3 | 40 | 250 |  | 2 | 3x \emptyset 10,5 inkoop |
| | 8 | 246 | 270 |  | 2 | gesneden |
| 1075 | 5 | 50 | 50 |  | 2 | |
| | 6 | 40 | 140 |  | 1 | 2x \emptyset 10,5x15 |
| | 5 | 75 | 90 |  | | 3x \emptyset 10,5 |
| | 6 | 75 | 60 |  | 1 | \emptyset 10,5 |
| | 2 | 30 | 30 |  | 1 | \emptyset 10,5 |
| | 6 | 120 | 185 |  | 1 | gesneden |
| | 6 | 120 | 205 |  | 1 | 3x \emptyset 10,5 gesneden |
| 1098 | 5 | 13 | 15 |  | 2 | |
| | 6 | 150 | 185 |  | 2 | 2x \emptyset 15x22 2x \emptyset 13x17 |
| | 6 | 130 | 150 |  | 1 | |
| | 5 | 130 | 230 |  | 1 | gebogen |
| | 6 | 30 | 170 |  | 2 | |
| 1280 | 5 | 50 | 50 |  | 3 | \emptyset 10,5 |

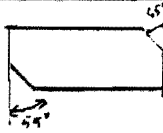
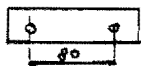
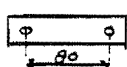

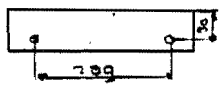
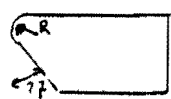

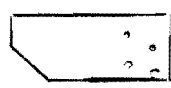
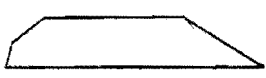
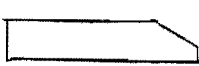
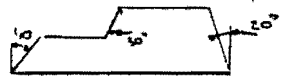
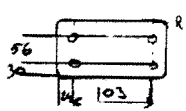
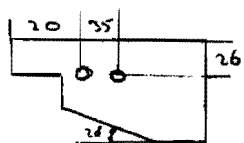
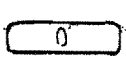
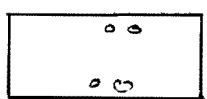
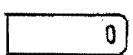
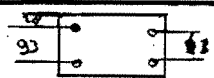
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|---|---|--------|-------------|
| 1280 | 5 | 30 | 30 |  | 1 | ∅ 10,5 |
| | 5 | 50 | 125 |  | 2 | ∅ 10,5x15 |
| | | | |  | 2 | |
| | 6 | 60 | 120 |  | 2 | |
| | 5 | 40 | 50 |  | 1 | |
| | 8 | 50 | 250 |  | 1 | stempel |
| | 5 | 20 | 305 |  | 4 | |
| | 5 | 100 | 310 |  | 2 | 2x ∅ 10,5 |
| | 6 | 50 | 100 |  | 2 | 2x ∅ 10,5 |
| | 10 | 40 | 100 |  | 2 | |
| | 4 | 30 | 85 |  | 1 | |
| 3 | 30 | 120 |  | 1 | | |
| 1207 | 5 | 50 | 50 |  | 2 | ∅ 10,5 |
| | 6 | 150 | 265 |  | 2 | 4x ∅ 10,5 |
| | 5 | 40 | 190 |  | 1 | |
| | 5 | 40 | 85 |  | 2 | |
| 1046 | 5 | 75 | 170 |  | 2 | 2x ∅ 10,5 |
| | 5 | 40 | 40 |  | 4 | ∅ 10,5 |

| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen | |
|-----------------|-------|---------|--------|---|--------|-------------|-----------|
| 1046 | 5 | 50 | 50 |  | 2 | Ø 10,5 | |
| | 5 | 40 | 175 |  | 2 | | |
| | 6 | 175 | 480 |  | 2 | gesneden | |
| 1026 | 5 | 20 | 20 |  | 4 | | |
| | 5 | 50 | 300 |  | 1 | | |
| | 8 | 50 | 160 |  | 2 | | |
| | 5 | 75 | 325 |  | 2 | | 2x Ø 10,5 |
| 513 | 8 | 25 | 160 |  | 2 | | |
| | 5 | 13 | 50 |  | 2 | | |
| | 5 | 50 | 300 |  | 1 | | |
| | 6 | 205 | 450 |  | 2 | | gesneden |
| 1188 | 5 | 40 | 110 |  | 2 | | |
| | 8 | 100 | 120 |  | 2 | | 2x Ø 9x14 |
| | 8 | 100 | 100 |  | 2 | | r=15 |
| | 8 | 57 | 146 |  | 2 | | gesneden |
| | 5 | 50 | 50 |  | 2 | | Ø 10,5 |
| | 8 | 100 | 67 |  | 2 | | 2x Ø 10,5 |







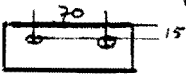
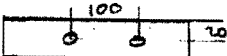
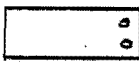



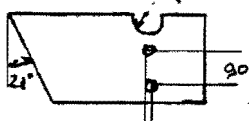


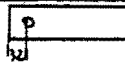
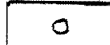



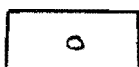
| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|--------|---|---|-----------------------|
| 944 | 6 | 50 | 180 |  | 2 | |
| | 5 | 130 | 210 |  | 1 | 4x \varnothing 10,5 |
| | 6 | 50 | 60 |  | 1 | |
| | 8 | 75 | 100 |  | 1 | |
| | 5 | 50 | 50 |  | 1 | \varnothing 10,5 |
| | 6 | 50 | 160 |  | 2 | |
| 1010 | 5 | 50 | 75 |  | 1 | 2x \varnothing 10,5 |
| | 5 | 75 | 130 |  | 1 | 2x \varnothing 10,5 |
| | 5 | 75 | 225 |  | 1 | 2x \varnothing 10,5 |
| | 8 | 30 | 175 |  | 1 | \varnothing 10,5 |
| | 8 | 30 | 142 |  | 1 | \varnothing 10,5 |
| | 8 | 30 | 360 |  | 1 | 2x \varnothing 10,5 |
| | 8 | 30 | 60 |  | 2 | \varnothing 10,5 |
| | 389 | 5 | 50 | 300 |  | 1 |
| 5 | | 13 | 50 |  | 2 | |
| 5 | | 75 | 280 |  | 2 | |
| 5 | | 50 | 280 |  | 1 | |
| 6 | | 50 | |  | 2 | gesneden |


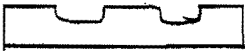


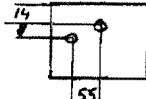

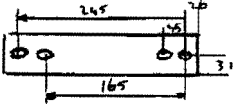

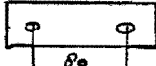
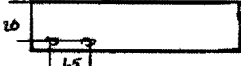



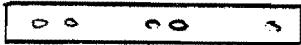
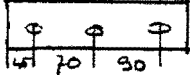



| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|--------|---|--------|-------------|
| 932 | 5 | 50 | 50 |  | 2 | ∅ 10,5 |
| | 8 | 75 | 210 |  | 2 | ∅ 10,5 |
| | 6 | 30 | 150 |  | 2 | ∅ 10,5 |
| | 8 | 40 | 90 |  | 2 | |
| 1171 | 8 | 30 | 230 |  | 2 | |
| | 6 | 75 | 110 |  | 2 | |
| | 8 | 50 | 110 |  | 2 | 2x ∅ 10,5 |
| | 5 | 100 | 300 |  | 2 | stempel |
| | 6 | 75 | 120 |  | 2 | 2x ∅ 10,5 |
| | 8 | 202 | 315 |  | 1 | gesneden |
| | 6 | 75 | 90 |  | 2 | gesneden |
| | 8 | 202 | 315 |  | 1 | gesneden |
| 860 | 6 | 80 | 350 |  | 2 | gesneden |
| | 5 | 50 | 50 |  | 2 | ∅ 10,5 |
| | 5 | 100 | 100 |  | 2 | ∅ 10,5 |
| | 8 | 40 | 620 |  | 1 | |
| | 10 | 40 | 200 |  | 2 | |
| 476 | 5 | 25 | 200 |  | 1 | 2x ∅ 10,5 |
| | 8 | 32 | 150 |  | 2 | |
| 1248 | 5 | 50 | 150 |  | 2 | 2x ∅ 10,5 |

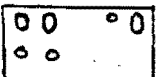
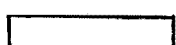


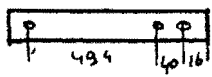
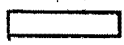
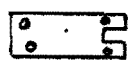
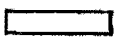
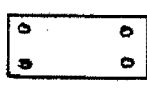
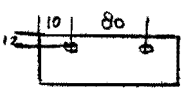
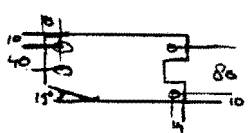
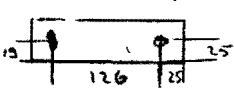

| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|--------|---------|--------|---|
| 1248 | 8 | 130 | 235 | | 1 | 2x \varnothing 10,5 |
| | 6 | 50 | 200 | | 1 | |
| | 6 | 50 | 160 | | 2 | 2x \varnothing 10,5 |
| | 5 | 130 | 210 | | 1 | 2x \varnothing 10,5 1x \varnothing 22x35 |
| | 6 | 130 | 310 | | 1 | R=25 2x \varnothing 10,5 |
| | 6 | 50 | 205 | | 1 | |
| | 5 | 25 | 115 | | 1 | 2x \varnothing 10,5 |
| 646 | 5 | 100 | 205 | | 1 | |
| | 6 | 75 | 320 | | 1 | |
| | 5 | 50 | 170 | | 2 | |
| | 5 | 50 | 50 | | 1 | \varnothing 10,5 |
| | 6 | 40 | 50 | | 1 | \varnothing 10,5 |
| | 5 | 25 | 140 | | 1 | 2x \varnothing 10,5x15 |
| | 3 | 75 | 320 | | 1 | inkoop |
| | 3 | 30 | 120 | | 1 | inkoop |
| | 3 | 140 | 680 | | 1 | inkoop |
| 1231 | 6 | 50 | 285 | | 1 | 2x \varnothing 11 |
| | 6 | 100 | 220 | | 1 | 2x \varnothing 11 |

| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|-----------------|-------|---------|--------|---|--------|--|
| 1231 | 8 | 39 | 72 |  | 2 | |
| | 6 | 40 | 130 |  | 1 | 2x \varnothing 12,5 |
| | 6 | 40 | 120 |  | 1 | 2x \varnothing 11 |
| | 5 | 30 | 30 |  | 6 | \varnothing 11 |
| | 6 | 50 | 260 |  | 1 | 2x \varnothing 11 |
| | 6 | 40 | 65 |  | 2 | R= 5 |
| 1332 | 5 | 50 | 50 |  | 2 | \varnothing 10,5 |
| | 6 | 150 | 265 |  | 2 | 4x \varnothing 10,5 |
| | 5 | 40 | 190 |  | 1 | |
| | 5 | 40 | 85 |  | 2 | |
| 1326 | 8 | 50 | 180 |  | 2 | |
| | 8 | 150 | 130 |  | 1 | 4xR=5 2x \varnothing 9 2x \varnothing 10,5 |
| | 5 | 130 | 235 |  | 1 | 2x \varnothing 10,5 |
| | 5 | 50 | 95 |  | 1 | \varnothing 13x17 |
| | 3 | 110 | 1230 |  | 1 | inkoop |
| | 4 | 60 | 110 |  | 2 | inkoop |
| 1180 | 6 | 120 | 175 |  | 1 | 4x \varnothing 10,5 |

| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|--------|---------|--------|--|
| 1180 | 5 | 120 | 383 | | 1 | 2x \emptyset 10,5 2x \emptyset 10,5x15 |
| | 5 | 120 | 155 | | 1 | 4x \emptyset 10,5 |
| | 8 | 190 | 212 | | 1 | gesneden |
| | 8 | 75 | 130 | | 1 | 2x \emptyset 10,5 |
| | 5 | 30 | 250 | | 1 | |
| | 10 | 50 | 150 | | 1 | 2x \emptyset 16 1x \emptyset 27 stempel |
| | 8 | 180 | 220 | | 1 | gesneden |
| 1325 | 8 | 40 | 300 | | 2 | 3x \emptyset 10,8 R= 18 |
| | 5 | 50 | 100 | | 2 | \emptyset 10,5 |
| | 5 | 75 | 75 | | 2 | \emptyset 10,5 |
| | 8 | 125 | 120 | | 1 | |
| | 8 | 130 | 105 | | 2 | gesneden |
| 776 | 6 | 75 | 140 | | 2 | \emptyset 10,5x15 \emptyset 10,5 |
| | 5 | 40 | 40 | | 2 | \emptyset 10,5 |
| | 5 | 150 | 140 | | 1 | |
| 203 | 5 | 50 | 50 | | 2 | |
| | 6 | 50 | 450 | | 2 | |

| trekhaak nummer | dikte | breedte | lengte | product | santal | opmerkingen |
|-----------------|-------|---------|--------|---|--------|-------------------|
| 203 | 8 | 30 | 175 |  | 2 | |
| | 5 | 13 | 50 |  | 2 | |
| | 5 | 50 | 300 |  | 1 | |
| | 3 | 70 | 80 |  | 1 | inkoop |
| 966 | 5 | 50 | 50 |  | 2 | ∅ 10,5 |
| | 6 | 130 | 115 |  | 1 | |
| | 6 | 50 | 100 |  | 2 | 2x ∅ 10,5 |
| | 6 | 120 | 250 |  | 1 | 2x ∅ 10,5 |
| | 6 | 100 | 205 |  | 1 | |
| | 5 | 50 | 100 |  | 1 | ∅ 10,5 |
| | - | - | - |  | 1 | |
| 1091 | 5 | 75 | 75 |  | 2 | ∅ 12,5 |
| | 6 | 150 | 215 |  | 1 | 2x ∅ 13 R=25,5 |
| | 5 | 30 | 210 |  | 2 | |
| | 5 | 75 | 120 |  | 2 | ∅ 12,5 |
| 1089 | 8 | 75 | 110 |  | 2 | ∅ 15 |
| | 8 | 40 | 75 |  | 2 | ∅ 15 |
| | 6 | 50 | 195 |  | 2 | |
| | 8 | 40 | 85 |  | 2 | |
| | 8 | 120 | 110 |  | 1 | |
| | 8 | 75 | 120 |  | 2 | ∅ 15 |

| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|-----------------|-------|---------|--------|---|--------|-----------------------------------|
| 1089 | 8 | 30 | 120 |  | 2 | Ø 15 |
| | 5 | 100 | 300 |  | 1 | |
| | 5 | 100 | 300 |  | 1 | |
| | 8 | 170 | 160 |  | 2 | gesneden |
| 862 | 8 | 120 | 115 |  | 1 | |
| | 8 | 40 | 260 |  | 2 | |
| | 8 | 50 | 300 |  | 1 | |
| | 8 | 120 | 135 |  | 2 | |
| | 5 | 40 | 110 |  | 1 | |
| | 5 | 40 | 220 |  | 1 | |
| | 5 | 50 | 120 |  | 1 | |
| | 5 | 50 | 120 |  | 1 | |
| | 8 | 75 | 60 |  | 1 | |
| 1168 | 8 | 50 | 564 |  | 2 | 2x Ø 14,5 2x Ø 13 1x Ø 10,5 |
| | 8 | 50 | 230 |  | 2 | 3x Ø 14,5 |
| | 6 | 100 | 120 |  | 1 | |
| | 6 | 50 | 250 |  | 1 | stempel |
| | 8 | 80 | 80 |  | 2 | gesneden |

| trekhaak nummer | dikte | breedte | lengte | product | aantal | opmerkingen |
|--------------------|-------|---------|---|---|----------|--|
| 638 | 6 | 150 | 250 |  | 2 | 3x \bigcirc 9x14 3x \varnothing 9 |
| | 5 | 50 | 200 |  | 1 | |
| | 6 | 50 | 75 |  | 2 | |
| | 6 | 38 | 50 |  | 1 | |
| 1036 | 6 | 50 | 575 |  | 2 | 3x \varnothing 10 |
| | 6 | 50 | 150 |  | 2 | |
| | 5 | 100 | 356 |  | 1 | 4x \varnothing 10,5 |
| | 5 | 13 | 90 |  | 2 | |
| | 5 | 130 | 210 |  | 1 | 4x \varnothing 10,5 |
| | 5 | 40 | 100 |  | 2 | 2x \varnothing 10,5 |
| | 5 | 100 | 350 |  | 1 | 2x \varnothing 10,5 2x \bigcirc 10,5x16 |
| | 6 | 50 | 180 |  | 2 | \varnothing 10,5 \bigcirc 10,5x12 |
| 8 | | |  | 2 | gesneden | |

VOORKOMENDE BEWERKINGEN

Gaten: \emptyset

aantal maten: 14
Passing: H12

maten: 8; 9; 10; 10,5; 11; 11,4; 12; 12,5; 13
15; 17; 20; 34; 38



aantal sleufgatmaten: 16
Passing: H12

maten: 7 x 13 n (L) ¹²⁷⁶ in 8mm 10,5 x 22 n
9 x 13 n 10,5 x 25 W
9 x 14 W 11 x 15 W
9 x 20 n 11 x 35 n
10 x 15 n 13 x 17 W
10,5 x 12 n 13 x 18 n
10,5 x 15 W 15 x 22 W
10,5 x 16 n 22 x 35 W
ook nog 11 x 25 en 13 x 25



aantal vierkant maten: 1
Passing

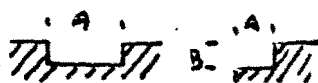
maten: 13 x 13

Uitkappingen:



Aantal maten R: 8
Totaal aantal maten: 14

maten R x h
16 x ? 18 x 15
16,5 x 60 18 x 60
17 x 40 18 x 70
17,5 x 20 19 x 60
17,5 x 45 25 x 30
18 x ? 25,5 x 25
18 x 10 25,5 x 50

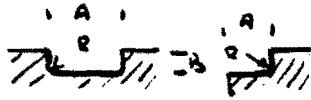


Aantal maten A: 6
Aantal maten B: 3
Totaal: 9

maten A x B
25 x 14 40 x 16 50 x 50
25 x 20 40 x 25 70 x 105

Voorkomende Bewerkingen

UITKAPPINGEN:



- Aantal maten A : 14
- aantal maten B : 11 ?
- aantal maten R : 4 ?
- Totaal aantal : 19

Maten A x B x R

- 30 x ... x 5
- 33 x 25 x ...
- 35 x 10 x 5
- 35 x 50 x 5
- 40 x 47 x ...
- 42 x 25 x 5
- 37 x 40 x 5
- 45 x 12 x 5
- 45 x 60 x 6

- 55 x 55 x 3
- 60 x 15 x 5
- 60 x 25 x 5
- 65 x 50 x 5
- 75 x 30 x 5
- 75 x 50 x 5
- 85 x 10 x 5
- 96 x 17 x ...
- 135 x 40 x 8
- 140 x 40 x ...



- Aantal maten A (+A') : 1 (+3)
- " " B (+B') : 1 (+3)
- " " R : 4 ?
- " " R : 2 ?

Maten : A x B x C x R

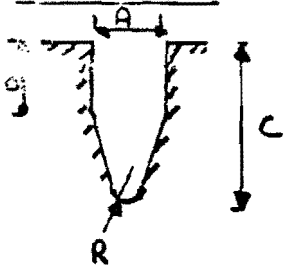
220 x 100 x 50 x

- A' x B' x C' x R
- 45 x 30 x 52 x 15
- 140 x 80 x 64 x 15
- 185 x 185 x 80 x 60

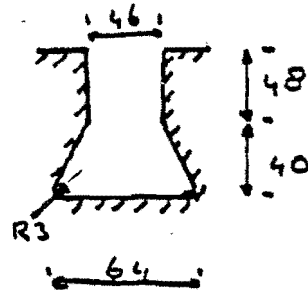
Zonder afgeronde hoek:

- 110 x 95 x 75
- ... x 30 x 30

DIVERSEN



- A x B x C x R
- 34 x 35 x 90 x 6
- 34 x 35 x 50 x 12
- 34 x 35 x 104 x 6

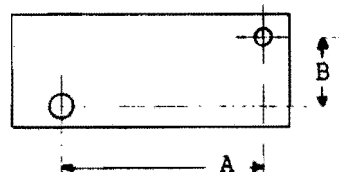


EXTERNE RADI

Aantal :

- Maten : ? ; ? ; 4 ; 5 ; 7 ; 12,5 ; 15 ; 22,5 ; 27,5 ; 4,0 ; 16



HARTAFSTANDEN rechthoek met twee gaten.

| | | |
|------|-----------------------|-----------|
| B=0: | $A \leq 25$ mm | 0 st. |
| | $25 < A \leq 50$ mm | 2555 st. |
| | $50 < A \leq 75$ mm | 42550 st. |
| | $75 < A \leq 100$ mm | 38886 st. |
| | $100 < A \leq 150$ mm | 62556 st. |
| | $A > 150$ mm | 9300 st. |

| B \neq 0: | A | B | aantal |
|-------------|-----|----|--------|
| | 15 | 45 | 479 |
| | 22 | 10 | 1346 |
| | 40 | 31 | 1294 |
| | 45 | 15 | 479 |
| | 47 | 30 | 2078 |
| | 50 | 29 | 2475 |
| | 53 | 18 | 417 |
| | 55 | 8 | 834 |
| | 56 | 16 | 2156 |
| | 65 | 7 | 949 |
| | 125 | 6 | 802 |
| | 130 | 29 | 911 |
| | 135 | 14 | 929 |
| | 185 | 9 | 1370 |

Hartafstand onbekend: ca. 4% v/d totale productie.

Gemiddelde hartafstand A = 93 mm.

3.2. Geradheit

Für die Geradheit von Flachstahl nach dieser Norm gelten die zulässigen Abweichungen nach Tabelle 2.



Tabelle 2

| Querschnitt mm ² | | Zulässige Abweichung q |
|--------------------------------|------|---------------------------|
| über | bis | |
| — | 1000 | 0,004 · l |
| 1000 | — | 0,0025 · l |

Weitergehende Anforderungen an die Geradheit sind bei der Bestellung zu vereinbaren.

4. Werkstoff

Flachstahl nach dieser Norm wird vorzugsweise aus den Stahlsorten nach DIN 17 100, DIN 17 200, DIN 17 210 und DIN 1651 hergestellt.

Die gewünschte Stahlsorte ist bei Bestellung anzugeben.

5. Gewicht und zulässige Gewichtsabweichungen

5.1. Das in Tabelle 1 angegebene Gewicht ist mit einer Dichte von 7,85 kg/dm³ aus dem Querschnitt errechnet worden.

5.2. Die zulässigen Gewichtsabweichungen in Prozenten des Gesamtgewichtes sind Tabelle 3 zu entnehmen. Als Gewichtsabweichung in diesem Sinne gilt der Unterschied zwischen dem tatsächlichen Liefergewicht und dem aus dem Gewicht nach Tabelle 1 und (bei Bestellung von Herstelllungen) der gelieferten Meter oder (bei Bestellung von Fest- und Genauängen) der bestellten Meter errechneten Gewicht.

Tabelle 4

| Längenart | Länge zulässige Abweichung | | Bestellangabe für die Länge |
|---------------|-------------------------------|--|---|
| | Bereich | | |
| Herstelllänge | 3 000 bis 12 000 | beliebig zwischen 3 000 und 12 000 | keine |
| Festlänge | bis 12 000 | ± 100 | gewünschte Festlänge in mm |
| Genaulänge | bis 12 000 | unter ± 100 bis ± 5; zubevorzuzug.: ± 50, ± 25, ± 10, ± 5 | gewünschte Genaulänge und gewünschte zulässige Abweichung in mm |

Tabelle 3

| Dicke s Nennwert | | Zulässige Gewichtsabweichung für Lieferungen | |
|---------------------|-----|---|-----------|
| über | bis | von 5 t und darüber | unter 5 t |
| — | 5 | ± 6 % | ± 8 % |
| 5 | 60 | ± 4 % | ± 5,3 % |

6. Lieferart

6.1. Für die Lieferung von warmgewalztem Flachstahl gelten die Längenangaben nach Tabelle 4.

6.2. Bei Bestellung nach Gewicht darf die Länge zwischen den für die Herstelllungen angegebenen größten und kleinsten Maßen schwanken.

6.3. Bestellbeispiele

100 t warmgewalzter Flachstahl von Breite $b = 40$ mm und Dicke $s = 12$ mm aus einem Stahl mit dem Kurznamen US1 37-2 oder der Werkstoffnummer 1.0112 nach DIN 17 100 in Herstelllungen:

100 t Flach 40 × 12 DIN 1017 — US1 37-2
oder 100 t Flach 40 × 12 DIN 1017 — 1.0112

7. Prüfung der Maßhaltigkeit

7.1. Prüfumfang

Die Anzahl der Stäbe, an denen die Maßhaltigkeit bei der Ablieferung beim Hersteller gemessen werden soll, ist bei der Bestellung zu vereinbaren.

7.2. Durchführung der Prüfung

7.2.1. Die Dicke und Breite nach Abschnitt 3.1 werden bei der Lieferung in Herstelllungen in mindestens 150 mm Abstand vom Ende der Stäbe gemessen, bei Lieferung von fest- und Genauängen beliebig.

7.2.2. Bei Prüfung der Geradheit nach Abschnitt 3.2 ist das Maß q über die Gesamtlänge des Stabes zu messen.

| Stabstahl | | DIN 1017 Blatt 2 |
|--|--|--|
| Warmgewalzter Flachstahl | | |
| für besondere Verwendung (in Stabziehereien, Schraubenwerken usw.) Maße, Gewichte, Zulässige Abweichungen | | |
| Steel bars; hot rolled flats for special application (bar drawing mills, screw factories etc.), dimensions, weights, tolerances | | Zugleich Ersatz für die Festlegungen über Flachstahl im Abschnitt D II von DIN 1612, Ausgabe März 1943 x |
| Die in dieser Norm genannten Werte für zulässige Abweichungen stimmen mit den entsprechenden Angaben in Euronorm 35-62 — Warmgewalzter Stabstahl für allgemeine Verwendung, zulässige Abweichungen — überein, jedoch mit der einen Ausnahme, daß bis zur Breite 33,5 die zulässige Breitenabweichung ± 0,75 beträgt anstatt ± 1,0. | | |
| Maße in mm | | |
| 1. Geltungsbereich | | |
| Diese Norm gilt für warmgewalzten Flachstahl aus den in Abschnitt 4 genannten Stahlsorten, der zusätzlich zu den in DIN 1017 Blatt 1 angeführten Abmessungen in dem in Tabelle 1 angegebenen Querschnittsbereich vor allem in Stabziehereien und Schraubenwerken benötigt wird. | | |
| DIN 1017 Blatt 1 behandelt warmgewalzten Flachstahl für allgemeine Verwendung. | | |
| Diese Norm gilt nicht für: | | |
| Warmgewalzten Federstahl für geschichtete Blattfedern (siehe DIN 4620) | | |
| Flachwalzdraht (siehe DIN 59 110) | | |
| Warmgewalzten Bandstahl (siehe DIN 1014) | | |
| Warmgewalzten Breiflachstahl (siehe DIN 59 200) | | |
| 2. Bezeichnung | | |
| | | |
| Bezeichnung eines warmgewalzten Flachstahles von Breite $b = 48$ mm und Dicke $s = 20$ mm aus einem Stahl mit dem Kurznamen S1 37-2 bzw. der Werkstoffnummer 1.0112 nach DIN 17 100: | | |
| Flach 48 × 20 DIN 1017 — S1 37-2 oder Flach 48 × 20 DIN 1017 — 1.0112 | | |
| An Stelle der ausgeschriebenen Benennung „Flach“ kann auch die vereinfachte Schreibweise „F1“ oder „□“ nach DIN 1353 gewählt werden. | | |
| 3. Maße und zulässige Maß- und Formabweichungen | | |
| 3.1. Breiten und Dicken | | |
| 3.1.1. Die Breiten und Dicken, mit denen Flachstahl bevorzugt geliefert wird, und deren zulässige Maßabweichungen sind in Tabelle 1 enthalten. | | |
| Erläuterungen siehe DIN-Mitteilungen Bd. 41 (1962) Heft 11, Seite 517-519. | | |
| Fortsetzung Seite 2 und 3 | | |
| Fachnormenausschuß Eisen und Stahl im Deutschen Normenausschuß (DNA) | | |

Tabelle 1

| Breite b) f_1 | Dicke s) zulässige Abweichung | | | | | | | | | | | Gewicht in kg/m | | | | | | | | | | | |
|-----------------------|-------------------------------------|------|---|------|------|------|------|------|------|------|----|-----------------|------|------|------|------|------|--------|------|--------|------|----|----|
| | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 20 | 22 | 24 | 27 | 30 | 32 | 34 | 42 | 43 | 53 |
| 21,5 | - | - | - | 1,25 | - | 1,69 | 1,86 | 2,03 | 2,19 | 2,36 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 23,5 | - | - | - | - | 1,84 | - | 2,29 | 2,40 | 2,57 | 2,77 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 26,5 | - | - | - | 1,87 | - | 2,29 | 2,72 | 2,91 | 3,11 | 3,33 | - | - | - | 4,58 | - | - | - | - | - | - | - | - | - |
| 31,5 | 1,24 | 1,48 | - | 1,73 | - | 2,63 | - | 3,16 | - | - | - | - | 4,20 | 4,47 | 5,26 | 5,79 | - | - | - | - | - | - | - |
| 33,5 | - | - | - | 1,72 | - | 2,58 | - | 3,15 | - | 4,01 | - | - | 4,87 | - | 6,30 | - | 7,74 | - | - | - | - | - | - |
| 36,5 | - | - | - | 1,95 | - | 2,28 | - | 2,93 | - | 4,56 | - | - | 5,54 | - | 7,17 | - | 8,80 | - | 10,4 | 11,1 | - | - | - |
| 41,5 | - | - | - | 2,19 | - | 2,56 | - | 3,29 | - | 4,02 | - | - | 6,21 | - | 8,03 | - | 9,86 | - | 12,4 | - | - | - | - |
| 45 | - | - | - | - | - | - | - | - | - | - | - | - | 7,54 | - | - | - | - | - | - | - | - | - | - |
| 46,5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 48 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 51,5 | - | - | - | 2,43 | - | 2,83 | - | 3,64 | - | 4,45 | - | - | 6,87 | - | 8,89 | - | 10,9 | (12,1) | 12,9 | (13,7) | - | - | - |
| 55 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 56,5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 57 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 61,5 | - | - | - | 2,90 | - | 3,38 | - | 4,34 | - | 5,79 | - | - | 8,21 | - | 10,6 | - | 13,0 | - | 15,4 | - | 20,3 | - | - |
| 65 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 70 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 72 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 75 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 80 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 82 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 85 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 92 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 102 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 122 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

1) Nur die durch Angabe ihrer Gewichtsgetrennschneidern, Größen fallen unter diese Norm. Größen, deren Gewichtswerte in Klammern gesetzt sind, sollen nach Möglichkeit vermieden werden.

3.2. Geradheit
Für die Geradheit von Flachstahl nach dieser Norm gelten die zulässigen Abweichungen nach Tabelle 2.



Tabelle 2

| über | bis | Zulässige Abweichung von der Geradheit g |
|------|------|--|
| | | |
| - | 1000 | $0,004 \cdot l$ |
| 1000 | - | $0,0025 \cdot l$ |

Weitergehende Anforderungen an die Geradheit sind bei der Bestellung zu vereinbaren.

4. Werkstoff
Flachstahl nach dieser Norm wird vorzugsweise aus den Stählen St 37 und St 37-2 nach DIN 17 100 hergestellt. Die gewünschte Stahlsorte ist bei der Bestellung anzugeben.

5. Gewicht und zulässige Gewichtsabweichungen

5.1. Das in Tabelle 1 angegebene Gewicht ist mit einer Dichte von $7,85 \text{ kg/dm}^3$ aus dem Querschnitt errechnet.
5.2. Die zulässigen Gewichtsabweichungen in Prozenten des Gesamtgewichtes sind Tabelle 3 zu entnehmen. Als Gewichtsabweichung in diesem Sinne gilt der Unterschied zwischen dem tatsächlichen Liefergewicht und dem aus dem Gewicht nach Tabelle 1 und (bei Bestellung von Herstelllängen) der gelieferten Meter oder (bei Bestellung von Fest- und Genauhlängen) der bestellten Meter errechneten Gewicht.

Tabelle 3

| Längenart | Länge | | Bestellangabe für die Länge |
|---------------|------------------|---|---|
| | Bereich | zulässige Abweichung | |
| Herstelllänge | 3 000 bis 12 000 | beliebig zwischen 3 000 und 12 000 | keine |
| Festlänge | bis 12 000 | ± 100 | gewünschte Festlänge in mm |
| Genaulänge | bis 12 000 | unter ± 100 bis ± 5 ; zu bevorzugen: ± 50 , ± 25 , ± 10 , ± 5 | gewünschte Genaulänge und gewünschte zulässige Abweichung in mm |

Tabelle 3

| Dicke s Nennwert | Zulässige Gewichtsabweichung für Lieferungen | |
|-----------------------|--|---------------------|
| | über | bis |
| - | 5 | von 5 t und darüber |
| 5 | 53 | unter 5 t |

6. Lieferart
6.1. Für die Lieferung von warmgewalztem Flachstahl gelten die Längenangaben nach Tabelle 4.
6.2. Bei Bestellung nach Gewicht darf die Länge zwischen den für die Herstelllängen angegebenen größten und kleinsten Maßen schwanken.

6.3. Bestellbeispiel
100 t warmgewalzter Flachstahl von Breite $b = 48 \text{ mm}$ und Dicke $s = 20 \text{ mm}$ aus einem Stahl mit dem Kurznamen St 37-2 bzw. der Werkstoffnummer 1.0112 nach DIN 17 100 in Herstelllänge:
100 t Flach 48×20 DIN 1017 - St 37-2
oder 100 t Flach 48×20 DIN 1017 - 1.0112

7. Prüfung der Maßhaltigkeit
7.1. Prüfumfang
Die Anzahl der Stäbe, an denen die Maßhaltigkeit bei der Ablieferung beim Hersteller gemessen werden soll, ist bei der Bestellung zu vereinbaren.

7.2. Durchführung der Prüfung
7.2.1. Die Dicke und Breite nach Abschnitt 3.1 werden bei der Lieferung in Herstelllängen in mindestens 150 mm Abstand vom Ende der Stäbe gemessen, bei Lieferung von Fest- und Genauhlängen beliebig.
7.2.2. Bei Prüfung der Geradheit nach Abschnitt 3.2 ist das Maß g über die Gesamtlänge des Stabes zu messen.

503

De voor- en nadelen van de drie verschillende uitgangsmaterialen zullen hieronder kort besproken worden.

Strip: * Kosten Fl 730.000,- / jaar

- * Alle gewenste maten (breedte en dikte) leverbaar
- Moet waarschijnlijk gericht worden, alvorens te bestellen
- 35 verschillende maten op voorraad nodig
- Hier afval toe coil (Hinder toe plaat)
- In één serie marktbaarheid toe coil en plaat
- Grote breedte en dikte tolerances
- Last van subelcoming

Coil: * Hinder afval dan bij strip of plaat

- * In één serie weinig marktbaarheid
- Kosten Fl 839.000,- / jaar
- Niet alle maten leverbaar.
- Richt- en afwerkings machines nodig
- Extra last en los gewicht nodig vanwege het leveringsgewicht (5 Ton en 10 Ton)
- Grote toleranties op materiaal breedte
- Last van subelcoming

Plaat: * Alle productafmetingen zijn te maken

- * Slechts 3 maten plaat op voorraad nodig (2,6 Plaat)
- * Plaatbewerkingsmachines zijn volop in de handel verkrijgbaar
- Kosten Fl 207.000,- / jaar
- Extra bewerking nodig van het origineel van de zijden van het product.
- Hier afval toe coil of strip
- Grote dikte toleranties
- Meer marktlijke toe coil in één serie
- Prijs plaatmateriaal erg marktgevoelig

| MAAT | VERBRUK [M] | KOSTEN [FL] |
|-------|-------------|-------------|
| 12x5 | 3750 | 2550 |
| 20x5 | 2268 | 1792 |
| 25x5 | 3400 | 3366 |
| 30x5 | 20122 | 22939 |
| 40x5 | 8449 | 12589 |
| 45x5 | 105 | 191 |
| 50x5 | 20964 | 38993 |
| 60x5 | 589 | 1284 |
| 75x5 | 12211 | 38831 |
| 100x5 | 12273 | 42048 |
| 120x5 | 2110 | 10508 |
| 130x5 | 3748 | 22600 |
| 150x5 | 8374 | 58199 |
| 25x6 | 1211 | 1368 |
| 30x6 | 5389 | 7275 |
| 40x6 | 8086 | 14474 |
| 50x6 | 18522 | 40563 |
| 75x6 | 7886 | 26418 |
| 100x6 | 14060 | 65520 |
| 120x6 | 4468 | 26004 |
| 130x6 | 2855 | 19614 |
| 150x6 | 4628 | 35404 |
| 180x6 | 511 | 5928 |
| 20x8 | 125 | 153 |
| 25x8 | 2011 | 4160 |
| 30x8 | 15072 | 27280 |
| 40x8 | 23409 | 61800 |
| 50x8 | 13368 | 41345 |
| 60x8 | 3891 | 13580 |
| 75x8 | 12214 | 57528 |
| 80x8 | 68 | 311 |
| 100x8 | 5712 | 33587 |
| 120x8 | 4431 | 31416 |
| 130x8 | 487 | 4378 |
| 150x8 | 3419 | 31694 |
| 70x8 | 747 | 2980 |

TOTAAL

FI 808.670,-

Betaalt UST 37-2
in lengten van 6 m
volgens DIN 17100
en DIN 1017
dikten 5, 6 en 8 mm

leveringsconditiesdikte: 5, 6, 8 mm ± 0,5Breedte: 12 1/2 mm 35 mm ± 0,75

38 1/2 mm 75 mm ± 1,0

80 1/2 mm 100 mm ± 1,5

110 1/2 mm 120 mm ± 2,0

130 1/2 mm 150 mm ± 2,5

lengte:

3000 mm ± 100

6000 mm ± 100

12000 mm ± 100

Op bestelling nauw-
keurige lengten
tot ± 5 mm

Prijzen in 1984 zal
10% lager liggen 10 m
andere leveringen

| Maat | VERBODEN | | KOSTEN (FL) | Min. best. | Vormaat (pauz) |
|-------|----------------|--------|-------------|------------|----------------|
| | INZ | [K.G.] | | | |
| 12x5 | 3750 | 1000 | 2133 | 5 Ton | 2,0 |
| 20x5 | 2260 | 1000 | 1908 | 5 | 2,0 |
| 25x5 | 3400 | 3300 | 3252 | 5 | 1,5 |
| 30x5 | 20122 | 23700 | 26260 | 5 | 1,05 |
| 40x5 | 8449 | 13300 | 14671 | 5 | 1,1 |
| 45x5 | 105 | 200 | 205 | 5 | 47,6 |
| 50x5 | 20564 | 41100 | 45034 | 5 | 1,1 |
| 60x5 | 585 | 1400 | 1523 | 5 | 3,6 |
| 70x5 | 12211 | 36000 | 38951 | 5 | 1,1 |
| 100x5 | 11273 | 44300 | 47103 | 10 | 1,1 |
| 120x5 | 2110 | 10000 | 10595 | 10 | 1,0 |
| 130x5 | 3740 | 15200 | 20397 | 10 | 1,0 |
| 150x5 | 8374 | 49300 | 52035 | 10 | 1,0 |
| 23x6 | 1211 | 1400 | 1596 | 5 | 3,5 |
| 30x6 | 5385 | 7600 | 2404 | 5 | 1,3 |
| 40x6 | 8086 | 15200 | 16813 | 5 | 1,3 |
| 50x6 | 10522 | 52400 | 57449 | 5 | 1,0 |
| 75x6 | 7886 | 27000 | 30203 | 5 | 1,1 |
| 100x6 | 14060 | 66200 | 70527 | 10 | 1,05 |
| 120x6 | 4460 | 15300 | 26844 | 10 | 1,2 |
| 130x6 | 2855 | 17300 | 18600 | 10 | 1,1 |
| 150x6 | 4620 | 32700 | 34455 | 10 | 1,2 |
| 170x6 | 9511 | 43000 | 4560 | 10 | 2,3 |
| 20x0 | 123 | — | — | — | — |
| 23x0 | 2011 | 3000 | 3995 | 5 | 1,4 |
| 40x0 | 15077 | 20500 | 31500 | 5 | 1,0 |
| 40x0 | 23409 | 50700 | — | — | 61800 |
| 50x0 | 13560 | 43000 | — | — | 41345 |
| 60x0 | 3091 | 14700 | — | — | 13500 |
| 70x0 | 747 | — | — | — | 2980 |
| 75x0 | 12214 | 3200 | — | — | 57520 |
| 80x0 | 747 | 300 | — | — | 311 |
| 100x0 | 5712 | 35900 | 38920 | 10 | 1,1 |
| 120x0 | 4431 | 33400 | 36249 | 10 | 1,2 |
| 130x0 | 407 | 4000 | 4311 | 10 | 2,5 |
| 150x0 | 3415 | 32200 | 34703 | 10 | 1,2 |

Kosten strip
Fl 153

61800
41345
13500
2980
57520
311

177.697

Total coil 684.042

Total 861.739

Stel plaatafmeting
dunwandig:

2000 x 6000 mm

d = 5 mm

601 platen

| |
|----------|
| S+37-2 |
| DIN 1543 |

RQ

d = 6 mm

431 platen

| |
|---------|
| 207.254 |
| 243.251 |

RQ

d = 8 mm

424 platen

| |
|---------|
| 319.119 |
|---------|

RQ

Totaal

| |
|---------|
| 849.664 |
|---------|

Toleranties:
(DIN 1543)

dikte

5 $\geq \pm 0,9$

6 $\geq \pm 0,9$

7 $\geq \pm 1,2$

breedte en lengte : $\pm 0,5\%$

inclus 2000 ± 10

6000 ± 30

Staalplaat S+37-2 (\approx u staal) (± 50 gulden / ton goedkoper dan RQ staal.)

d = 5 mm 601 platen = Fl. 273.082,-

d = 6 mm 431 platen = Fl. 231.111,-

d = 8 mm 424 platen = Fl. 303.142,-

Totaal

Fl. 807.335,-

Een hele voor- en nadelen van
diverse bewerkingstechnieken

- Ponsen: voordelen:
- Hoog productiesnelheid
 - "eenvoudige aandrijving" (goedkoop)
 - Nauwkeurig
 - geen braamvorming
 - Flexibel: Door toepassing van meerdere gereedschappen is een groot aantal producttypen te maken

- nadelen
- lawaai
 - Meerdere gereedschappen nodig
 - Gereedschapsstijging

- Knubbalen: voordelen
- Afhangelijk van gereedschapsafmeting hoge productiesnelheid
 - Flexibel: Kan met één gereedschap een groot aantal verschillende producttypen maken

- nadelen
- Geen braamvorming
 - "Gereedschaps" machine
 - lawaai
 - Gereedschapsstijging
 - grote snede breedte bij het maken van sneden (ca 2 mm bij 2 mm materiaal dikte)

Autogeen snijden : voordelen : + flexibel : veel producttypen
 machbaar
 + relatief goedkope installatie

nadelen : - Grote warmtebehoefte
~~besontere~~ producten
 - Braamvorming
 - Starttijd : voor het snijden
 beugelen heen worden eerst eerst
 product voorverwarmd worden
 dus is dit proces niet geschikt
 voor het maken van hete sneden
 - Afwijzig installatie nodig voor
 afvoer procesgassen.

Plasma snijden voordelen + flexibel
 + kleinere warmtebehoefte
 zone dan autogeen
 + sneller dan autogeen

nadelen - Braamvorming
 - relatief dure installatie
 (duurder dan autogeen)
 - Starttijd : voor het opstarten
 van de boeg is tijd nodig.
 Daarna kan pas gestart worden
 met snijden
 - Grotere snedebreedte dan
 bij autogeen
 - Afwijzig installatie nodig
 voor afvoeren procesgassen.

- Knippen voordelen
- hoge productiesnelheid, vooral voor het aanbrengen van korte rechte sneden
 - geen warmtebeïnvloeding product
 - Machine relatief goedkoop
 - geen snedebreuk
 - geen braamvorming

- Nadelen
- alleen geschikt voor het aanbrengen van rechte sneden.
 - gereedschap slijtage
 - lawaai

- Magen voordelen
- "uiterlijk" snede beter dan pouse knippen of snijden
 - geen braamvorming
 - machine relatief goedkoop
 - kan ook niet-rechte snedes maken

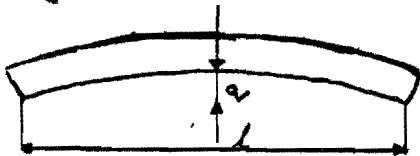
- Nadelen
- lagere productiesnelheid dan knippen
 - Gereedschaps slijtage
 - niet geschikt voor maken van gaten

- Boren: voordelen
- hoge productieve nauwkeurigheid

- Nadelen
- lage productiesnelheid
 - alleen geschikt voor ~~aanbrengen~~ het maken van gaten (ronde)
 - Gereedschaps slijtage

Metingen mbt de sabelkromheid v/h uitgangsmateriaal

Het strip materiaal wordt geleverd volgens DIN 1017. Volgens deze norm moogen strippen met een lengte van 6 m de volgende sabelkromheid hebben:



$$b \times d < 1000 \text{ mm}^2 \rightarrow q = 0,004 \ell$$

$$b \times d \geq 1000 \text{ mm}^2 \rightarrow q = 0,0025 \ell$$

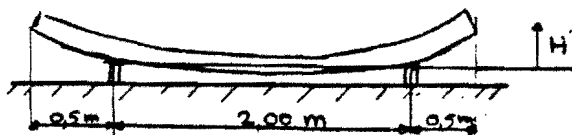
afmeting: 12×5 Tm $150 \times 6 \rightarrow q = 24 \text{ mm}$

130×8 ; 150×8 ; $180 \times 6 \rightarrow q = 15 \text{ mm}$

Om na te gaan of het geleverde materiaal een derlike extreme waarde q heeft, en hoedene q varieert over de striplengte (afloeiend of slijpwaarts) het is enkele strippen nagemeten.

Deze meting gebeurde als volgt:

Een strip van 6 m wordt doormidden geflinipt, ende sneede wordt gemarkeert. De stukken van 3 m worden met de smelste mijele (cubik) op 2 eindmaten gelegd welke op een



vloetafel liggen. Gemeten wordt de hoogte H aan de bovenzijde van de strip waarna de breedte ervan wordt afgelezen waarna men H leest. H is de afstand v/donderzijde van de strip tot de neutrale lijn tussen de twee eindmaten.

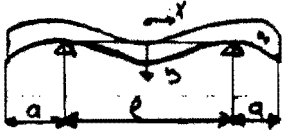
Omdat men ook de doorbuiging van de strip tegen het eigen gewicht meet moet H hierop gecorrigeerd worden.

Daarna wordt een lijn getrokken tussen de twee uiteinden van de strip en de afstand tot deze rechte lijn daerwaer wordt q gemeten. Indien q nuwel positief als negatief is, wordt getrokken naar de minimale afstand tussen twee parallelle lijnen waartussen de strip gelegd kan worden.

Om zeker te weten dat de goede maat H' wordt gemeten mag de strip niet geborderd zijn. Tijdens het meten is dan ook steeds getoetst of de strip haaks op de vlakke zijde stond. De maximale tordering van de strip bedroeg nie meer dan $0,5^\circ$. De hieruit voortvloeiende fout in H' bedraagt dan $(1 - \cos 0,5^\circ) \times H' = 0,00003 H'$ ~~voor~~ Voor een breedte van 100 mm is de fout dan 0,0030 mm. Om ook rekening te houden met aflesfouten en de nauwkeurigheid van de afgeleide meetapparatuur kan men zeggen dat de nauwkeurigheid van de metingen 0,05 mm is.

Een uit spraak over de sabelkromheid van de strip over een lengte van 6 m is moeilijk te doen. Bij het doorsnijden van de strip is zoveel mogelijk geprobeerd deze snede haaks op de lengterichting van de strip te zetten. Het nauwkeurig van deze haak is vrij moeilijk en een fout hierin van $0,5^\circ$ geeft een fout in H van $\approx 3,6$ mm aan het uiteinde van de strip.

De gecontroleerde strips waren allen gemiddeld. De maximale sabelkromheid over een lengte van 3 m bedroeg 4,2 mm (30x8). De verandering van q over deze lengte is geleidelijk waardoor de strip vorma gbooid te worden is.

Correctie op doorbuiging

$$y = \frac{q l^4}{16EI} \left\{ 1 - \frac{4x^2}{l^2} \right\} \left\{ \frac{5}{24} - \frac{a^2}{l^2} - \frac{1}{6} \frac{x^2}{l^2} \right\}$$

$$a = 0,5 \text{ m} \quad l = 2,0 \text{ m}$$

$$E = 21 \cdot 10^9 \text{ N/m}^2$$

$$\text{Ship } 30 \times 8 : I = 1,8 \cdot 10^{-8} \text{ m}^4$$

$$q = 1,88 \text{ kg/m} = 18,4 \text{ N/m}$$

| | | | | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|-----|
| x | 0 | 0,1 | 0,2 | 0,3 | 0,4 | 0,5 | 0,6 | 0,7 | 0,8 | 0,9 | 1,0 | 1,1 | 1,2 | 1,3 | 1,4 | 1,5 | [m] |
| y | 7,1 | 7,0 | 6,7 | 6,3 | 5,7 | 4,9 | 4,1 | 3,1 | 2,1 | 1,6 | 0,6 | -0,9 | -1,8 | -2,5 | -3,0 | -3,2 | [m] |

$$\text{Ship } 50 \times 5 : I = 5,2 \cdot 10^{-8} \text{ m}^4$$

$$q = 1,56 \text{ kg/m} = 15,2 \text{ N/m}$$

| | | | | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|-----|
| x | 0 | 0,1 | 0,2 | 0,3 | 0,4 | 0,5 | 0,6 | 0,7 | 0,8 | 0,9 | 1,0 | 1,1 | 1,2 | 1,3 | 1,4 | 1,5 | [m] |
| y | 2,6 | 2,5 | 2,4 | 2,3 | 2,1 | 1,8 | 1,5 | 1,1 | 0,8 | 0,4 | 0,0 | -0,4 | -0,7 | -0,9 | -1,1 | -1,1 | [m] |

$$\text{Ship } 100 \times 6 : I = 5 \cdot 10^{-7} \text{ m}^4$$

$$q = 4,71 \text{ kg/m} = 46,2 \text{ N/m}$$

| | | | | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|-----|
| x | 0 | 0,1 | 0,2 | 0,3 | 0,4 | 0,5 | 0,6 | 0,7 | 0,8 | 0,9 | 1,0 | 1,1 | 1,2 | 1,3 | 1,4 | 1,5 | [m] |
| y | 0,6 | 0,6 | 0,6 | 0,6 | 0,5 | 0,4 | 0,4 | 0,3 | 0,2 | 0,0 | 0,0 | -0,0 | -0,2 | -0,2 | -0,3 | -0,3 | [m] |

Strip 50x5

swede

B

B

swede

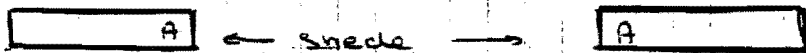
| X [mm] | H [mm] | H _{gecor} [mm] | q [mm] | H [mm] | H _{gecor} [mm] | q [mm] |
|-----------|-----------|----------------------------|-----------|-----------|----------------------------|-----------|
| 0,0 | 0,73 | 0,62 | 0,00 | 0,07 | -0,04 | 0,00 |
| 0,1 | 0,51 | 0,40 | -0,21 | 0,09 | -0,02 | 6,02 |
| 0,2 | 0,34 | 0,25 | -0,35 | 0,09 | -0,00 | 0,03 |
| 0,3 | 0,13 | 0,06 | -0,53 | 0,03 | -0,04 | 0,01 |
| 0,4 | 0,00 | 0,04 | -0,62 | 0,00 | -0,04 | 0,02 |
| 0,5 | 0,00 | 0,00 | -0,57 | 0,00 | 0,00 | 0,02 |
| 0,6 | 0,00 | +0,04 | -0,51 | -0,10 | -0,06 | -0,05 |
| 0,7 | -0,13 | -0,05 | -0,59 | -0,10 | -0,10 | -0,09 |
| 0,8 | -0,28 | -0,17 | -0,70 | -0,16 | 0,05 | -0,05 |
| 0,9 | -0,40 | -0,25 | -0,77 | -0,14 | 0,01 | 0,01 |
| 1,0 | -0,44 | -0,26 | -0,77 | -0,09 | 0,09 | -0,00 |
| 1,1 | -0,39 | -0,18 | -0,68 | -0,13 | 0,08 | -0,07 |
| 1,2 | -0,36 | -0,13 | -0,62 | -0,25 | -0,02 | -0,04 |
| 1,3 | -0,53 | -0,29 | -0,77 | -0,31 | -0,07 | -0,09 |
| 1,4 | -0,55 | -0,30 | -0,77 | -0,51 | -0,25 | -0,28 |
| 1,5 | -0,62 | -0,36 | -0,82 | -0,47 | -0,21 | -0,24 |
| 1,6 | -0,51 | -0,26 | -0,70 | -0,43 | -0,18 | -0,21 |
| 1,7 | -0,57 | -0,33 | -0,76 | -0,37 | -0,13 | -0,17 |
| 1,8 | -0,57 | -0,34 | -0,76 | -0,25 | -0,12 | -0,16 |
| 1,9 | -0,44 | -0,23 | -0,64 | -0,13 | 0,00 | 0,03 |
| 2,0 | -0,38 | -0,20 | -0,60 | -0,07 | 0,11 | 0,06 |
| 2,1 | -0,34 | -0,19 | -0,58 | -0,09 | 0,06 | 0,00 |
| 2,2 | -0,18 | -0,07 | -0,45 | -0,07 | 0,04 | -0,02 |
| 2,3 | -0,14 | -0,06 | -0,43 | -0,07 | 0,01 | -0,06 |
| 2,4 | -0,08 | -0,04 | -0,40 | -0,00 | -0,04 | -0,11 |
| 2,5 | 0,00 | 0,00 | -0,35 | 0,00 | 0,00 | -0,00 |
| 2,6 | 0,07 | 0,03 | -0,30 | 0,00 | -0,04 | -0,12 |
| 2,7 | 0,13 | 0,06 | -0,26 | 0,06 | -0,01 | -0,10 |
| 2,8 | 0,25 | 0,16 | -0,15 | 0,13 | -0,04 | -0,05 |
| 2,9 | 0,28 | 0,17 | -0,13 | 0,10 | 0,07 | -0,03 |
| 3,0 | 0,40 | 0,29 | 0,00 | 0,21 | 0,10 | 0,00 |

0,82

-0,02

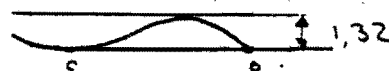
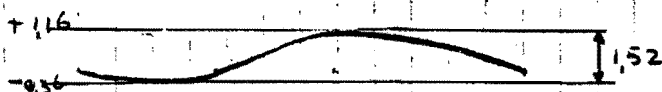
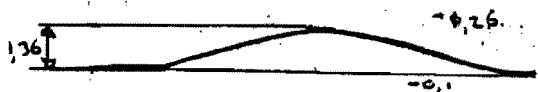
-0,20

Ship 50x5

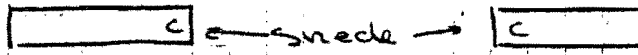


| X [m] | H [mm] | H _{gecor} [mm] | q [mm] |
|-------|--------|-------------------------|--------|
| 0.0 | -0.34 | -0.45 | 0 |
| 0.1 | -0.39 | -0.50 | -0.06 |
| 0.2 | -0.36 | -0.45 | -0.02 |
| 0.3 | -0.29 | -0.36 | -0.06 |
| 0.4 | -0.00 | -0.12 | 0.04 |
| 0.5 | 0.00 | 0.00 | 0.39 |
| 0.6 | 0.00 | 0.04 | 0.42 |
| 0.7 | 0.14 | 0.22 | 0.59 |
| 0.8 | 0.20 | 0.31 | 0.67 |
| 0.9 | 0.23 | 0.38 | 0.73 |
| 1.0 | 0.30 | 0.48 | 0.82 |
| 1.1 | 0.51 | 0.72 | 1.05 |
| 1.2 | 0.62 | 0.86 | 1.18 |
| 1.3 | 0.68 | 0.87 | 1.17 |
| 1.4 | 0.66 | 0.91 | 1.20 |
| 1.5 | 0.72 | 0.90 | 1.26 |
| 1.6 | 0.66 | 0.91 | 1.18 |
| 1.7 | 0.71 | 0.95 | 1.21 |
| 1.8 | 0.72 | 0.95 | 1.20 |
| 1.9 | 0.45 | 0.66 | 0.89 |
| 2.0 | 0.33 | 0.51 | 0.73 |
| 2.1 | 0.34 | 0.49 | 0.70 |
| 2.2 | 0.24 | 0.35 | 0.55 |
| 2.3 | 0.27 | 0.35 | 0.54 |
| 2.4 | 0.25 | 0.29 | 0.47 |
| 2.5 | 0.00 | 0.00 | 0.16 |
| 2.6 | -0.13 | -0.17 | -0.01 |
| 2.7 | -0.17 | -0.24 | -0.10 |
| 2.8 | -0.05 | -0.14 | -0.01 |
| 2.9 | 0.00 | -0.11 | 0.01 |
| 3.0 | 0.00 | -0.11 | 0.00 |

| H [mm] | H _{gecor} [mm] | q [mm] |
|--------|-------------------------|--------|
| 0.60 | 0.49 | 0 |
| 0.39 | 0.28 | -0.18 |
| 0.32 | 0.23 | -0.20 |
| 0.17 | 0.10 | -0.30 |
| 0.05 | 0.01 | -0.36 |
| 0.00 | 0 | -0.34 |
| 0.07 | 0.11 | -0.26 |
| 0.17 | 0.25 | -0.02 |
| 0.22 | 0.33 | 0.07 |
| 0.28 | 0.43 | 0.20 |
| 0.31 | 0.49 | 0.29 |
| 0.42 | 0.63 | 0.46 |
| 0.58 | 0.81 | 0.67 |
| 0.66 | 0.90 | 0.79 |
| 0.78 | 1.03 | 0.95 |
| 0.77 | 1.03 | 0.90 |
| 0.91 | 1.16 | 1.14 |
| 0.91 | 1.15 | 1.16 |
| 0.82 | 1.05 | 1.09 |
| 0.77 | 0.90 | 1.05 |
| 0.76 | 0.94 | 1.04 |
| 0.76 | 0.91 | 1.04 |
| 0.73 | 0.84 | 1.00 |
| 0.47 | 0.55 | 0.73 |
| 0.17 | 0.21 | 0.42 |
| 0.08 | 0 | 0.24 |
| -0.07 | -0.11 | 0.16 |
| -0.21 | -0.28 | 0.02 |
| -0.27 | -0.37 | 0.00 |
| -0.27 | -0.30 | -0.02 |
| -0.28 | -0.39 | 0 |

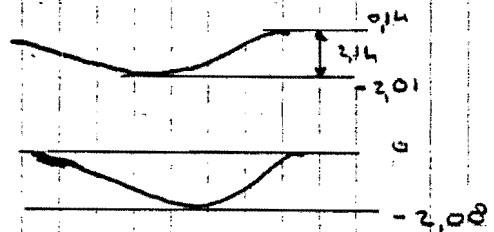
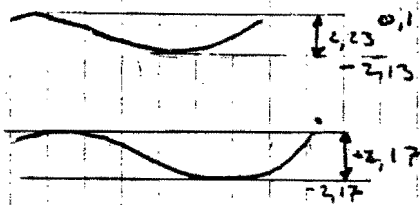


Strip 50x5

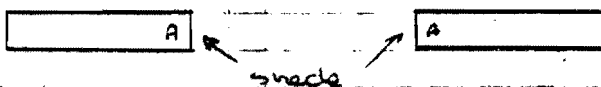


| X [m] | H [mm] | H _{gocor} [mm] | q [mm] |
|-------|--------|-------------------------|--------|
| 0,0 | 0,27 | 0,16 | 0,00 |
| 0,1 | 0,39 | 0,20 | +0,10 |
| 0,2 | 0,30 | 0,27 | 0,07 |
| 0,3 | 0,45 | 0,30 | 0,16 |
| 0,4 | 0,27 | 0,23 | -0,01 |
| 0,5 | 0,00 | 0,00 | -0,27 |
| 0,6 | -0,31 | -0,27 | -0,56 |
| 0,7 | -0,61 | -0,53 | -0,84 |
| 0,8 | -0,85 | -0,84 | -1,17 |
| 0,9 | -1,05 | -0,90 | -1,25 |
| 1,0 | -1,17 | -0,98 | -1,36 |
| 1,1 | -1,20 | -1,07 | -1,46 |
| 1,2 | -1,44 | -1,21 | -1,62 |
| 1,3 | -1,50 | -1,34 | -1,77 |
| 1,4 | -1,76 | -1,51 | -1,96 |
| 1,5 | -1,84 | -1,58 | -2,06 |
| 1,6 | -1,82 | -1,57 | -2,07 |
| 1,7 | -1,73 | -1,49 | -2,01 |
| 1,8 | -1,82 | -1,59 | -2,13 |
| 1,9 | -1,73 | -1,52 | -2,00 |
| 2,0 | -1,53 | -1,35 | -1,93 |
| 2,1 | -1,40 | -1,25 | -1,85 |
| 2,2 | -1,20 | -1,09 | -1,71 |
| 2,3 | -0,76 | -0,68 | -1,32 |
| 2,4 | -0,41 | -0,37 | -1,03 |
| 2,5 | 0,00 | 0,00 | -0,60 |
| 2,6 | 0,39 | 0,35 | -0,36 |
| 2,7 | 0,67 | 0,60 | -0,13 |
| 2,8 | 0,80 | 0,71 | -0,04 |
| 2,9 | 0,87 | 0,76 | -0,01 |
| 3,0 | 0,90 | 0,79 | 0,00 |

| H [mm] | H _{gocor} [mm] | q [mm] |
|--------|-------------------------|--------|
| 0,29 | 0,10 | 0,00 |
| 0,25 | 0,14 | -0,06 |
| 0,24 | 0,15 | -0,06 |
| 0,12 | 0,05 | -0,10 |
| 0,03 | -0,01 | -0,25 |
| 0,00 | 0,00 | -0,26 |
| 0,06 | 0,10 | -0,17 |
| 0,04 | 0,12 | -0,17 |
| 0,03 | 0,14 | -0,17 |
| -0,11 | 0,04 | -0,20 |
| -0,42 | -0,24 | -0,50 |
| -0,65 | -0,44 | -0,73 |
| -0,94 | -0,71 | -1,00 |
| -1,03 | -0,79 | -1,17 |
| -1,10 | -0,93 | -1,33 |
| -1,40 | -1,22 | -1,64 |
| -1,64 | -1,39 | -1,82 |
| -1,67 | -1,43 | -1,80 |
| -1,70 | -1,55 | -2,01 |
| -1,69 | -1,48 | -1,96 |
| -1,56 | -1,38 | -1,87 |
| -1,10 | -1,03 | -1,54 |
| -0,96 | -0,85 | -1,37 |
| -0,60 | -0,52 | -1,06 |
| -0,20 | -0,24 | -0,80 |
| 0,00 | 0,00 | -0,57 |
| 0,34 | 0,30 | -0,29 |
| 0,77 | 0,70 | 0,10 |
| 0,84 | 0,75 | 0,13 |
| 0,82 | 0,71 | 0,00 |
| 0,76 | 0,65 | 0,00 |

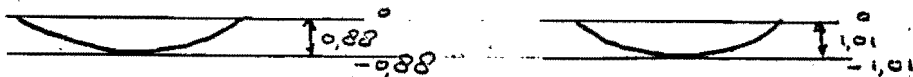


Strip 100x6

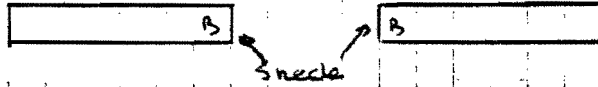


| K [m] | H [mm] | H _{gecorr.} [mm] | q [mm] |
|-------|--------|---------------------------|--------|
| 0,0 | 0,23 | 0,20 | 0,00 |
| 0,1 | 0,20 | 0,17 | -0,05 |
| 0,2 | 0,15 | 0,13 | -0,02 |
| 0,3 | 0,06 | 0,04 | -0,21 |
| 0,4 | 0,00 | 0,00 | -0,27 |
| 0,5 | 0,00 | 0,00 | -0,29 |
| 0,6 | -0,07 | -0,07 | -0,37 |
| 0,7 | -0,10 | -0,16 | -0,48 |
| 0,8 | -0,25 | -0,22 | -0,58 |
| 0,9 | -0,25 | -0,21 | -0,57 |
| 1,0 | -0,22 | -0,18 | -0,55 |
| 1,1 | -0,15 | -0,10 | -0,49 |
| 1,2 | -0,19 | -0,13 | -0,54 |
| 1,3 | -0,25 | -0,19 | -0,62 |
| 1,4 | -0,35 | -0,29 | -0,73 |
| 1,5 | -0,30 | -0,24 | -0,70 |
| 1,6 | -0,30 | -0,24 | -0,72 |
| 1,7 | -0,23 | -0,17 | -0,66 |
| 1,8 | -0,23 | -0,17 | -0,60 |
| 1,9 | -0,26 | -0,21 | -0,74 |
| 2,0 | -0,21 | -0,17 | -0,72 |
| 2,1 | -0,25 | -0,21 | -0,77 |
| 2,2 | -0,24 | -0,21 | -0,79 |
| 2,3 | -0,30 | -0,28 | -0,88 |
| 2,4 | -0,17 | -0,17 | -0,79 |
| 2,5 | 0,00 | 0,00 | -0,63 |
| 2,6 | 0,16 | 0,16 | -0,41 |
| 2,7 | 0,39 | 0,37 | -0,30 |
| 2,8 | 0,47 | 0,45 | -0,24 |
| 2,9 | 0,58 | 0,55 | -0,15 |
| 3,0 | 0,75 | 0,72 | 0,00 |

| H [mm] | H _{gecorr.} [mm] | q [mm] |
|--------|---------------------------|--------|
| 0,73 | 0,70 | 0,00 |
| 0,47 | 0,44 | -0,25 |
| 0,40 | 0,38 | -0,30 |
| 0,20 | 0,10 | -0,50 |
| 0,10 | 0,10 | -0,57 |
| 0,00 | 0,00 | -0,66 |
| -0,00 | -0,00 | -0,73 |
| -0,17 | -0,15 | -0,79 |
| -0,27 | -0,25 | -0,88 |
| -0,42 | -0,38 | -1,01 |
| -0,44 | -0,40 | -1,02 |
| -0,44 | -0,39 | -1,00 |
| -0,46 | -0,40 | -1,00 |
| -0,42 | -0,36 | -0,96 |
| -0,44 | -0,38 | -0,97 |
| -0,43 | -0,37 | -0,95 |
| -0,30 | -0,32 | -0,90 |
| -0,40 | -0,34 | -0,90 |
| -0,35 | -0,29 | -0,85 |
| -0,32 | -0,27 | -0,82 |
| -0,27 | -0,23 | -0,77 |
| -0,20 | -0,16 | -0,69 |
| -0,11 | -0,08 | -0,60 |
| -0,11 | -0,09 | -0,61 |
| -0,05 | -0,05 | -0,56 |
| 0,00 | 0,00 | -0,50 |
| 0,16 | 0,16 | -0,33 |
| 0,20 | 0,26 | -0,22 |
| 0,40 | 0,38 | -0,10 |
| 0,58 | 0,49 | 0,02 |
| 0,49 | 0,46 | 0,00 |

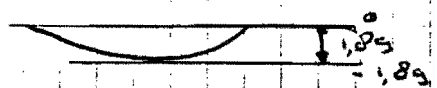
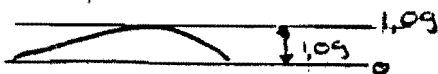


Ship 100 x 6

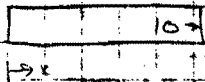


| X [m] | H [mm] | H _{geoc.} [mm] | q |
|-------|--------|-------------------------|-------|
| 0,0 | -0,22 | -0,25 | 0,00 |
| 0,1 | -0,32 | -0,35 | -0,09 |
| 0,2 | -0,30 | -0,32 | -0,04 |
| 0,3 | -0,27 | -0,29 | 0,00 |
| 0,4 | -0,24 | -0,24 | 0,07 |
| 0,5 | 0,00 | 0,00 | 0,32 |
| 0,6 | 0,13 | 0,13 | 0,47 |
| 0,7 | 0,31 | 0,33 | 0,68 |
| 0,8 | 0,42 | 0,45 | 0,81 |
| 0,9 | 0,60 | 0,64 | 1,02 |
| 1,0 | 0,64 | 0,68 | 1,07 |
| 1,1 | 0,60 | 0,65 | 1,06 |
| 1,2 | 0,61 | 0,67 | 1,09 |
| 1,3 | 0,58 | 0,64 | 1,08 |
| 1,4 | 0,55 | 0,61 | 1,06 |
| 1,5 | 0,55 | 0,61 | 1,08 |
| 1,6 | 0,55 | 0,64 | 1,09 |
| 1,7 | 0,54 | 0,60 | 1,09 |
| 1,8 | 0,47 | 0,53 | 1,04 |
| 1,9 | 0,37 | 0,42 | 0,94 |
| 2,0 | 0,30 | 0,34 | 0,88 |
| 2,1 | 0,19 | 0,23 | 0,78 |
| 2,2 | 0,07 | 0,10 | 0,67 |
| 2,3 | 0,00 | 0,02 | 0,60 |
| 2,4 | 0,00 | 0,00 | 0,55 |
| 2,5 | 0,00 | 0,00 | 0,61 |
| 2,6 | -0,04 | -0,04 | 0,58 |
| 2,7 | -0,18 | -0,20 | 0,44 |
| 2,8 | -0,43 | -0,45 | 0,20 |
| 2,9 | -0,52 | -0,55 | 0,12 |
| 3,0 | -0,65 | -0,68 | 0,0 |

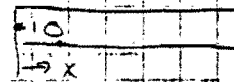
| H [mm] | H _{geoc.} [mm] | q [mm] |
|--------|-------------------------|--------|
| 1,20 | 1,17 | 0,0 |
| 0,71 | 0,68 | -0,40 |
| 0,49 | 0,47 | -0,89 |
| 0,33 | 0,31 | -0,84 |
| 0,14 | 0,14 | -1,01 |
| 0,00 | 0,00 | -1,14 |
| -0,22 | -0,22 | -1,35 |
| -0,36 | -0,34 | -1,47 |
| -0,55 | -0,56 | -1,60 |
| -0,79 | -0,75 | -1,87 |
| -0,82 | -0,78 | -1,89 |
| -0,84 | -0,79 | -1,89 |
| -0,79 | -0,73 | -1,83 |
| -0,75 | -0,69 | -1,78 |
| -0,78 | -0,72 | -1,81 |
| -0,79 | -0,73 | -1,81 |
| -0,77 | -0,71 | -1,78 |
| -0,74 | -0,68 | -1,75 |
| -0,67 | -0,61 | -1,67 |
| -0,64 | -0,59 | -1,65 |
| -0,42 | -0,38 | -1,43 |
| -0,28 | -0,24 | -1,28 |
| -0,31 | -0,28 | -1,32 |
| -0,27 | -0,25 | -1,28 |
| -0,17 | -0,17 | -1,20 |
| 0,00 | 0,00 | -1,02 |
| 0,16 | 0,16 | -0,85 |
| 0,37 | 0,35 | -0,66 |
| 0,64 | 0,62 | -0,38 |
| 0,86 | 0,83 | -0,17 |
| 1,02 | 0,99 | 0,00 |



4



30 x 10



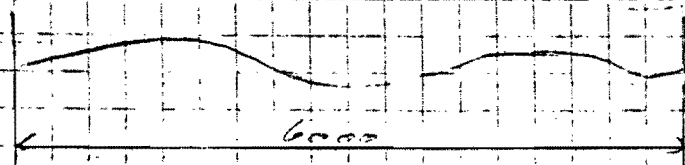
| X [mm] | H [mm] | H _{gecorr.} [mm] | q [mm] |
|--------|--------|---------------------------|--------|
| 0,0 | 2,43 | 2,11 | 0,00 |
| 0,1 | 1,96 | 1,66 | 0,4 |
| 0,2 | 1,54 | 1,69 | 0,4 |
| 0,3 | 0,93 | 0,75 | 0,4 |
| 0,4 | 0,46 | 0,35 | 1,0 |
| 0,5 | 0,00 | 0,00 | 2,1 |
| 0,6 | -0,47 | -0,37 | 3,5 |
| 0,7 | -0,72 | -0,51 | 2,7 |
| 0,8 | -1,34 | -1,03 | 3,2 |
| 0,9 | -1,35 | -1,34 | 3,7 |
| 1,0 | -2,09 | -1,60 | 3,0 |
| 1,1 | -2,34 | -1,77 | 4,0 |
| 1,2 | -2,53 | -1,90 | 4,1 |
| 1,3 | -2,71 | -2,04 | 4,2 |
| 1,4 | -2,73 | -2,03 | 4,2 |
| 1,5 | -2,63 | -1,92 | 4,1 |
| 1,6 | -2,51 | -1,81 | 4,0 |
| 1,7 | -2,46 | -1,79 | 4,0 |
| 1,8 | -2,44 | -1,81 | 4,0 |
| 1,9 | -2,35 | -1,78 | 4,0 |
| 2,0 | -2,08 | -1,55 | 3,8 |
| 2,1 | -1,79 | -1,38 | 3,6 |
| 2,2 | -1,35 | -1,04 | 3,3 |
| 2,3 | -0,93 | -0,72 | 3,0 |
| 2,4 | -0,45 | -0,35 | 2,6 |
| 2,5 | 0,00 | 0,00 | 2,3 |
| 2,6 | +0,51 | 0,42 | 1,9 |
| 2,7 | 1,15 | 0,97 | 1,3 |
| 2,8 | 1,65 | 1,48 | 0,9 |
| 2,9 | 2,18 | 1,86 | 0,4 |
| 3,0 | 2,61 | 2,29 | 0,0 |

| H [mm] | H _{gecorr.} | q [mm] |
|--------|----------------------|--------|
| 1,20 | 0,88 | 0 |
| 1,00 | 0,20 | -0,14 |
| 0,26 | 0,51 | -0,208 |
| 0,37 | 0,19 | -0,26 |
| 0,13 | 0,04 | -0,66 |
| 0,00 | 0,00 | -0,66 |
| 0,00 | 0,10 | 0,51 |
| 0,00 | 0,21 | 0,36 |
| 0,00 | 0,31 | 0,21 |
| -0,14 | 0,27 | 0,21 |
| -0,35 | 0,15 | 0,20 |
| -0,43 | 0,14 | 0,25 |
| -0,45 | 0,10 | 0,16 |
| -0,52 | 0,15 | 0,15 |
| -0,41 | 0,29 | 0,00 |
| -0,09 | 0,62 | 0,42 |
| +0,53 | 0,23 | 1,11 |
| +0,80 | 1,47 | 1,36 |
| +1,18 | 1,81 | 1,74 |
| +1,42 | 1,99 | 1,97 |
| +1,40 | 1,85 | 1,91 |
| +1,15 | 1,56 | 1,63 |
| +0,25 | 1,06 | 1,17 |
| +0,45 | 0,66 | 0,82 |
| +0,21 | 0,35 | 0,25 |
| 0,00 | 0,00 | 0,25 |
| -0,13 | -0,27 | 0,07 |
| -0,28 | -0,46 | 0,13 |
| -0,20 | -0,53 | 0,15 |
| -0,18 | -0,48 | 0,06 |
| -0,15 | -0,47 | 0,00 |

q_{max} = 4,2 mm

max 2,7 mm

bolcaal



Maximaal verschil:

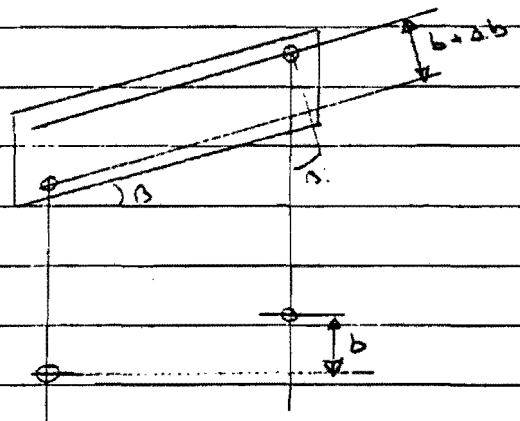
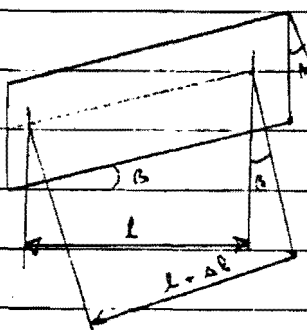
| | | | |
|---|--------|------|-------|
| $\Delta x = 0,1 \text{ m} \rightarrow \Delta q =$ | 1,0 mm | 0,39 | 0,48 |
| $\Delta x = 0,2 \text{ m} \rightarrow \Delta q =$ | 1,4 mm | 0,67 | 0,69 |
| $\Delta x = 0,3 \text{ m} \rightarrow \Delta q =$ | 1,7 mm | 0,90 | 0,84 |
| $\Delta x = 0,4 \text{ m} \rightarrow \Delta q =$ | 2,1 mm | 1,16 | 1,01 |
| $\Delta x = 0,5 \text{ m} \rightarrow \Delta q =$ | 2,3 mm | 1,47 | 1,14 |
| $\Delta x = 0,6 \text{ m} \rightarrow \Delta q =$ | 2,8 mm | 1,64 | 1,35 |
| $\Delta x = 0,7 \text{ m} \rightarrow \Delta q =$ | 3,1 mm | 1,97 | 1,47 |
| $\Delta x = 0,8 \text{ m} \rightarrow \Delta q =$ | 3,4 mm | 2,06 | 1,68 |
| $\Delta x = 0,9 \text{ m} \rightarrow \Delta q =$ | 3,6 mm | 2,11 | 1,87 |
| $\Delta x = 1,0 \text{ m} \rightarrow \Delta q =$ | 3,7 mm | 2,14 | 1,89 |
| | 30x8 | 50x5 | 100x6 |

De gemiddelde striplengte $l = 160 \text{ mm}$

Maximale hoek $\beta = 0,57^\circ$ op 3m

dit geeft een lengteverandering (lengte Δl) van $(1 - \cos \beta) \times 100$

$$\Delta l = 0,005 \% = 0,05 \text{ ‰}$$



$$\Delta b = (1 - \cos \beta) b = (1 - 0,999995) b = 0,05 \text{ ‰ van } b$$

Hoffmann B.V.

speciaal machines en gereedschappen

3334 KC ZWIJNDRECHT (HOLLAND)
GILDENWEG 35
TEL. 078 - 10 05 89 / 10 00 79

POSTREKENING 647313

TELEX 29414

NED. MIDDENSTANDBANK N.V.
Kantoor Dordrecht no. 66.12.12.300
A.B.N. no. 50.80.23.769

K.v.K. Dordrecht no. 43181

Brink B.V.
Postbus 24
7950 AA STAPHORST

Uw ref. t.a.v. Dhr. Onze ref.: RH/JK ZWIJNDRECHT, 11 juli 1984
G.J. Brink

Betr.: ponsstraat

Mijne heren,

Referend aan het onderhoud tussen uw heer G.J. Brink en onze heren H. Lübbertsmeier en R. Hoffmann, doen wij u hierbij het gevraagde toekomen.

- A1 Elektronische-hydraulische ponsstraat voor het vervaardigen van div. produkten zoals besproken.
De staven, van circa 6 meter lang (welke vlak/recht aangeleverd worden) worden via een Alba vrijprogrammeerbare tang aangevoerd (x-as), waarna deze door div. ponseenheden de bewerkingen uitgevoerd worden.
Frame en toebehoren, agregaat, aanvoerapparaat en complete besturingen: richtprijs circa DM 230.000,--
- B2 Hydraulische ponseenheid en lineaire verstelling y-as en sleden met een complete stempel: per stuk DM 49.000,--
- C1 Schaar en lineaire verstelling; x-as+ slede compleet met 1 stel messen: DM 54.000,--

Alternatief:

- D1 Schaar en lineaire verstelling
x-as en draaibeweging voorgraden instelling compleet met slede en 1 stel messen: DM 83.000,--

Alternatief:

- E1 Schaar en draaibeweging voor graden instelling compleet met slede en 1 stel messen: DM 54.000,--

Blad 2 Betropingsstraat

Uw ref.: 11

Onze ref.: RH/JK

Datum: 11 juli 1950

1^e opstelling: A + B + C

richtprijs: DM 382.000,--

2^e opstelling: A + B + E

richtprijs: DM 382.000,--

3^e opstelling: A + B + D

richtprijs: DM 411.000,--

Levering: Later overeen te komen

Levertijd: ca. 7-8 maanden na opdracht.

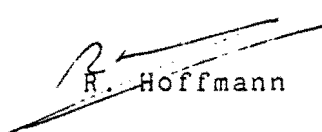
Betaling: in termijnen (nader overeen te komen)

Prijswijzigingen voorbehouden.

Hopende u een passende aanbieding te hebben gedaan en zien uw nadere berichten met belangstelling tegemoet.

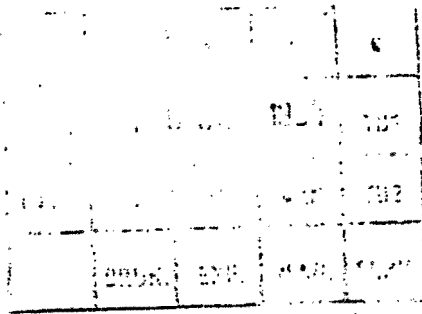
Hoogachtend,

F. Hoffmann B.V.


R. Hoffmann

Firma
Möller & Co. bv.
Postbus 10

NL-7550 aa Hengelo ov



| Ihre Zeichen | Ihre Nachricht vom | Unsere Nachricht vom | Direktdurchwahl 02722/62- | Unsere Zeichen | Attendom, den |
|--------------|--------------------|----------------------|------------------------------|------------------------------------|---------------|
| hw-mvm | 2.7.1984 | | 252 | Exp. V He/KÖ Angebot No. 31.349 | 16. Juli 1984 |

Betr.: Kunde Brink, Staphorst

Sehr geehrte Herren,

wir beziehen uns auf Ihr Schreiben vom 2.7.1984 und übersenden Ihnen nach eingehender Prüfung der uns eingesandten Unterlagen unser Richtangebot über eine

2-achsig numerisch gesteuerte Stanz- und
Schneidanlage für Flachstahl

Type CNC - 120/10 - 3PS.

Zur Errechnung der Fertigungszeiten wollen Sie bitte nachstehende Richtwerte an den Kunden weitergeben:

| | | |
|------------------|-----|----------|
| je Lochoperation | 3 | Sekunden |
| je Schervorgang | 4,5 | Sekunden |

Nebenzeit:

Auflegen eines Materialstabes
bei einer Ausgangslänge von 6 m 30 Sekunden
(einschl. Wagenrücklauf)

Bitte besprechen Sie unser Angebot mit dem Kunden. Wir sind jederzeit bereit, alle evtl. noch auftretenden Fragen zu diskutieren - entweder an Ort und Stelle beim Kunden, oder aber in Attendorn.

Mit freundlichen Grüßen.

M U H R U N D B E N D E R

Anlage

Muhr und Bender Maschinen

ANGEBOT No. 31.349

FIRMA MÖLLER & CO. BV.

HENGELO / HOLLAND

Kunde: FIRMA BRINK, STAPHORST

1 ORIGINAL - MUBEA - MATIC
2-achsig numerisch gesteuerte Stanz- und
Schneidanlage für Flachstahl

Type CNC - 120/10 - 3PS



- 2 -

1.0 ALLGEMEINES

Die nachfolgend angebotene Anlage 120/10 - 3PS ist ausgelegt zur automatischen Bearbeitung von Flacheisen mit nur 1 Bedienungsmann.

2.0 ARBEITSAUFGABE2.1 Rohmaterial

| | | |
|-------|---------------------|-----------------------------|
| 2.1.1 | Profilart und Größe | Flachstahl 30x6 - 120x10 mm |
| 2.1.2 | Ausgangslänge | max. 6 m |
| 2.1.3 | Materialfestigkeit | 450-560 N/mm ² |

2.2 Fertigteil

| | | |
|-------|--|--------------------------|
| 2.2.1 | Fertiglänge | min. 50 - 1000 |
| 2.2.2 | Anzahl der verschiedenen Lochdurchmesser | 1 - 3 in einem Werkstück |
| 2.2.3 | max. Loch-Durchmesser | 3 x 30 mm |
| 2.2.4 | Einbringen der Löcher | durch Stanzen |
| 2.2.5 | Anzahl der Reißmaße | beliebig |

2.2.6 Toleranzen:

bezogen auf den Nullpunkt der X-Achse beträgt die Positioniergenauigkeit +/- 0,5 mm.

- 3 -



- 3 -

2.3 Arbeitsablauf

- 2.3.1 Die Rohmaterialstangen werden nach manueller Vereinzelung vom Bedienenden auf die Zuführbahn übergeben und von Hand in die Positionierwagenzange geführt. Über Drucktaster am Steuerpult kann nun der Greifvorgang eingeleitet und der autom. Ablauf gestartet werden. Der Positionierwagen transportiert den Stab in das Bearbeitungszentrum. Im Bearbeitungszentrum werden die Werkstücke gem. Programm gestanzt und abgelängt.

3.0 MASCHINENKONZEPTION

3.1 Maschinenaufbau

3.1.1 Materialzuführung

- 3.1.1.1 1 Materialzuführbahn (für 6 m Materiallänge) kompl. mit Auflage- und Führungsrollen, Führungsschiene und Zahnstangen zur Aufnahme und zum Transport des Positionierwagens.

3.1.1.2 1 Positionierwagen

kompl. mit Materialgreifzange, Gleichstrommotor, Getriebe, Drehgeber mit Meßritzel, Kabelschlepp und allen pneum. Steuerungskomponenten.

- 4 -



- 4 -

- 3.1.2 Maschinenständer
- 3.1.2.1 1 Maschinenpodest
zur Aufnahme der Stanze und der Schere
- 3.1.3 Stanzeinrichtung
- 3.1.3.1 3 hydr. Stanzeinheiten
kompl. mit Stempel- und Matrizenhalter
- 3.1.3.2 1 Führungsschlitten
mit Unterbau, Verstellmechanismus zum Verfahren der Einheiten gem. Programm, sowie Einrichtung zum autom. Verfahren der Einheiten, aus dem Durchführbereich der Greifzange, einschl. Ölzentral schmierung.
- 3.1.4 Schereinrichtung
- 3.1.4.1 1 hydr. Schere für 90°-Schnitte
kompl. mit Niederhalter
- 3.1.5 Materialniederhalter und Führungselemente
- 3.1.5.1 hydr. Niederhalter
senkrecht arbeitend
- 3.1.6 Hydraulik
- 3.1.6.1 1 zentrale Hydraulikstation
mit getrenntem Hoch- und Niederdruckkreis, sowie allen erforderlichen Ventilen und Druckspeichern

- 5 -



- 5 -

3.1.7 Steuerung

3.1.7.1 1 MUBEA - CNC

2-achsig aufgebaut, mit Dateneingabe über Tastatur (gegen Aufpreis kann die Dateneingabe auch über die Lochstreifen oder Cassette erfolgen), sowie allen erforderlichen Elementen zur manuellen Bedienung der Anlage.

3.1.7.2 1 Interface

in freiprogrammierbarer Ausführung, zum Ansteuern der Ventile, Endschalter und Regeleinrichtung zum Positionierwagen.

3.1.7.3 1 Leistungsteil

zum Ansteuern der Drehstromantriebe

3.2 Technische Maschinendaten

3.2.1 Materialzuführung

3.2.1.1 Zuführrollenbahn

Zuführlänge für 6 m Materiallänge

3.2.1.2 Positionierwagen

Vorlaufgeschwindigkeit max. 30 m/Min.

Rücklaufgeschwindigkeit max. 40 m/Min.

- 6 -



Huber und Bender Allendorn

- 6 -

3.2.2 Stanzeinrichtung

| | |
|--------------------------|---------------------|
| Stanzdruck | 3 x 450 kN |
| Stanzhub verstellbar | 0 - 30 mm |
| Hubzahl bei 15 mm Hubweg | ca. 30/56 Hübe/Min. |
| Anzahl der Reißmaße | beliebig |

3.2.3 Schereinrichtung

| | |
|--------------------------|------------------|
| Scherdruck | 800 kN |
| Scherhub verstellbar | 0 - 30 mm |
| Hubzahl bei 15 mm Hubweg | ca. 30 Hübe/Min. |

3.2.4 Niederhalter

| | |
|------------|-------|
| Spanndruck | 20 kN |
|------------|-------|

3.2.5 Hydraulik

3.2.5.1 Hochdruckkreis für Stanz- und Scherzylinder

| | |
|-----------------------|--------------|
| Betriebsdruck | max. 300 bar |
| Fördermenge der Pumpe | 30 l/Min. |
| Elektromotor | 22 kW |

3.2.5.2 Niederdruckkreis für alle Nebenzylinder

| | |
|-----------------------|--------------|
| Betriebsdruck | 80 - 100 bar |
| Fördermenge der Pumpe | 50 l/Min. |
| Druckspeichergröße | 20 l |

- 7 -



- 7 -

3.2.6 Steuerung

MUBEA - CNC 2-achsig

3.2.6.1 Installierte Spannungen

| | |
|---|---------------|
| Eingangsspannung | 380 V - 50 Hz |
| Steuerspannung | 220 V - 50 Hz |
| Spannung für Ventile und Endschalter | 24 V - D.C. |
| Spannung für Programm- steuerung | 5 V - D.C. |

3.3 Technische Merkmale

3.3.1 Materialzuführung

- Schweißkonstruktion für hohe Belastung
- flache, nicht angetriebene Rollen
- Führungsschiene mit gehärteten Stahlbändern
- Zahnstange zum Meßwagentransport
- Meßzahnstange zur Positionskontrolle des Meßwagens mittels Meßritzel und Drehgeber
- Positionierwagen numerisch gesteuert
- Positionierwagenantrieb über Gleichstrommotor mit stufenloser Geschwindigkeitsregelung beim Anfahren jeder Position

- 8 -



3.3.2 Maschinenunterbau

- stabile, verwindungsfreie Ausführung
- Führungsschienen und Verfährzylinder zum Verfahren der Trennschere

3.3.3 Stanzeinrichtung

- Einheiten vertikal angeordnet
- Einrichtung zum Freischalten der Einheiten aus dem Durchführbereich der Greifzange
- Verwendung von Normwerkzeugen
- Öl-Zentralschmierung

3.3.4 Schereinrichtung

- Schere vertikal arbeitend angeordnet
- Öl-Zentralschmierung

3.3.5 Niederhalter und Führungselemente

- innerhalb des Maschinenblockes sind ausreichend dimensionierte Niederhalter angeordnet, die das Material ausrichten und während der Bearbeitung festhalten

3.3.6 Hydraulik

- Aggregat wird als separate Einheit neben dem Maschinenblock aufgebaut
- Hochdruckkreis für alle Arbeitsmaschinen
- Niederdruckkreis für alle Nebenzylinder
- logische Schaltungen und eingebaute Druckspeicher erlauben schnelle Arbeitsbewegungen



- 9 -

- Öl-Luftkühler und Heizelemente sorgen für Einhaltung der richtigen Öltemperatur, Regelung erfolgt über Thermostate.
- zur Kontrolle werden alle Steuerbewegungen der Ventile durch Leucht-Würfelstecker sichtbar gemacht

3.3.7 Steuerung

MUBEA - MATIC - CNC 48/16

Die Steuerung ist 2-achsig aufgebaut und besteht aus:

- A - einer Programmsteuerung
 - B - einem Leistungsteil und einem Interface
- im übrigen gem. beiliegender, separater Beschreibung



- 10 -

Gesamtpreis der vorstehend angebotenen
Anlage

DM 420.000,--
=====

502.000

Lieferung:

franko deutsche Grenze

Lieferzeit:

ca. 6 Monate nach Auftragserteilung
und Klärung aller technischen Einzelheiten

Montage und Inbetriebnahme:

erfolgt durch unsere Werksmonteure.

Es kommen folgende Kosten in Anrechnung:

| | |
|---------------|----------|
| Fahrtstunde | DM 52,-- |
| Fahrt-km | DM 0,60 |
| Arbeitsstunde | DM 52,-- |
| Tagesspesen | DM 60,-- |
| Nachtspesen | DM 60,-- |

Zahlungsbedingungen:

1/3 bei Auftragserteilung
1/3 bei Meldung der Versandbereitschaft
1/3 30 Tage nach Lieferung

Garantie:

12 Monate nach Inbetriebnahme der Anlage, spätestens 18 Monate nach Lieferung

Alle weiteren Bedingungen wollen Sie bitte dem beigefügten Formblatt No. 188 A entnehmen.

Attendorn, den 16. Juli 1984

M U H R U N D B E N D E R

Muhr

Oude Subsidie

In dienst 9 man voor skippen project

Maatwerk kosten:

| | | |
|---------------|------------------|--------------------|
| Loon | 9 x 55.000,- | € 495.000,- |
| Machinelasten | 38% van aanschaf | € 284.000,- |
| Gereedschap | | € 75.000,- |
| Totaal | | € 854.000,- |

Kosten Machine I: één pousunit + ^{vaste} schaar

| | |
|--|--------------------|
| Voorstudie + concept machine | € 45.000,- |
| Engineering (+detaileren) | € 50.000,- |
| Beauw (zie Hoffmann) | € 366.000,- |
| Software ontwikkeling + invoer | € 100.000,- |
| Testen + afstellen - ^{hard + cruciaal} | € 75.000,- |
| Subtotaal | € 636.000,- |
| Af 12,5% WIR | € 79.500,- |
| Totale kosten exclusief subsidie | € 715.500,- |

Indien Subsidie wordt toegepast:

| | |
|---|--------------------|
| Subtotaal | € 636.000,- |
| Af 25% Subsidie | € 159.000,- |
| Subtotaal | € 477.000,- |
| Af 12,5% WIR | € 59.625,- |
| Totale kosten inclusief subsidie | € 417.375,- |

Kosten Machine II: twee pousunits + vaste schaar

| | |
|---|--------------------|
| voorstudie + concept machine | € 45.000,- |
| Engineering (+detaileren) | € 75.000,- |
| Beauw (Hoffmann) | € 420.000,- |
| Software + invoeren | € 150.000,- |
| Testen + afstellen | € 100.000,- |
| Subtotaal | € 790.000,- |
| Af 12,5% WIR | € 98.750,- |
| Totale kosten exclusief subsidie | € 888.750,- |

Indien subsidie:

| | |
|-------------------------------------|--------------------|
| Subtotaal | € 790.000,- |
| Af 25% Subsidie | € 197.500,- |
| Subtotaal | € 592.500,- |
| Af 12,5% WIR | € 74.060,- |
| Totale kosten incl. subsidie | € 518.440,- |

Kosten Machine III : twee consumenten + draaibare schaar

| | |
|-----------------------------|-----------|
| Vorstudie + concept machine | 45.000,- |
| Engineering (+ detailleren) | 100.000,- |
| Bouw (Hoffmann) | 452.000,- |
| Software + invoeren | 200.000,- |
| Invoeren + kosten | 125.000,- |

| | |
|--------------|-----------|
| Subtotaal | 922.000,- |
| Af 12,5% WIR | 115.250,- |

Totaal kosten exclusief subsidie 806.750,-

Indien subsidie wordt bevestigd

| | |
|-----------------|-----------|
| Subtotaal | 922.000,- |
| Af 25% Subsidie | 230.500,- |
| Subtotaal | 691.500,- |
| Af 12,5% WIR | 86.437,- |

Totaal kosten inclusief subsidie 605.063,-

Kosten 2 machines III

| | |
|-----------------------------|-----------|
| Vorstudie + concept machine | 45.000,- |
| Engineering (+ detailleren) | 100.000,- |
| Bouw (Hoffmann) | 904.000,- |
| Software + invoeren | 300.000,- |
| Invoeren + kosten | 200.000,- |

| | |
|--------------|-------------|
| Subtotaal | 1.549.000,- |
| Af 12,5% WIR | 193.625,- |

Totaal exclusief subsidie 1355.375,-

Indien subsidie wordt bevestigd

| | |
|--------------|-------------|
| Subtotaal | 1.549.000,- |
| Af 25% Subs. | 387.250,- |
| Subtotaal | 1.161.750,- |
| Af 12,5% WIR | 145.220,- |

Totaal inclusief subsidie 1016.530,-

Kosten Machine I^d één pons unit met draaibare schaar

| | |
|----------------------|-------------|
| Voorstudie | ƒ 45.000,- |
| Engineering | ƒ 75.000,- |
| Bouw | ƒ 398.000,- |
| Software + invoeren | ƒ 150.000,- |
| Testen + installeren | ƒ 125.000,- |
| | <hr/> |
| Subtotaal | ƒ 793.000,- |
| AP WIR | ƒ 99.125,- |
| | <hr/> |
| Totaal | ƒ 693.875,- |

Indien subsidie wordt toegevend:

| | |
|--------------|-------------|
| Subtotaal | ƒ 793.000,- |
| 25% Subsidie | ƒ 198.250,- |
| Subtotaal | ƒ 594.750,- |
| WIR | ƒ 74.340,- |
| Totaal | ƒ 520.410,- |

Kosten machine I^a + II

| | |
|----------------------|--------------|
| Voorstudie | ƒ 45.000,- |
| Engineering | ƒ 125.000,- |
| Bouw | ƒ 810.000,- |
| Software + invoeren | ƒ 250.000,- |
| Testen + installeren | ƒ 200.000,- |
| | <hr/> |
| Subtotaal | ƒ 1430.000,- |
| WIR | ƒ 179.750,- |
| | <hr/> |
| Totaal | ƒ 1250.250,- |

Indien subsidie wordt toegevend:

| | |
|-----------|---------------|
| Subtotaal | ƒ 1430.000,- |
| subsidie | ƒ 359.500 |
| | <hr/> |
| | ƒ 1.070.500,- |
| WIR | ƒ 134.800,- |
| | <hr/> |
| Totaal | ƒ 935.700,- |

Kosten twee Machines I^a

10.4

| | |
|----------------------|---------------|
| Voorstudie | ƒ 45.000,- |
| Engineering | ƒ 25.000,- |
| Bouw | ƒ 796.000,- |
| Software + invoeren | ƒ 200.000,- |
| Testen + installeren | ƒ 175.000,- |
| | <hr/> |
| | ƒ 1.291.000,- |
| WIR | ƒ 161.375,- |
| | <hr/> |
| Totaal | ƒ 1.129.625,- |

Indien subsidie wordt toegeleend:

| | |
|-----------|---------------|
| subtotaal | ƒ 1.291.000,- |
| Subsidie | ƒ 322.750,- |
| | <hr/> |
| Subtotaal | ƒ 968.250,- |
| WIR | ƒ 121.000,- |
| | <hr/> |
| Totaal | ƒ 847.250,- |

13

Kosten Machine II en Machine III

| | |
|--------------------------|---------------|
| Voorstudie + conceptmach | ƒ 45.000,- |
| Engineering | ƒ 150.000,- |
| Bouw | ƒ 872.000,- |
| Software + invoeren | ƒ 300.000,- |
| Invoeren + testen | ƒ 200.000,- |
| | <hr/> |
| Subtotaal | ƒ 1.567.000,- |
| AP 12,5% WIR | ƒ 195.875,- |

Totale kosten exclusief subsidie ƒ 1.371.125,-

Indien subsidie wordt toegeleend:

| | |
|-----------------|---------------|
| Subtotaal | ƒ 1.567.000,- |
| AP 25% subsidie | ƒ 391.750,- |
| | <hr/> |
| Subtotaal | ƒ 1.175.250,- |
| AP 12,5% WIR | ƒ 146.906,- |

Totale kosten exclusief subsidie ƒ 1.028.344,-

Capaciteitsberekening van de diverse Machines

Bij de aannamen op de volgende bladzijde zijn de pauze- en schaar tijden van machine A gelijk aan de waarden welke zijn opgegeven door Mubea.

De onder B genoemde aannamen zijn eigen schattingen welke beter haalbaar moeten zijn. Een omsteltijd van 3 minuten moet haalbaar zijn bij een goede productieplanning en organisatie.

In de ^{opz.} reën na laatste kolom van de tabellen is de productie tijd per ship aangegeven in seconden zonder rekening te houden met de omsteltijd.

In de laatste kolom is de totale productie tijd aangegeven in dagen (Puur (dag) (incl. omsteltijd)) van de jaarproductie.



Bij alle berekeningen is uitgegaan van de gemiddelde productielengte.



Opz. reënd is dat de machine 220 dagen per jaar bezet kan zijn. Dit is echter niet OK!

Men van 52×5 - feestdagen \approx 240 dagen maken maar dan heeft men $1 + \frac{20}{220} = 1\frac{1}{11}$ man nodig.

Aannamen?

| | Machine A | Machine B |
|--|-----------|-----------|
| Ponsoperatie | 3 s | 2,4 s |
| Schaarsoperatie | 4,5 s | 3 s |
| Gemid. transport snelheid | 10 m/min | 10 m/min |
| Stukken stop tijd samen | 0,25 s | 0,25 s |
| Terugloop + laden | 30 s | 30 s |
| Omscheltijel | 180 s | 180 s |
| Draaien schaar voor een andere hoek | 3 s | 2 s |

* Producten met een schuine snede ( en ) kunnen "geest" worden zonder dat dit invloed heeft op de nauwkeurigheid

* Nesting maakt de gemiddelde lengte van de producten kleiner
geleend wordt met $\bar{l} = 0,95 \cdot l$ voor 
 $\bar{l} = 0,90 \cdot l$ voor 

* Machine type I :- één ponsunit met vaste schaar
- Afstand ponsunit - schaar gemiddeld 0,3 m

* Machinetype II - twee ponsunits met vaste schaar
- Gemiddelde afstand 1° ponsunit - schaar 0,5 m

* Machinetype III - twee ponsunits met draai-
bare schaar
- Gemid. afstand 1° ponsunit -
schaar 1,0 m

* Uitgangsmateriaal altijd 6 m. lang!

* Seriegrrootte 75 stuk

Machine I A

één Poms unit + vaste schaar

11.3

| product | lengte [mm] | % v/d tot. Productie | Perz 6 meter | | | | | | Perz Perz | Perz Perz | Perz Perz | Totale Prod incl. omstel |
|---------------|----------------|-------------------------|-----------------------------|------|--------|--------|-------|-------|--------------|--------------|---------------|-----------------------------|
| | | | Pomg | Pomg | Schaar | Schaar | Draai | Draai | | | | |
| | 70 | 22,0 | 4 | 81 | 4 | - | 89 | 85 | 5,70 s | 74,25 | | |
| | 150 | 25,7 | 41 | 37 | 2 | - | 80 | 39 | 9,92 s | 131,90 | | |
| | 150 | 1,3 | - | - | - | - | - | - | - | - | | |
| | 300 | 3,3 | 39 | 18 | 1 | - | 58 | 19 | 15,02 s | 24,00 | | |
| | 140 | 0,6 | - | - | - | - | - | - | - | - | | |
| | 225 | 6,2 | 80 | 24 | 2 | - | 106 | 26 | 17,40 s | 51,15 | | |
| | 225 | 1,0 | - | - | - | - | - | - | - | - | | |
| | 340 | 0,2 | - | - | - | - | - | - | - | - | | |
| | 340 | 0,2 | - | - | - | - | - | - | - | - | | |
| | 550 | 0,2 | 51 | 9 | 1 | - | 61 | 10 | 28,17 s | 2,55 | | |
| | 550 | 0,1 | - | - | - | - | - | - | - | - | | |
| | 260 | 0,1 | 163 | 21 | 2 | - | 186 | 23 | 30,76 s | 1,38 | | |
| | 140 | 1,2 | 45 | 39 | 3 | - | 87 | 42 | 9,86 s | 6,13 | | |
| | 270 | 1,3 | - | - | - | - | - | - | - | - | | |
| | 210 | 1,4 | - | - | - | - | - | - | - | - | | |
| | 480 | 2,8 | - | - | - | - | - | - | - | - | | |
| | 330 | 0,3 | - | - | - | - | - | - | - | - | | |
| | 300 | 0,3 | - | - | - | - | - | - | - | - | | |
| | 320 | 0,1 | - | - | - | - | - | - | - | - | | |
| | 140 | 1,9 | - | - | - | - | - | - | - | - | | |
| | 140 | 0,4 | - | - | - | - | - | - | - | - | | |
| | 145 | 1,7 | - | - | - | - | - | - | - | - | | |
| | 100 | 0,5 | - | - | - | - | - | - | - | - | | |
| | 170 | 0,4 | - | - | - | - | - | - | - | - | | |
| | 200 | 0,7 | - | - | - | - | - | - | - | - | | |
| | 240 | 0,2 | - | - | - | - | - | - | - | - | | |
| | 240 | 0,4 | - | - | - | - | - | - | - | - | | |
| | 140 | 0,2 | - | - | - | - | - | - | - | - | | |
| | 220 | 0,7 | - | - | - | - | - | - | - | - | | |
| | 350 | 0,3 | - | - | - | - | - | - | - | - | | |
| | 70 | 0,1 | - | - | - | - | - | - | - | - | | |
| | 120 | 0,3 | - | - | - | - | - | - | - | - | | |
| | 190 | 0,1 | - | - | - | - | - | - | - | - | | |
| | 160 | 0,1 | - | - | - | - | - | - | - | - | | |
| | 150 | 0,2 | - | - | - | - | - | - | - | - | | |
| | 600 | 0,4 | - | - | - | - | - | - | - | - | | |
| | 130 | 0,4 | - | - | - | - | - | - | - | - | | |
| | 130 | 2,5 | - | - | - | - | - | - | - | - | | |
| | 115 | 1,5 | - | - | - | - | - | - | - | - | | |
| | 100 | 0,3 | - | - | - | - | - | - | - | - | | |
| | 270 | 0,5 | - | - | - | - | - | - | - | - | | |
| | 110 | 0,4 | - | - | - | - | - | - | - | - | | |
| | 215 | 0,4 | - | - | - | - | - | - | - | - | | |
| | 330 | 0,7 | - | - | - | - | - | - | - | - | | |
| | 170 | 5,1 | - | - | - | - | - | - | - | - | | |
| | 160 | 0,3 | - | - | - | - | - | - | - | - | | |
| | 300 | 1,2 | - | - | - | - | - | - | - | - | | |
| | 175 | 0,2 | - | - | - | - | - | - | - | - | | |
| | 220 | 0,2 | - | - | - | - | - | - | - | - | | |
| | 170 | 2,0 | - | - | - | - | - | - | - | - | | |
| | 180 | 0,4 | - | - | - | - | - | - | - | - | | |
| | 200 | 1,2 | - | - | - | - | - | - | - | - | | |
| Totaal | | 58,7% | v/d Jaarproductie in | | | | | | | | 291,36 | dagen |

| product | lengte | % v/d tot. | Perz 6 meter | | | | | | Product | Total Product | |
|---------|--------|------------|----------------------|-------------|--------|-------|--------|-------|--------------|---------------|-------|
| | [mm] | Productie | Pons | Pons+Schaar | Schaar | Draai | Draaib | Perz. | Perz Product | incl. omstel | |
| | 70 | 22,0 | 4 | 81 | 4 | - | 89 | 85 | 4,20 | 60,50 | |
| | 150 | 25,7 | 41 | 37 | 2 | - | 80 | 39 | 7,02 | 100,90 | |
| | 150 | 13 | - | - | - | - | - | - | - | - | |
| | 300 | 33 | 39 | 18 | 1 | - | 58 | 19 | 12,30 | 20,20 | |
| | 140 | 06 | - | - | - | - | - | - | - | - | |
| | 225 | 62 | 80 | 24 | 2 | - | 106 | 26 | 14,03 | 42,46 | |
| | 225 | 10 | - | - | - | - | - | - | - | - | |
| | 340 | 02 | - | - | - | - | - | - | - | - | |
| | 340 | 02 | - | - | - | - | - | - | - | - | |
| | 550 | 02 | 51 | 9 | 1 | - | 61 | 10 | 23,61 | 2,17 | |
| | 550 | 01 | - | - | - | - | - | - | - | - | |
| | 260 | 01 | 163 | 21 | 2 | - | 186 | 23 | 25,00 | 1,14 | |
| | 140 | 12 | 45 | 39 | 3 | - | 87 | 42 | 7,00 | 4,70 | |
| | 270 | 13 | - | - | - | - | - | - | - | - | |
| | 210 | 14 | - | - | - | - | - | - | - | - | |
| | 480 | 28 | - | - | - | - | - | - | - | - | |
| | 330 | 03 | - | - | - | - | - | - | - | - | |
| | 300 | 03 | - | - | - | - | - | - | - | - | |
| | 320 | 01 | - | - | - | - | - | - | - | - | |
| | 140 | 19 | - | - | - | - | - | - | - | - | |
| | 140 | 04 | - | - | - | - | - | - | - | - | |
| | 145 | 17 | - | - | - | - | - | - | - | - | |
| | 100 | 05 | - | - | - | - | - | - | - | - | |
| | 170 | 04 | - | - | - | - | - | - | - | - | |
| | 200 | 07 | - | - | - | - | - | - | - | - | |
| | 240 | 02 | - | - | - | - | - | - | - | - | |
| | 240 | 04 | - | - | - | - | - | - | - | - | |
| | 140 | 02 | - | - | - | - | - | - | - | - | |
| | 220 | 07 | - | - | - | - | - | - | - | - | |
| | 350 | 03 | - | - | - | - | - | - | - | - | |
| | 70 | 01 | - | - | - | - | - | - | - | - | |
| | 120 | 03 | - | - | - | - | - | - | - | - | |
| | 190 | 01 | - | - | - | - | - | - | - | - | |
| | 160 | 01 | - | - | - | - | - | - | - | - | |
| | 150 | 02 | - | - | - | - | - | - | - | - | |
| | 600 | 04 | - | - | - | - | - | - | - | - | |
| | 130 | 04 | - | - | - | - | - | - | - | - | |
| | 130 | 25 | - | - | - | - | - | - | - | - | |
| | 115 | 15 | - | - | - | - | - | - | - | - | |
| | 100 | 03 | - | - | - | - | - | - | - | - | |
| | 270 | 05 | - | - | - | - | - | - | - | - | |
| | 110 | 04 | - | - | - | - | - | - | - | - | |
| | 215 | 04 | - | - | - | - | - | - | - | - | |
| | 330 | 07 | - | - | - | - | - | - | - | - | |
| | 170 | 51 | - | - | - | - | - | - | - | - | |
| | 160 | 03 | - | - | - | - | - | - | - | - | |
| | 300 | 12 | - | - | - | - | - | - | - | - | |
| | 175 | 02 | - | - | - | - | - | - | - | - | |
| | 220 | 02 | - | - | - | - | - | - | - | - | |
| | 170 | 20 | - | - | - | - | - | - | - | - | |
| | 180 | 04 | - | - | - | - | - | - | - | - | |
| | 200 | 12 | - | - | - | - | - | - | - | - | |
| Totaal | | 58,7 % | vld Jaarproductie in | | | | | | | 232,07 | dagen |

| product | lengte | % v/d tot. | Per 6 meter | | | | | | Product | Totale product | |
|---------|--------|------------|----------------------|--------------|--------|-------|--------|-------|-------------|----------------|-------|
| | cm] | Productie | Pons | Pouze Schaar | Schaar | Draai | Draaib | Part. | Per Product | incl. omstel | |
| | 70 | 22.0 | 8 | 77 | 8 | - | 93 | 85 | 5.87 | 75.81 | |
| | 150 | 25.7 | 43 | 35 | 4 | - | 82 | 39 | 10.10 | 133.85 | |
| | 150 | 13 | - | - | - | - | - | - | - | - | |
| | 300 | 33 | 44 | 17 | 2 | - | 63 | 19 | 15.91 | 25.18 | |
| | 140 | 0.6 | - | - | - | - | - | - | - | - | |
| | 225 | 6.2 | 81 | 23 | 3 | - | 207 | 26 | 17.53 | 51.49 | |
| | 225 | 10 | - | - | - | - | - | - | - | - | |
| | 340 | 0.2 | - | - | - | - | - | - | - | - | |
| | 340 | 0.2 | - | - | - | - | - | - | - | - | |
| | 550 | 0.2 | 51 | 9 | 1 | - | 61 | 10 | 28.22 | 2.55 | |
| | 550 | 0.1 | - | - | - | - | - | - | - | - | |
| | 260 | 0.1 | 163 | 21 | 2 | - | 186 | 23 | 30.80 | 1.45 | |
| | 140 | 1.2 | 46 | 38 | 4 | - | 88 | 42 | 9.95 | 6.17 | |
| | 270 | 1.3 | - | - | - | - | - | - | - | - | |
| | 210 | 1.4 | - | - | - | - | - | - | - | - | |
| | 480 | 2.8 | - | - | - | - | - | - | - | - | |
| | 330 | 0.3 | - | - | - | - | - | - | - | - | |
| | 300 | 0.3 | - | - | - | - | - | - | - | - | |
| | 320 | 0.1 | - | - | - | - | - | - | - | - | |
| | 140 | 1.9 | 0 | 0 | 84 | 84 | 84 | 42 | 17.14 | 15.47 | |
| | 140 | 0.4 | 4 | 38 | 46 | 84 | 88 | 42 | 17.45 | 3.31 | |
| | 145 | 1.7 | 45 | 37 | 45 | 82 | 127 | 41 | 20.75 | 16.40 | |
| | 100 | 0.5 | - | - | - | - | - | - | - | - | |
| | 170 | 0.4 | - | - | - | - | - | - | - | - | |
| | 200 | 0.7 | 90 | 26 | 32 | 58 | 148 | 29 | 27.97 | 8.86 | |
| | 240 | 0.2 | - | - | - | - | - | - | - | - | |
| | 240 | 0.4 | 27 | 21 | 27 | 48 | 75 | 24 | 22.03 | 4.07 | |
| | 140 | 0.2 | - | - | - | - | - | - | - | - | |
| | 220 | 0.7 | - | - | - | - | - | - | - | - | |
| | 350 | 0.3 | - | - | - | - | - | - | - | - | |
| | 70 | 0.1 | - | - | - | - | - | - | - | - | |
| | 120 | 0.3 | - | - | - | - | - | - | - | - | |
| | 190 | 0.1 | - | - | - | - | - | - | - | - | |
| | 160 | 0.1 | - | - | - | - | - | - | - | - | |
| | 150 | 0.2 | - | - | - | - | - | - | - | - | |
| | 600 | 0.4 | - | - | - | - | - | - | - | - | |
| | 130 | 0.4 | - | - | - | - | - | - | - | - | |
| | 130 | 2.5 | 0 | 0 | 48 | 48 | 48 | 48 | 9.19 | 12.07 | |
| | 115 | 1.5 | 5 | 49 | 5 | 54 | 59 | 54 | 9.33 | 7.33 | |
| | 100 | 0.3 | 68 | 58 | 5 | 63 | 131 | 63 | 12.35 | 1.84 | |
| | 270 | 0.5 | 48 | 21 | 2 | 23 | 71 | 23 | 17.53 | 4.15 | |
| | 110 | 0.4 | 62 | 52 | 5 | 57 | 119 | 57 | 12.56 | 3.48 | |
| | 215 | 0.4 | - | - | - | - | - | - | - | - | |
| | 330 | 0.7 | - | - | - | - | - | - | - | - | |
| | 170 | 5.1 | 0 | 0 | 39 | 39d | 39 | 39 | 12.50 | 28.83 | |
| | 160 | 0.3 | 45 | 37 | 4 | 41d | 86 | 41 | 16.00 | 2.30 | |
| | 300 | 1.2 | 46 | 20 | 2 | 22d | 68 | 22 | 20.70 | 11.55 | |
| | 175 | 0.2 | 114 | 34 | 3 | 37d | 151 | 37 | 22.63 | 2.09 | |
| | 220 | 0.2 | 153 | 27 | 3 | 30d | 183 | 30 | 25.63 | 3.67 | |
| | 170 | 2.0 | 42 | 36 | 3 | 35d | 81 | 39 | 16.02 | 15.55 | |
| | 180 | 0.4 | - | - | - | - | - | - | - | - | |
| | 200 | 1.2 | - | - | - | - | - | - | - | - | |
| Totaal | | 78.1% | v/d Jaarproductie in | | | | | | | 435.27 | dagen |

Machine T^d B één pompsluit + daaribovene schaar

11.6

| product | lengte | % v/d tot. | Perz 6 meter | | | | | | Product | Totale prod |
|---------|--------|------------|--------------|-------|--------|--------|-------|-------|---------|--------------|
| | [mm] | Productie | Pomps | Pomps | Schaar | Schaar | Draai | Draai | Perz | Perz Product |
| | 70 | 22.0 | 8 | 77 | 8 | - | 93 | 85 | 4,31 | 61,51 |
| | 150 | 25,7 | 43 | 35 | 4 | - | 82 | 39 | 7,94 | 110,72 |
| | 150 | 13 | - | - | - | - | - | - | - | - |
| | 300 | 33 | 44 | 17 | 2 | - | 63 | 19 | 13,02 | 21,20 |
| | 140 | 06 | - | - | - | - | - | - | - | - |
| | 225 | 6,2 | 81 | 23 | 3 | - | 107 | 26 | 14,16 | 42,70 |
| | 225 | 10 | - | - | - | - | - | - | - | - |
| | 340 | 02 | - | - | - | - | - | - | - | - |
| | 340 | 02 | - | - | - | - | - | - | - | - |
| | 550 | 02 | 51 | 9 | 1 | - | 61 | 10 | 23,67 | 2,18 |
| | 550 | 01 | - | - | - | - | - | - | - | - |
| | 260 | 01 | 163 | 21 | 2 | - | 186 | 23 | 25,03 | 1,35 |
| | 140 | 1,2 | 46 | 38 | 4 | - | 88 | 42 | 7,80 | 5,10 |
| | 270 | 1,3 | - | - | - | - | - | - | - | - |
| | 210 | 1,4 | - | - | - | - | - | - | - | - |
| | 480 | 2,8 | - | - | - | - | - | - | - | - |
| | 330 | 0,3 | - | - | - | - | - | - | - | - |
| | 300 | 0,3 | - | - | - | - | - | - | - | - |
| | 320 | 0,1 | - | - | - | - | - | - | - | - |
| | 140 | 1,9 | 0 | 0 | 84 | 84 | 84 | 42 | 12,14 | 11,51 |
| | 140 | 0,4 | 4 | 38 | 46 | 84 | 88 | 57 | 17,40 | 2,87 |
| | 145 | 1,7 | 45 | 37 | 45 | 82 | 127 | 41 | 15,10 | 12,40 |
| | 100 | 0,5 | - | - | - | - | - | - | - | - |
| | 170 | 0,4 | - | - | - | - | - | - | - | - |
| | 200 | 0,7 | 90 | 26 | 32 | 58 | 148 | 29 | 23,10 | 7,44 |
| | 240 | 0,2 | - | - | - | - | - | - | - | - |
| | 240 | 0,4 | 27 | 21 | 27 | 48 | 75 | 24 | 16,35 | 3,13 |
| | 140 | 0,2 | - | - | - | - | - | - | - | - |
| | 220 | 0,7 | - | - | - | - | - | - | - | - |
| | 350 | 0,3 | - | - | - | - | - | - | - | - |
| | 70 | 0,1 | - | - | - | - | - | - | - | - |
| | 120 | 0,3 | - | - | - | - | - | - | - | - |
| | 190 | 0,1 | - | - | - | - | - | - | - | - |
| | 160 | 0,1 | - | - | - | - | - | - | - | - |
| | 150 | 0,2 | - | - | - | - | - | - | - | - |
| | 600 | 0,4 | - | - | - | - | - | - | - | - |
| | 130 | 0,4 | - | - | - | - | - | - | - | - |
| | 130 | 2,5 | 0 | 0 | 48 | 48 | 48 | 48 | 6,69 | 9,47 |
| | 115 | 1,5 | 5 | 49 | 5 | 54 | 59 | 54 | 6,70 | 5,74 |
| | 100 | 0,3 | 68 | 58 | 5 | 63 | 131 | 63 | 9,20 | 1,45 |
| | 270 | 0,5 | 48 | 21 | 2 | 23 | 71 | 23 | 13,86 | 3,38 |
| | 110 | 0,4 | 62 | 52 | 5 | 52 | 119 | 52 | 9,34 | 1,96 |
| | 215 | 0,4 | - | - | - | - | - | - | - | - |
| | 330 | 0,7 | - | - | - | - | - | - | - | - |
| | 170 | 5,1 | 0 | 0 | 39 | 39d | 39 | 39 | 9,02 | 24,27 |
| | 160 | 0,3 | 45 | 37 | 4 | 41d | 86 | 41 | 11,84 | 1,78 |
| | 300 | 1,2 | 46 | 20 | 2 | 22d | 68 | 22 | 15,93 | 9,12 |
| | 175 | 0,2 | 114 | 34 | 3 | 32d | 151 | 37 | 12,30 | 1,64 |
| | 220 | 0,2 | 153 | 27 | 3 | 30d | 183 | 30 | 23,07 | 2,12 |
| | 170 | 2,0 | 42 | 36 | 3 | 39d | 81 | 39 | 11,88 | 11,90 |
| | 180 | 0,4 | - | - | - | - | - | - | - | - |
| | 200 | 1,2 | - | - | - | - | - | - | - | - |

Totaal 78,1% van de jaarproductie in 355,07 dagen

Machine II A tweeë pousunits + vaste schaar

11.07

| product | Lengte [mm] | % v/d tot. Productie | Perz 6 meter | | | | | | Perz Perz Product | Totale prod incl. omstel |
|---------|----------------|-------------------------|--------------|---------------|--------|--------|---------|-------|----------------------|-----------------------------|
| | | | Pans | Pans + Schaar | Schaar | Drassi | Drasset | Perz. | | |
| | 70 | 22,0 | 2 | 81 | 4 | - | 87 | 85 | 5,64 | 73,75 |
| | 150 | 25,7 | 6 | 36 | 3 | - | 45 | 39 | 7,03 | 101,07 |
| | 150 | 13 | 6 | 26 | 3 | - | 45 | 39 | 7,03 | 5,24 |
| | 300 | 33 | 21 | 17 | 2 | - | 40 | 19 | 12,00 | 19,80 |
| | 140 | 06 | 46 | 38 | 4 | - | 88 | 42 | 9,97 | 3,09 |
| | 225 | 6,2 | 56 | 24 | 2 | - | 82 | 26 | 14,43 | 43,47 |
| | 225 | 10 | 56 | 24 | 2 | - | 82 | 26 | 14,43 | 7,01 |
| | 340 | 02 | 55 | 15 | 2 | - | 72 | 17 | 19,36 | 1,81 |
| | 340 | 02 | - | - | - | - | - | - | - | - |
| | 550 | 02 | 42 | 9 | 1 | - | 52 | 10 | 25,76 | 2,35 |
| | 550 | 01 | 42 | 9 | 1 | - | 52 | 10 | 25,76 | 1,17 |
| | 260 | 01 | 142 | 21 | 2 | - | 165 | 23 | 27,84 | 1,26 |
| | 140 | 1,2 | 8 | 38 | 4 | - | 50 | 42 | 7,03 | 4,71 |
| | 270 | 1,3 | 26 | 20 | 2 | - | 48 | 22 | 11,75 | 7,67 |
| | 210 | 1,4 | 62 | 25 | 3 | - | 90 | 28 | 14,43 | 9,82 |
| | 480 | 2,8 | 40 | 10 | 2 | - | 52 | 12 | 21,38 | 27,75 |
| | 330 | 03 | - | - | - | - | - | - | - | - |
| | 300 | 03 | 42 | 17 | 2 | - | 61 | 19 | 15,60 | 2,25 |
| | 320 | 01 | - | - | - | - | - | - | - | - |
| | 140 | 1,9 | - | - | - | - | - | - | - | - |
| | 140 | 04 | - | - | - | - | - | - | - | - |
| | 145 | 1,7 | - | - | - | - | - | - | - | - |
| | 100 | 05 | - | - | - | - | - | - | - | - |
| | 170 | 04 | - | - | - | - | - | - | - | - |
| | 200 | 07 | - | - | - | - | - | - | - | - |
| | 240 | 02 | - | - | - | - | - | - | - | - |
| | 240 | 04 | - | - | - | - | - | - | - | - |
| | 140 | 02 | - | - | - | - | - | - | - | - |
| | 220 | 07 | - | - | - | - | - | - | - | - |
| | 350 | 03 | - | - | - | - | - | - | - | - |
| | 70 | 01 | - | - | - | - | - | - | - | - |
| | 120 | 03 | - | - | - | - | - | - | - | - |
| | 190 | 01 | - | - | - | - | - | - | - | - |
| | 160 | 01 | - | - | - | - | - | - | - | - |
| | 150 | 02 | - | - | - | - | - | - | - | - |
| | 600 | 04 | - | - | - | - | - | - | - | - |
| | 130 | 04 | - | - | - | - | - | - | - | - |
| | 130 | 2,5 | - | - | - | - | - | - | - | - |
| | 115 | 1,5 | - | - | - | - | - | - | - | - |
| | 100 | 03 | - | - | - | - | - | - | - | - |
| | 270 | 05 | - | - | - | - | - | - | - | - |
| | 110 | 04 | - | - | - | - | - | - | - | - |
| | 215 | 04 | - | - | - | - | - | - | - | - |
| | 330 | 07 | - | - | - | - | - | - | - | - |
| | 170 | 5,1 | - | - | - | - | - | - | - | - |
| | 160 | 03 | - | - | - | - | - | - | - | - |
| | 300 | 1,2 | - | - | - | - | - | - | - | - |
| | 175 | 02 | - | - | - | - | - | - | - | - |
| | 220 | 02 | - | - | - | - | - | - | - | - |
| | 170 | 2,0 | - | - | - | - | - | - | - | - |
| | 180 | 04 | - | - | - | - | - | - | - | - |
| | 200 | 1,2 | - | - | - | - | - | - | - | - |

Totaal 67,6% v/d Jaarproductie in 312,18 daag

2023-07-11 14:00:00

Machine II B twee posities + vaste schaar

11.8

| product | lengte [mm] | % v/d tot. Productie | Perz 6 meter | | | | | | Perz Perz Product | Totale prod incl. omsel |
|---------|----------------|-------------------------|--------------|-------------|--------|-------|--------|------|----------------------|----------------------------|
| | | | Pons | Perz Schaar | Schaar | Draai | Draait | Perz | | |
| | 70 | 22,0 | 2 | 81 | 4 | - | 87 | 85 | 4,13 | 59,87 |
| | 150 | 25,7 | 6 | 36 | 3 | - | 45 | 39 | 5,44 | 83,98 |
| | 150 | 1,3 | 6 | 36 | 3 | - | 45 | 39 | 5,44 | 4,38 |
| | 300 | 3,3 | 21 | 17 | 2 | - | 40 | 19 | 9,84 | 16,83 |
| | 140 | 0,6 | 46 | 38 | 4 | - | 88 | 42 | 7,81 | 2,55 |
| | 225 | 6,2 | 56 | 24 | 2 | - | 82 | 26 | 11,64 | 36,26 |
| | 225 | 1,0 | 56 | 24 | 2 | - | 82 | 26 | 11,64 | 5,85 |
| | 340 | 0,2 | 55 | 15 | 2 | - | 72 | 17 | 15,92 | 1,53 |
| | 340 | 0,2 | - | - | - | - | - | - | - | - |
| | 550 | 0,2 | 42 | 9 | 1 | - | 52 | 10 | 21,34 | 1,98 |
| | 550 | 0,1 | 42 | 9 | 1 | - | 52 | 10 | 21,34 | 0,99 |
| | 260 | 0,1 | 142 | 21 | 2 | - | 165 | 23 | 22,64 | 1,04 |
| | 140 | 1,2 | 8 | 38 | 4 | - | 50 | 42 | 5,41 | 3,99 |
| | 270 | 1,3 | 26 | 20 | 2 | - | 48 | 22 | 9,55 | 6,47 |
| | 210 | 1,4 | 62 | 25 | 3 | - | 90 | 28 | 11,61 | 8,17 |
| | 480 | 2,8 | 40 | 10 | 2 | - | 52 | 12 | 17,88 | 23,66 |
| | 330 | 0,3 | - | - | - | - | - | - | - | - |
| | 300 | 0,3 | 42 | 17 | 2 | - | 61 | 19 | 12,77 | 1,90 |
| | 320 | 0,1 | - | - | - | - | - | - | - | - |
| | 140 | 1,9 | - | - | - | - | - | - | - | - |
| | 140 | 0,4 | - | - | - | - | - | - | - | - |
| | 145 | 1,7 | - | - | - | - | - | - | - | - |
| | 100 | 0,5 | - | - | - | - | - | - | - | - |
| | 170 | 0,4 | - | - | - | - | - | - | - | - |
| | 200 | 0,7 | - | - | - | - | - | - | - | - |
| | 240 | 0,2 | - | - | - | - | - | - | - | - |
| | 240 | 0,4 | - | - | - | - | - | - | - | - |
| | 140 | 0,2 | - | - | - | - | - | - | - | - |
| | 220 | 0,7 | - | - | - | - | - | - | - | - |
| | 350 | 0,3 | - | - | - | - | - | - | - | - |
| | 70 | 0,1 | - | - | - | - | - | - | - | - |
| | 120 | 0,3 | - | - | - | - | - | - | - | - |
| | 190 | 0,1 | - | - | - | - | - | - | - | - |
| | 160 | 0,1 | - | - | - | - | - | - | - | - |
| | 150 | 0,2 | - | - | - | - | - | - | - | - |
| | 600 | 0,4 | - | - | - | - | - | - | - | - |
| | 130 | 0,4 | - | - | - | - | - | - | - | - |
| | 130 | 2,5 | - | - | - | - | - | - | - | - |
| | 115 | 1,5 | - | - | - | - | - | - | - | - |
| | 100 | 0,3 | - | - | - | - | - | - | - | - |
| | 270 | 0,5 | - | - | - | - | - | - | - | - |
| | 110 | 0,4 | - | - | - | - | - | - | - | - |
| | 215 | 0,4 | - | - | - | - | - | - | - | - |
| | 330 | 0,7 | - | - | - | - | - | - | - | - |
| | 170 | 5,1 | - | - | - | - | - | - | - | - |
| | 160 | 0,3 | - | - | - | - | - | - | - | - |
| | 300 | 1,2 | - | - | - | - | - | - | - | - |
| | 175 | 0,2 | - | - | - | - | - | - | - | - |
| | 220 | 0,2 | - | - | - | - | - | - | - | - |
| | 170 | 2,0 | - | - | - | - | - | - | - | - |
| | 180 | 0,4 | - | - | - | - | - | - | - | - |
| | 200 | 1,2 | - | - | - | - | - | - | - | - |

Totaal 67,6 % v/d Jaarproductie in 259,37 dagen

| product | lengte [mm] | % v/d tot. Productie | Per 6 meter | | | | | | Prod.dijkt | Totale prod. dijkt incl. omstel |
|---------|----------------|-------------------------|-------------|--------------|--------|-------|--------------|------|------------|------------------------------------|
| | | | Pom | Pom + Schaar | Schaar | Draai | Draai + Post | Post | | |
| | 70 | 22,0 | 9 | 70 | 15 | — | 84 | 85 | 5,91 | 76,18 |
| | 150 | 25,7 | 7 | 32 | 7 | — | 46 | 39 | 7,18 | 102,60 |
| | 150 | 13 | 7 | 32 | 7 | — | 46 | 39 | 7,18 | 5,19 |
| | 300 | 33 | 23 | 15 | 4 | — | 42 | 19 | 12,47 | 20,45 |
| | 140 | 06 | 49 | 35 | 7 | — | 91 | 42 | 10,26 | 3,16 |
| | 225 | 6,2 | 57 | 21 | 5 | — | 83 | 26 | 14,64 | 44,03 |
| | 225 | 10 | 57 | 21 | 5 | — | 83 | 26 | 14,64 | 7,10 |
| | 340 | 02 | 51 | 13 | 4 | — | 68 | 17 | 18,74 | 1,76 |
| | 340 | 02 | — | — | — | — | — | — | — | — |
| | 550 | 02 | 50 | 8 | 2 | — | 60 | 10 | 28,20 | 2,55 |
| | 550 | 01 | 50 | 8 | 2 | — | 60 | 10 | 28,20 | 1,28 |
| | 260 | 01 | 161 | 19 | 4 | — | 184 | 23 | 30,63 | 1,38 |
| | 140 | 1,2 | 16 | 34 | 8 | — | 58 | 42 | 7,07 | 5,05 |
| | 270 | 1,3 | 30 | 18 | 4 | — | 52 | 22 | 12,45 | 8,05 |
| | 210 | 1,4 | 66 | 23 | 5 | — | 94 | 28 | 15,00 | 10,14 |
| | 480 | 2,8 | 42 | 9 | 3 | — | 54 | 12 | 22,13 | 28,61 |
| | 330 | 03 | — | — | — | — | — | — | — | — |
| | 300 | 03 | 42 | 15 | 4 | — | 61 | 19 | 15,72 | 2,27 |
| | 320 | 01 | — | — | — | — | — | — | — | — |
| | 140 | 1,9 | 0 | 0 | 84 | 84 | 84 | 42 | 17,2 | 15,53 |
| | 140 | 04 | 8 | 34 | 50 | 84 | 92 | 42 | 17,84 | 3,15 |
| | 145 | 1,7 | 7 | 34 | 48 | 82 | 89 | 41 | 17,81 | 14,32 |
| | 100 | 05 | 10 | 49 | 69 | 118 | 128 | 59 | 17,27 | 4,10 |
| | 170 | 04 | 41 | 29 | 41 | 70 | 111 | 35 | 21,36 | 3,96 |
| | 200 | 07 | 63 | 24 | 34 | 58 | 121 | 29 | 25,04 | 8,00 |
| | 240 | 02 | 53 | 19 | 29 | 48 | 101 | 24 | 25,68 | 2,34 |
| | 240 | 04 | 10 | 19 | 29 | 48 | 58 | 24 | 19,86 | 3,71 |
| | 140 | 02 | 40 | 34 | 50 | 84 | 134 | 42 | 21,09 | 1,96 |
| | 220 | 07 | 59 | 22 | 32 | 54 | 113 | 27 | 25,27 | 8,07 |
| | 350 | 03 | 88 | 12 | 22 | 34 | 122 | 17 | 36,56 | 4,70 |
| | 70 | 01 | — | — | — | — | — | — | — | — |
| | 120 | 03 | — | — | — | — | — | — | — | — |
| | 190 | 01 | — | — | — | — | — | — | — | — |
| | 160 | 01 | — | — | — | — | — | — | — | — |
| | 150 | 02 | — | — | — | — | — | — | — | — |
| | 600 | 04 | — | — | — | — | — | — | — | — |
| | 130 | 04 | — | — | — | — | — | — | — | — |
| | 130 | 25 | 0 | 0 | 48 | 48 | 48 | 48 | 9,25 | 12,14 |
| | 115 | 1,5 | 9 | 45 | 9 | 54 | 63 | 54 | 9,63 | 7,25 |
| | 100 | 03 | 11 | 52 | 11 | 63 | 74 | 63 | 9,46 | 1,49 |
| | 270 | 05 | 27 | 19 | 4 | 23 | 50 | 23 | 14,70 | 3,57 |
| | 110 | 04 | 15 | 47 | 10 | 57 | 72 | 57 | 9,87 | 2,05 |
| | 215 | 04 | 63 | 24 | 5 | 29 | 92 | 29 | 17,38 | 3,29 |
| | 330 | 07 | 61 | 15 | 4 | 19 | 80 | 19 | 22,00 | 7,11 |
| | 170 | 5,1 | 0 | 0 | 39 | 39 d | 39 | 39 | 12,60 | 31,87 |
| | 160 | 03 | 7 | 34 | 7 | 41 d | 48 | 41 | 13,06 | 1,94 |
| | 300 | 1,3 | 26 | 18 | 4 | 22 d | 48 | 22 | 17,68 | 10,00 |
| | 175 | 02 | 80 | 31 | 6 | 37 d | 117 | 37 | 19,73 | 1,84 |
| | 220 | 02 | 125 | 25 | 5 | 30 d | 155 | 30 | 26,70 | 2,43 |
| | 170 | 2,0 | 9 | 33 | 6 | 39 d | 48 | 39 | 13,35 | 13,13 |
| | 180 | 04 | 80 | 31 | 6 | 37 d | 117 | 37 | 19,73 | 3,69 |
| | 200 | 1,2 | — | — | — | — | — | — | — | — |

Totaal 90,8% v/d Jaarproductie in 491,44

27,2% v/d Jaarproductie in 218,8 dinsten

315, ↑
↓
600
A
100
↑
dage

Machine III B twee persunits + draaibare schaar

11.10

| product | lengte [mm] | % vld tot Productie | Per 6 meter | | | | | | Product | Totale prod incl. overval | |
|---------------|----------------|------------------------|-----------------------------|-------------|--------|-------|--------|-------|---------|------------------------------|-------------|
| | | | Pans | Pans/Schaar | Schaar | Draai | Draait | Post. | | | |
| | 70 | 22,0 | 9 | 70 | 15 | - | 94 | 25 | 4,35 | 61,88 | |
| | 150 | 25,7 | 7 | 32 | 7 | - | 46 | 39 | 5,60 | 85,37 | |
| | 150 | 13 | 7 | 32 | 7 | - | 46 | 39 | 5,60 | 4,33 | |
| | 300 | 33 | 23 | 15 | 4 | - | 42 | 19 | 10,27 | 17,40 | |
| | 140 | 06 | 49 | 35 | 7 | - | 91 | 42 | 8,06 | 2,61 | |
| | 225 | 6,2 | 57 | 21 | 5 | - | 83 | 26 | 11,83 | 36,76 | |
| | 225 | 10 | 57 | 21 | 5 | - | 83 | 26 | 11,83 | 5,93 | |
| | 340 | 02 | 51 | 13 | 4 | - | 68 | 17 | 15,44 | 1,49 | |
| | 340 | 02 | - | - | - | - | - | - | - | - | |
| | 550 | 02 | 50 | 8 | 2 | - | 60 | 10 | 23,70 | 2,81 | |
| | 550 | 01 | 50 | 8 | 2 | - | 60 | 10 | 23,70 | 1,09 | |
| | 260 | 01 | 161 | 19 | 4 | - | 184 | 23 | 24,93 | 1,14 | |
| | 140 | 1,2 | 16 | 34 | 8 | - | 58 | 42 | 5,97 | 4,19 | |
| | 270 | 1,3 | 30 | 18 | 4 | - | 57 | 22 | 10,14 | 6,20 | |
| | 210 | 1,4 | 66 | 23 | 5 | - | 94 | 28 | 12,07 | 8,44 | |
| | 480 | 2,8 | 42 | 9 | 3 | - | 54 | 12 | 18,53 | 24,41 | |
| | 330 | 03 | - | - | - | - | - | - | - | - | |
| | 300 | 03 | 42 | 15 | 4 | - | 61 | 19 | 12,90 | 1,92 | |
| | 320 | 01 | - | - | - | - | - | - | - | - | |
| | 140 | 1,9 | 0 | 0 | 84 | 84 | 84 | 42 | 12,21 | 11,57 | |
| | 140 | 04 | 8 | 34 | 50 | 84 | 92 | 42 | 12,72 | 2,52 | |
| | 145 | 1,7 | 7 | 34 | 48 | 87 | 89 | 41 | 12,71 | 10,76 | |
| | 100 | 05 | 10 | 49 | 69 | 110 | 128 | 59 | 12,17 | 3,04 | |
| | 170 | 04 | 41 | 29 | 41 | 70 | 111 | 35 | 15,66 | 3,01 | |
| | 200 | 07 | 63 | 24 | 34 | 58 | 121 | 29 | 18,74 | 6,17 | |
| | 240 | 02 | 53 | 19 | 29 | 48 | 101 | 24 | 19,36 | 1,82 | |
| | 240 | 04 | 10 | 19 | 29 | 48 | 58 | 24 | 14,61 | 2,84 | |
| | 140 | 02 | 40 | 34 | 50 | 84 | 134 | 42 | 15,37 | 1,37 | |
| | 220 | 02 | 59 | 22 | 32 | 54 | 113 | 27 | 18,96 | 5,84 | |
| | 350 | 03 | 88 | 12 | 22 | 34 | 122 | 17 | 28,45 | 3,65 | |
| | 70 | 01 | - | - | - | - | - | - | - | - | |
| | 120 | 03 | - | - | - | - | - | - | - | - | |
| | 190 | 01 | - | - | - | - | - | - | - | - | |
| | 160 | 01 | - | - | - | - | - | - | - | - | |
| | 150 | 02 | - | - | - | - | - | - | - | - | |
| | 600 | 04 | - | - | - | - | - | - | - | - | |
| | 130 | 04 | - | - | - | - | - | - | - | - | |
| | 130 | 25 | 0 | 0 | 8 | 48 | 48 | 48 | 6,75 | 9,53 | |
| | 115 | 1,5 | 9 | 45 | 9 | 54 | 63 | 54 | 7,03 | 5,90 | |
| | 100 | 03 | 11 | 52 | 11 | 63 | 74 | 63 | 6,86 | 1,16 | |
| | 270 | 05 | 27 | 19 | 4 | 23 | 50 | 23 | 11,50 | 2,90 | |
| | 110 | 04 | 15 | 47 | 10 | 57 | 72 | 57 | 7,22 | 1,60 | |
| | 215 | 04 | 63 | 24 | 10 | 29 | 92 | 29 | 13,49 | 2,43 | |
| | 330 | 07 | 61 | 15 | 5 | 19 | 80 | 19 | 17,55 | 5,82 | |
| | 170 | 5,1 | 0 | 0 | 39 | 39 d | 39 | 39 | 9,10 | 24,43 | |
| | 160 | 03 | 7 | 34 | 7 | 41 d | 48 | 41 | 9,46 | 1,49 | |
| | 300 | 1,2 | 26 | 18 | 4 | 22 d | 48 | 22 | 13,66 | 8,03 | |
| | 175 | 02 | 80 | 31 | 6 | 37 d | 117 | 37 | 14,93 | 1,44 | |
| | 220 | 02 | 125 | 25 | 5 | 30 d | 155 | 30 | 20,70 | 1,93 | |
| | 170 | 2,0 | 9 | 33 | 6 | 39 d | 48 | 39 | 9,71 | 10,09 | |
| | 180 | 04 | 80 | 31 | 6 | 37 d | 117 | 37 | 15,00 | 2,89 | |
| | 200 | 1,2 | - | - | - | - | - | - | - | - | |
| Totaal | | 90,8% | vld Jaarproductie in | | | | | | | 398,78 | doop |

266
↓
57
A
V
70
A

| product | I ^d A | | II A | | I ^d B | | II B | |
|---------|------------------|--------|------|--------|------------------|-------|------|---------|
| | | | | | | | | |
| | + | 75,81 | | | + | 61,51 | | |
| | | | + | 101,03 | | | + | 0,3, 20 |
| | | | + | 5,24 | | | + | 4,30 |
| | + | 25,18 | | | | | + | 16,83 |
| | | | + | 3,03 | | | + | 7,25 |
| | | | + | 43,47 | | | + | 36,26 |
| | | | + | 7,01 | | | + | 5,85 |
| | | | + | 1,81 | | | + | 1,53 |
| | | | | | | | ✓ | 1,53 |
| | | | + | 2,35 | | | + | 1,38 |
| | | | + | 1,17 | | | + | 1,17 |
| | | | + | 1,26 | | | + | 1,00 |
| | | | + | 4,71 | | | + | 3,81 |
| | | | + | 7,67 | | | + | 7,17 |
| | | | + | 9,82 | | | + | 9,12 |
| | | | + | 27,75 | | | + | 27,13 |
| | | | | | | | ✓ | 1,80 |
| | | | + | 2,25 | | | + | 2,25 |
| | | | | | | | ✓ | 0,5 |
| | + | 15,47 | | | + | 11,51 | | |
| | | | | | + | 2,02 | | |
| | + | 16,40 | | | + | 12,40 | | |
| | | | | | ✓ | 3,60 | | |
| | | | | | ✓ | 2,00 | | |
| | + | 8,86 | | | + | 7,11 | | |
| | | | | | ✓ | 2,2 | | |
| | | | | | + | 3,13 | | |
| | | | | | ✓ | 1,6 | | |
| | | | | | ✓ | 5,5 | | |
| | | | | | ✓ | 7,6 | | |
| | | | | | ✓ | 3,2 | | |
| | | | | | ✓ | 2,2 | | |
| | | | | | ✓ | 1,0 | | |
| | | | | | | | ✓ | 0,5 |
| | | | | | | | ✓ | 1,5 |
| | | | | | | | ✓ | 2,4 |
| | | | | | ✓ | 2,5 | | |
| | + | 12,07 | | | + | 9,12 | | |
| | + | 7,33 | | | + | 5,75 | | |
| | | | | | + | 1,45 | | |
| | | | | | + | 3,38 | | |
| | + | 2,48 | | | + | 1,33 | | |
| | | | | | ✓ | 2,00 | | |
| | | | | | ✓ | 1,80 | | |
| | + | 28,83 | | | + | 24,27 | | |
| | | | | | + | 1,20 | | |
| | + | 11,55 | | | + | 9,12 | | |
| | | | | | + | 1,64 | | |
| | | | | | + | 2,12 | | |
| | + | 15,35 | | | + | 11,90 | | |
| | | | | | ✓ | 2,4 | | |
| | | | | | ✓ | 4,6 | | |
| | | 219,33 | | 218,57 | | 211,3 | | 208 |

84,6 % v/d jaarprod.

86,9% + Rest voorbereiden

| Product | II A | | III A | | II B | | III B | |
|---------|-------|------|-------|------|-------|------|-------|------|
| | Value | Sign | Value | Sign | Value | Sign | Value | Sign |
| | 7375 | + | 7612 | - | 5927 | + | 6122 | - |
| | 10103 | 0 | 10260 | 945 | 2350 | + | 2537 | - |
| | 524 | + | 514 | - | 432 | + | 433 | - |
| | 1982 | + | 2045 | - | 1623 | + | 1740 | - |
| | 309 | + | 316 | - | 755 | + | 261 | - |
| | 4347 | + | 4403 | - | 2626 | - | 2626 | + |
| | 701 | + | 710 | - | 525 | - | 593 | + |
| | 181 | + | 176 | - | 653 | + | 144 | - |
| | - | - | - | - | - | - | - | 3 |
| | 235 | + | 255 | - | 192 | + | 281 | - |
| | 417 | + | 122 | - | 299 | + | 105 | - |
| | 126 | + | 138 | - | 104 | + | 114 | - |
| | 471 | + | 505 | - | 591 | + | 413 | - |
| | 767 | + | 805 | - | 647 | + | 626 | - |
| | 922 | + | 1014 | - | 817 | + | 844 | - |
| | 2775 | + | 2861 | - | 2366 | + | 2441 | - |
| | - | - | - | - | - | - | - | 5 |
| | 225 | + | 227 | - | 14 | + | 152 | - |
| | | | - | | | | - | 5 |
| | | | 1253 | + | | | 1157 | + |
| | | | 315 | - | | | 252 | + |
| | | | 1432 | - | | | 1020 | + |
| | | | 410 | + | | | 204 | + |
| | | | 396 | + | | | 201 | + |
| | | | 800 | - | | | 617 | + |
| | | | 234 | - | | | 182 | + |
| | | | 371 | - | | | 220 | + |
| | | | 196 | - | | | 131 | + |
| | | | 207 | - | | | 524 | + |
| | | | 470 | - | | | 365 | + |
| | | | - | | | | - | 1 |
| | | | - | | | | - | 3 |
| | | | - | | | | - | 2 |
| | | | - | | | | - | 5 |
| | | | - | | | | - | 2 |
| | | | - | | | | - | 5 |
| | | | - | | | | - | 2 |
| | | | 1284 | + | | | 953 | + |
| | | | 725 | + | | | 590 | + |
| | | | 144 | + | | | 116 | + |
| | | | 357 | + | | | 290 | + |
| | | | 205 | + | | | 160 | + |
| | | | 379 | + | | | 443 | + |
| | | | 711 | + | | | 522 | + |
| | | | 3187 | + | | | 2443 | + |
| | | | 154 | + | | | 144 | + |
| | | | 1000 | + | | | 203 | + |
| | | | 124 | + | | | 144 | + |
| | | | 243 | + | | | 153 | + |
| | | | 1313 | + | | | 1004 | + |
| | | | 364 | + | | | 229 | + |
| | | | - | - | | | - | 8 |
| | 242 | | 249 | | 273 | | 1749 | 2159 |

• 86.6%

• 30.8%

Rendementsberekeningen van de investeringen

In het volgende gedeelte is het rendement berekend van de eventueel aangeschafte machines.

Dese machines zijn allen zonder automatische Stripbeveer

Er is gekeerd voor situaties met en zonder de FPA subsidie.

De WIR premie is 12,5% waarbij dus geen rekening is gehouden met een eventuele kleinhandelingsbeslag

De terugverdiendtijd wordt geschat door:

$$T.V.T. = \frac{\text{Investering}}{\text{besparing} - \text{afschrijving (positief)}}$$

In de tabellen en grafieken is de kasstroom uit getuut, waarbij alles geïndexeerd is naar jaar 1 met een rente van 10%

Dese methode noemt men de Netto Contante Waarde methode.

Indien men een machine II A koopt kan deze machine met een bedieningsman ca 55% van de productie aan. De resterende 45% wordt gemaakt door 5 man en 60% van het oude machine park.

Dit geeft de volgende jaarlijkse kosten:

| | |
|--|--------------------|
| Loon: 6 x f 55.000,- | f 330.000,- |
| (20% van f 790.000) Afwijking machine II | f 158.000,- |
| (5% prijs f 1.200) Gemiddelde Machine II Machine II | f 34.560,- |
| Verzekerings machine II | f 45.000,- |
| (13% van 420.000) Energie + onderhoud + die. mach II | f 56.600,- |
| (35% van) 60% oude mach. kosten | f 215.400,- |
| <u>Totale jaarlijkse kosten</u> | <u>f 839.560,-</u> |

Dit levert een jaarlijkse besparing van f 14.440,-

Een globale schatting van de terugverdien tijd is dan:

$$TVP = \frac{\text{Investering}}{\text{besparing, toename}} = \frac{691.250}{14.440 + 158.000} = 4.01 \text{ jaar}$$

| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|----------|-----------|------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Invest | 691.250,- | - | - | - | - | - |
| besp. | - | 14440/1,1 | 14440/1,1 ² | 14440/1,1 ³ | 14440/1,1 ⁴ | 14440/1,1 ⁵ |
| Afscr | 158000,- | 158000/1,1 | 158000/1,1 ² | 158000/1,1 ³ | 158000/1,1 ⁴ | 158000/1,1 ⁵ |
| Kassh. | 158000,- | 156764,- | 142.512,- | 129.556,- | 117.779,- | 107.072,- |
| Cum surp | -533250,- | -376.486,- | -233.974,- | -104.417 | 13362,- | 120.434,- |

△
1,1⁵

Indien men machine II A koopt en de afschrijving van de projectkosten in het eerste jaar doet!

Dan: jaarlijkse kosten

| | | |
|--|-----------|-----------|
| loon | 6255000,- | 330.000,- |
| Afschrijving mach II 20% van 420+150 | - | 114.000,- |
| Rente op 5% old project: 691.250 | - | 34.560,- |
| Gereedschap Mach II | - | 45.000,- |
| Energie + onderhoud Mach II: 13% van 420 | - | 56.000,- |
| 60% old oude mach kosten | - | 215.000,- |

Totale jaarlijkse kosten

f 795.560,-

Dit geeft een jaarlijkse besparing van f 58.440,-

Een globale schatting van de TVT = $\frac{691250}{172440} = 4,01$ jaar

| | 1 | 2 | 3 | 4 | 5 | 6 |
|--------------|---------------------------------|-------------|-----------|----------|-----------|-----------|
| Investering | 691.250,- | - | - | - | - | - |
| Besparing | - | 58.440/1,1 | | | | |
| Afschrijving | 3.35000 | 114.000/1,1 | | | | |
| Kasstroom | 339.800 | 156.764,- | 142.582,- | 129.557 | 117.779,- | 107.072 |
| Cum Sweep. | 339.800 -357250,- | -200.486,- | -57.974,- | 71.583,- | 189.362,- | 296.434,- |

Eén machine II A met subsidie

| | |
|-------------------------------|-----------|
| loon | 330.000,- |
| Afschrijving 20% v 592500 | 118.500,- |
| Opmerente 4,5% van 518440 | 23.330,- |
| Overoedschap | 45.000,- |
| Energie + exp. 13% van 420000 | 56.600,- |
| 6% oude situatie | 215.400,- |

Totale jaarlijkse kosten $\text{f } 788.830,-$

Dit levert een jaarlijkse besparing van $\text{f } 65.170,-$

$$\text{Globale schakeling TVT} = \frac{518440}{65.170 + 118.500} = 2,83 \text{ jaar}$$

| | 1 | 2 | 3 | 4 | 5 | 6 |
|--------------|------------|-------------|--------------------------|-----------|-----------|-----------|
| Invest. | 518.440,- | - | | | | |
| besparing | - | 65.170/1,1 | 65.170/1,1 ² | | | |
| Afschrijving | 118.500 | 118.500/1,1 | 118.500/1,1 ² | | | |
| Kasstroom | 118.500 | 166.973 | 151.793,- | 137.994,- | 125.449 | 114.045 |
| Cum. Sompl. | -399.940,- | -232.967 | -81.174,- | 56.8920,- | 182.269,- | 296.314,- |

Een machine II A met subsidie en afschrijving van de Projectkosten in het eerste jaar

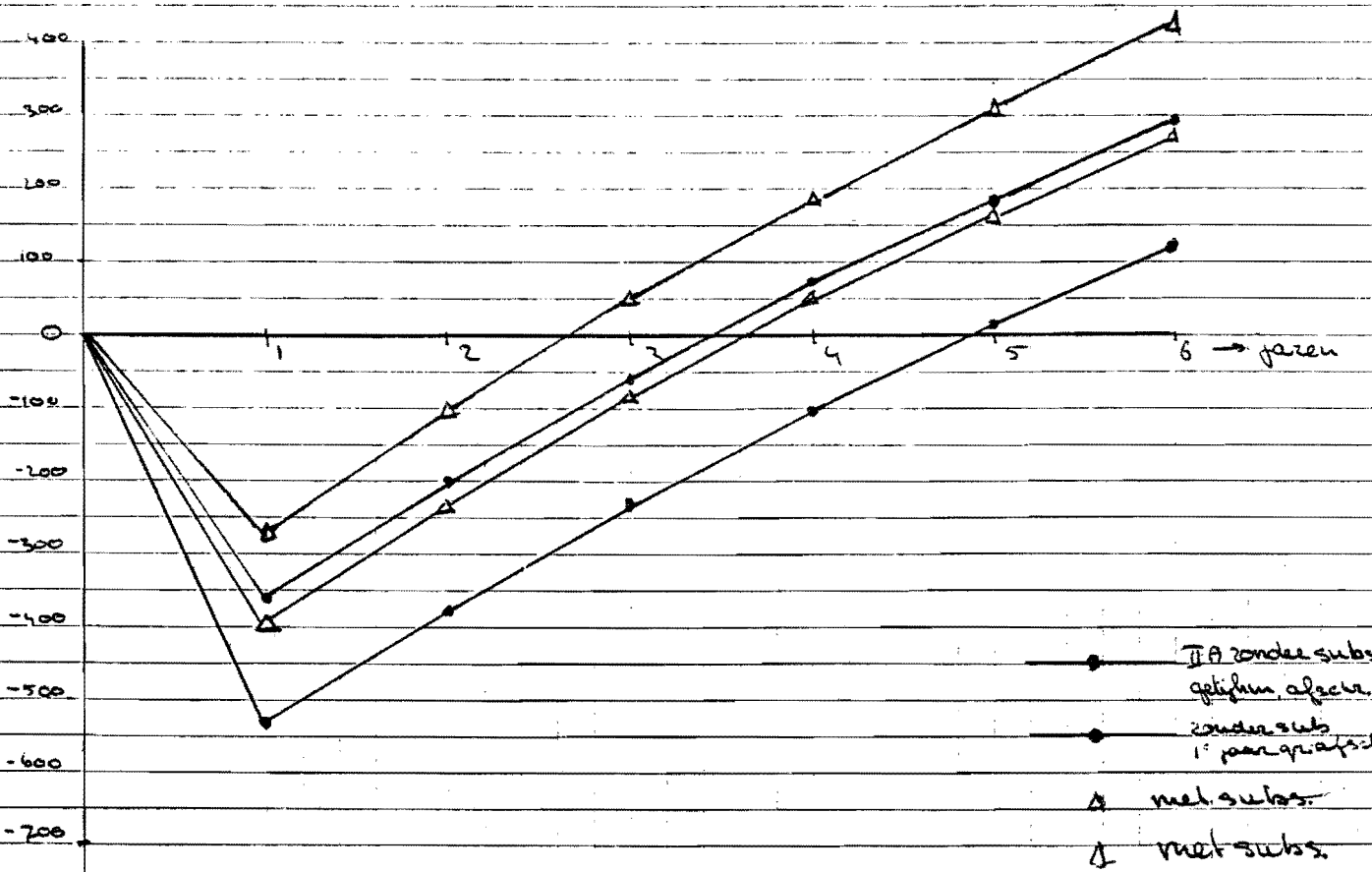
| | |
|--------------------------------------|------------------|
| loon | 330.000,- |
| Afschrijving Mach II 20% van 427.500 | 85.500,- |
| Rentekosten gem 4,5% van 510.440 | 23.300,- |
| Eigenaarderschap | 45.000,- |
| Energie + O + R 13% van 420.000 | 56.600,- |
| 6% andere situatie | 25.400,- |
| Totale jaarlijkse kosten | 755.800,- |

Afschrijving eerste jaar: $f 85.500 + f 165.000 = f 250.500,-$
 $5 \times (427.500 - 427.500)$

Jaarlijkse besparing $f 90.200,-$

| | 1 | 2 | 3 | 4 | 5 | 6 |
|-------------|-------------|------------|-------------|-----------|-----------|-----------|
| Invest | 510.440,- | - | - | - | - | - |
| Bexp | - | 90.200/1,1 | 90.200/1,21 | | | |
| Afschr | f 250.500,- | 85.500/1,1 | 85.500/1,21 | | | |
| Klaasstr | 250.500,- | 167.000,- | 151.818,- | 138.016,- | 125.420,- | 114.063,- |
| Cum surplus | -267.940,- | -100.940,- | 50.878,- | 188.894,- | 314.364,- | 428.427,- |

2,6 jaar



Bij aanschaf van 2 Machines I^a A kan men met ~~keuze~~
 man 78,1% van de productie aan.

De resterende 21,9% kunnen door 3 man en 35% van
 de oude machines gemaakt worden

| | | | |
|---------|--------------------------|-------------------|-------------|
| Kosten: | Loon | 5 x 55000 | 275.000,- |
| | Afschrijving | 20% van f 1129625 | 258.200,- |
| | Gemid rente: | 5% over f 1129625 | 56.500,- |
| | Gezondschap | | 90.000,- |
| | R + E + O | 8% van 796.000 | 63.700,- |
| | 35% van | | 125.300,- |
| | | | <hr/> |
| | Totale jaarlijkse kosten | | f 868.700,- |

Jaarlijks verlies: f 14.700,-

Globale +VT = $\frac{1129625}{258200 + 14700} = 4,64$ jaar

| | 1 | 2 | 3 | 4 | 5 | 6 |
|------------|---------|-------------|---------|---------|--------|--------|
| Invest. | 1129625 | - | | | | |
| besparing | - | -14.700/1,1 | | | | |
| Afschr. | 258200 | 258200/1,1 | | | | |
| Kasstr. | 258200 | 221364 | 201240 | 182945 | 166313 | 151194 |
| Cum surpl. | -871425 | -650061 | -448821 | -265876 | -99563 | +51600 |

5,7 jaar

Met subsidie: jaarlijkse kosten f 785.800,-

Jaarlijkse besparing f 68.200,-

| | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|---------|------------|---------|--------|--------|--------|
| Invest. | 847.250 | - | | | | |
| besp | - | 68.200/1,1 | | | | |
| afschr | 193650 | 193650/1,1 | | | | |
| Kasstr | 193650 | 238045 | 216405 | 196732 | 178847 | 162588 |
| Cum Surpl | -653600 | -415455 | -199050 | -2318 | 176529 | 339117 |

4,1 jaar

By Aanschaf van machine I^a A + II A kunnen ca 29% ^{12.7}

van de productie a.w. met twee mensen. De resterende
16% kunnen met 2 mensen en 25% v.l. oude machinepark maken

De jaarlijkse kosten zijn dan:

Loon
Afschrijving 20% van 143800
Gem rente 5% van 1258250
Overheidschap
EIO + D + R 8% van 818000
25% oude machines

220.000,-
287.600,-
63.000,-
90.000,-
65.450,-
89.750,-

f 815.800,-

jaarlijkse besparing f 38.200,-

| | 1 | 2 | 3 | 4 | 5 | 6 |
|------------|---------|-----------|---------|---------|--------|---------|
| Invest | 1258250 | - | | | | |
| boep | - | 38200/,, | | | | |
| Afsch | 287600 | 287600/,, | | | | |
| Kassh. | 287600 | 296182 | 269256 | 247778 | 222526 | 202296 |
| Cum simpl. | -970650 | -674468 | -405212 | -160934 | +62092 | +264388 |

4.7 jaar

Indien subsidie wordt toegelaten zijnde jaarlijkse kosten f 723350,

De jaarlijkse besparingen f 130650,-

| | 1 | 2 | 3 | 4 | 5 | 6 |
|------------|-------------------|-----------|---------|--------|--------|--------|
| Invest. | 943200 | | | | | |
| Boep | 130650 | 130650/,, | | | | |
| Afschr. | 215700 | 215700/,, | | | | |
| Kassh. | 215700 | 314864 | 286240 | 266218 | 238561 | 215056 |
| Cum simpl. | -728000 | -413136 | -126896 | 133322 | 369883 | 584939 |

3.5 jaar

Bij aanschaf van de Machines II A + III A kan men

met 2 man 86,6% van de producten maken

De resterende 13,4% kunnen door 2 mensen te 25%

Van de oude machines gemaakt worden.

| | | |
|----------------------------------|------------|-----------|
| leen | 4 x 55.000 | 220.000,- |
| Afschrijving 20% van 1567.000,- | | 313.400,- |
| Gemidd. rente 5% over 1321.125,- | | 66.062,50 |
| Overeenkomst | | 90.000,- |
| Pop + O 18% van 872.000 | | 156.960,- |
| 25% oude w.o.w. | | 89.750,- |

Totale jaarlijkse kosten $\text{f} 895.070,-$

Dit levert een jaarl. verlies van $\text{f} 41.070,-$

Een globale schubbing van de TVT = $\frac{1321.125}{313.400 - 41070} = 5,03$ jaar

| | 1 | 2 | 3 | 4 | 5 | 6 |
|--------------|----------|------------|-------------|-----------|-----------|--------|
| Invest. | 1321125 | - | - | - | | |
| besparing | - | -41070/1,1 | -41070/1,21 | | | |
| Afschrijving | 313.400 | 313400/1,1 | 313400/1,21 | | | |
| kasstroom | 313.400 | 247573 | 225066 | 204605 | 186005 | 169095 |
| Com. swrpl. | -1057725 | -810192,- | -583086,- | -380480,- | -194475,- | -25380 |

Indien men bij aanschaf van II A en III A de projectkosten het eerste jaar afschrijft zal het kostenplaatje er als volgt uit

| | |
|-------------------------------|-----------|
| Loon | 220.000,- |
| Afschrijving 20% van 1172.000 | 234.400,- |
| Gem. Rente over 1371125,- | 68.560,- |
| Gereedsch. | 90.000,- |
| R+O | 112.360,- |
| 25% oadesil. | 89.750,- |

Totale jaarlijkse kosten f 816.070,-

Dit levert een jaarlijkse besparing van f 379.30,-

De afschrijving het eerste jaar = $1567000 - 1172000 = f 395000 + 234400$
= 629.900,-

| | 1 | 2 | 3 | 4 | 5 | 6 |
|------------|-----------|------------|-----------|--------|--------|----------|
| Invest. | 1371125,- | - | - | - | - | - |
| besp | - | 37930/1,1 | 1,21 | | | |
| Afschrijv. | 629900 | 234400/1,1 | 1,21 | | | |
| Kasstr. | 629900 | 247573 | 225066 | 204605 | 186004 | 169095 |
| Cum Surpl | -741225,- | -493652,- | -268585,- | -63980 | 122024 | 291119,- |

Aankoop machines IIA + IIIA met subsidie

| | |
|------------------------------|-----------|
| loon | 220.000,- |
| Afschrijving 20% van 1175250 | 235.050,- |
| Gen. rente 4,5% van 1020344 | 46.275,- |
| Geraadschap | 90.000,- |
| R+O 13% van 877.000 | 113.360,- |
| 25% van andere lasten | 89.750,- |
| Totale lasten per jaar | 794.435,- |

Dit geeft een jaarlijkse besparing van 59.565,-

Globale schatting TVT = $\frac{1020344}{235050 + 59565} = 3,5$ jaar

| | 1 | 2 | 3 | 4 | 5 | 6 |
|--------------|------------|-------------|-------------|------------|-------------|-------------|
| Invest. | 1020344,- | - | | | | |
| Besp. | - | 59.565/11 | | | | |
| Afschr. | 235050 | 235050/11 | | | | |
| Kasstr. | 235050 | 267832,- | 243484 | 221349,- | 201226 | 182933 |
| Cum. surplus | = 793294,- | = 525.462,- | = 281.970,- | = -60629,- | = 140.597,- | = 323.530,- |

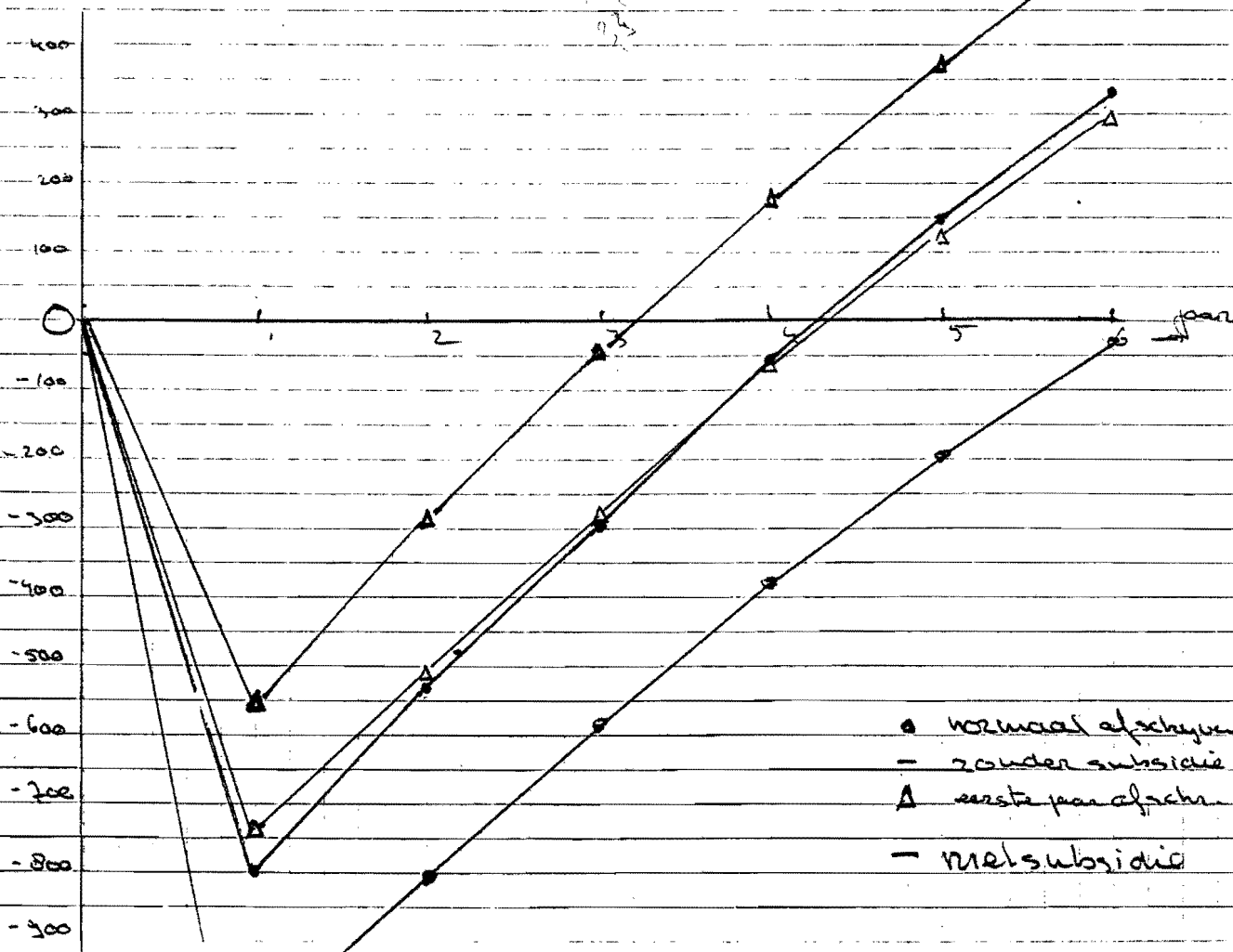
Machines IIA + IIIA met subsidie en afschrijving
projectkosten in eerste jaar:

| | |
|---------------------------------|--------------------|
| leen | € 220.000,- |
| Afschrijving 20% van 875.000 | € 175.000,- |
| Gen rente 4,5% van 1028344 | € 46.275,- |
| Rest | € 293.110,- |
| Totaal jaarlijkse kosten | € 735.185,- |

Dit geeft een jaarlijkse besparing van € 118.815,-

Afschrijving eerste jaar: € 175.000 + € 118.815 - 875.000 = € 472.050,-

| | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|-----------|-----------|----------|-----------|-----------|----------|
| Invest. | 1028344 | - | | | | |
| Rest | - | 118815,1 | | | | |
| Afschr | 472050 | 175200/11 | | | | |
| Kassvlo | 472050 | 267832 | 243484 | 221349 | 201226,- | 182933 |
| Cum Swipt | -556454,- | -288462,- | -44978,- | 176.371,- | 377.597,- | 560539,- |



Bij aanschaf van Machine II B + III B kan men met 2 man zijn 90% old prod maken + ca 5% voorbereiden
De resterende producten kunnen door 1 man + ca 20% old oude machines gemaakt worden

De situatie is dan :

| | |
|---------------------|-----------|
| loon | 165.000,- |
| Afschrijving | 313.400,- |
| Gen rente | 68.560,- |
| Gereedschap | 90.000,- |
| R+O+E | 113.000,- |
| 20% v oude situatie | 71.800,- |

Totale jaarlijkse kosten f 821.760,-

Dit geeft een jaarlijkse besparing van f 32.240,-

Globale TVT = $\frac{1371125}{313400 + 32240}$ 4 jaar

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---------|----------|------------|---------|---------|---------|----------|
| Invest | 1371125 | | | | | |
| Besp | - | 32240/1,1 | | | | |
| Afzch | 313400 | 313400/1,1 | | | | |
| Kassh | 313400 | 314218 | 285653 | 259685 | 236077 | 214615 |
| Cum swp | -1097735 | -743507 | -457854 | -190169 | 37900,- | 252523,- |

4,8

II B + III B inclusief subsidie

| | |
|--------------|-----------|
| loon | 165.000,- |
| Afschrijving | 235.050,- |
| Gen rente | 46.275,- |
| Gereedschap | 96.000,- |
| R+O+E+D | 113.360,- |
| 20% van rest | 71.800,- |

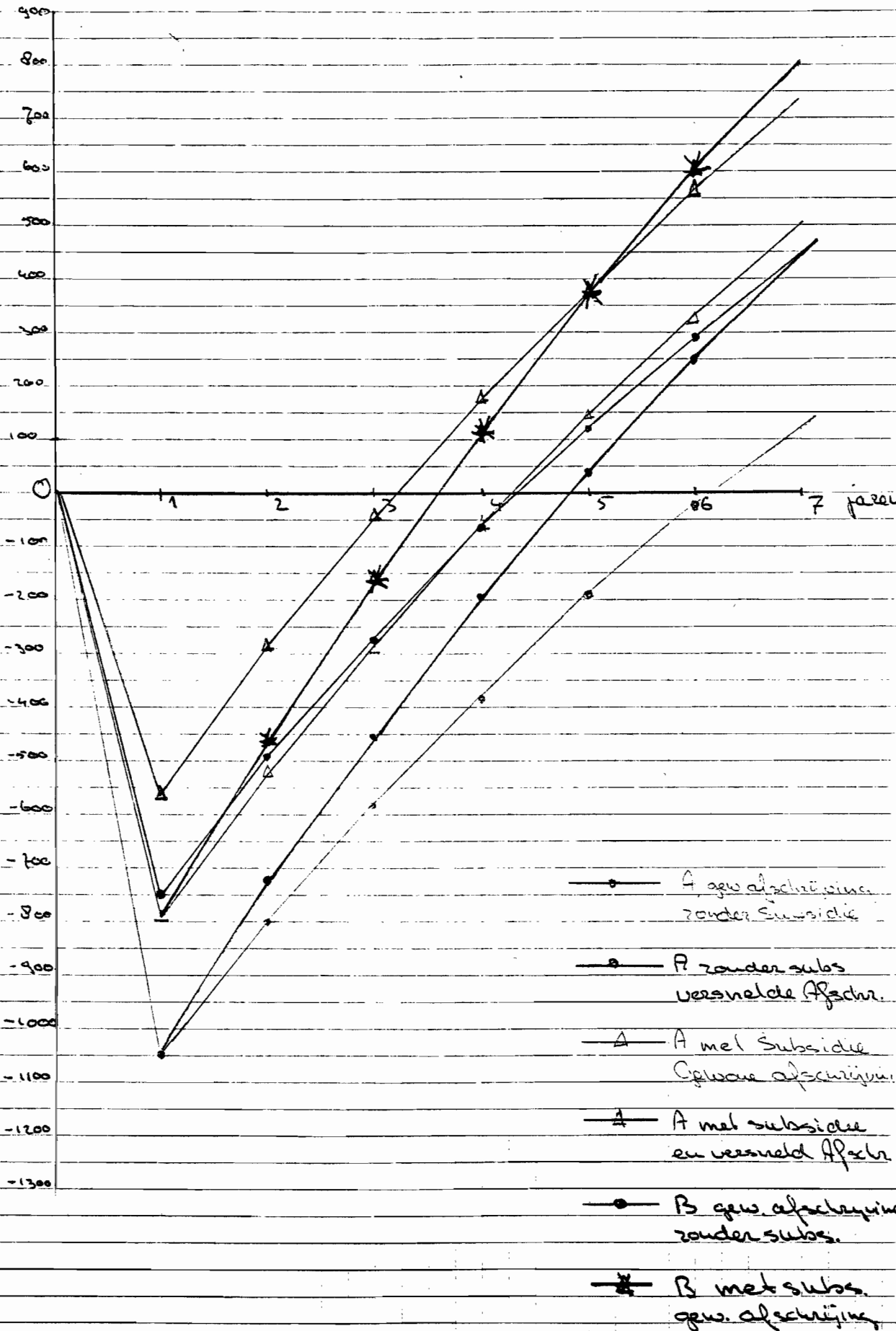
Totaal jaarlijks $\text{f } 721.485,-$

Dit levert een jaarlijkse besparing: $\text{f } 132.515,-$

globale T.V.T : $\frac{1020344}{235050 + 132515} \approx 2,8 \text{ jaar}$

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---------|-----------|------------|-----------|----------|----------|----------|
| Invest | 1020344 | - | | | | |
| Besp | - | 132515/1.1 | | | | |
| Afsch | 235050 | 235050/1.1 | | | | |
| Kasst | 235050 | 334150 | 303773,- | 276157 | 251052,- | 228229 |
| Cur Sum | -793294,- | -459144,- | -155371,- | 120786,- | 371838,- | 600067,- |

Aankoop machine II + machine III



Bij aanschaf van 2 machines III A kan men met 2 mensen ca 83% vld productie aan
De resterende 17% kan men met ca 2 mensen en 0,25% van de oude machines.

Dit geeft de volgende situatie

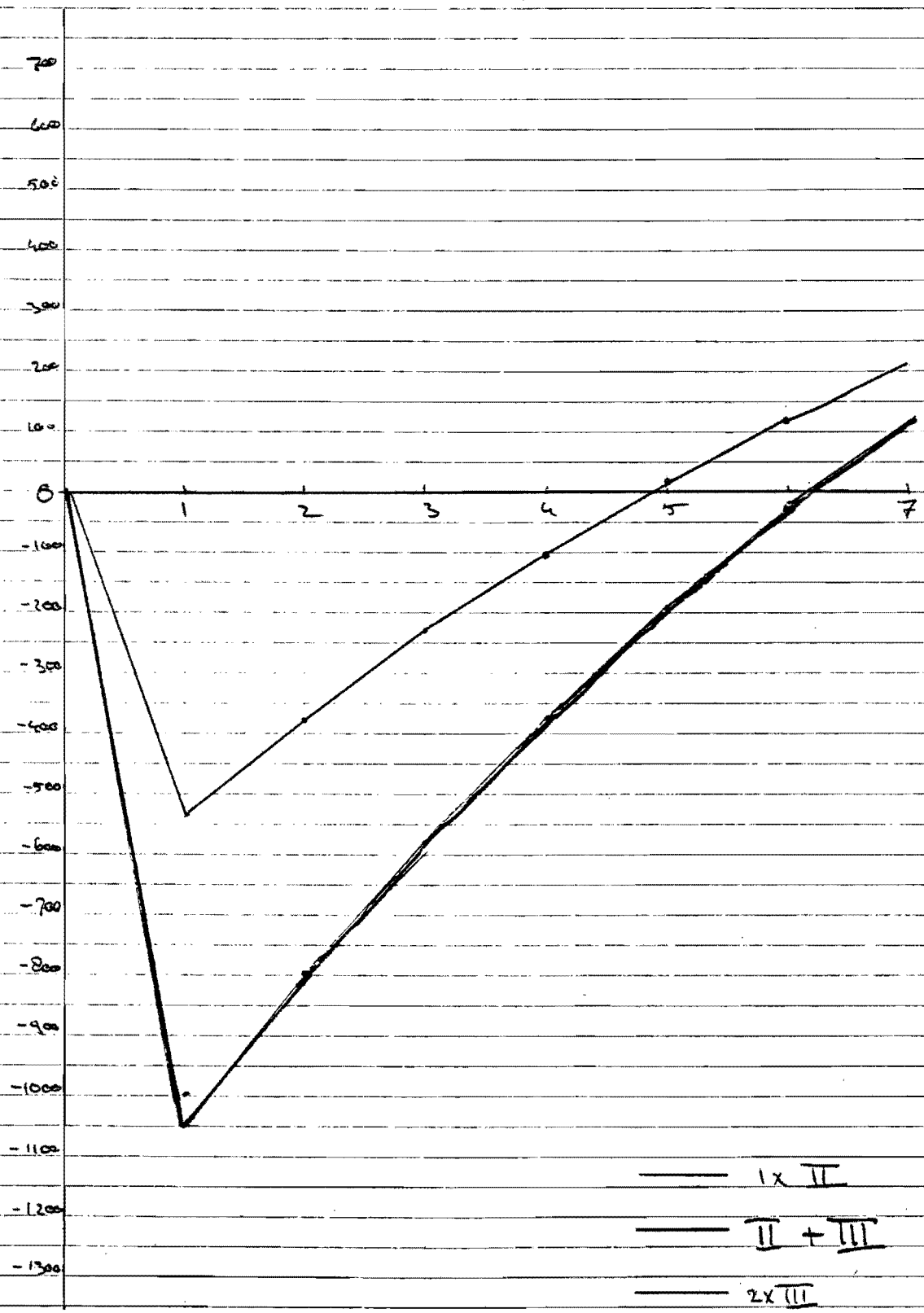
| | |
|--------------------------------|-----------|
| Roan | 220.000,- |
| Afschrijving 20% van 1.549.000 | 309.800,- |
| Gen rente 5% van 1.355.375 | 67.770,- |
| Gereedschap | 90.000,- |
| RTOE 13% van 904.000 | 117.520,- |
| 25% van oude situatie | 89.750,- |
| Totale jaarlijkse kosten | 894.840,- |

Dit levert een jaarlijks verlies van 40.840,-

Globale schetzing $\Delta VT = \frac{1.355.375}{309.800 - 40.840} = 5,04$ jaar

| | 1 | 2 | 3 | 4 | 5 | 6 |
|-------------|--------------|------------|------------|------------|------------|-----------|
| Investering | 1.355.375 | - | | | | |
| Besparing | - | -40.840,- | | | | |
| Afschrijv. | 309.800 | 309.800,- | | | | |
| Kasstrook | 309.800 | 244.509 | 222.281 | 202.074 | 183.704,- | 167.004 |
| Kum. Surpl. | -1.045.575,- | -801.066,- | -578.785,- | -376.711,- | -193.007,- | -26.003,- |

Diverse machines A zonder subsidie
met normale afschrijving



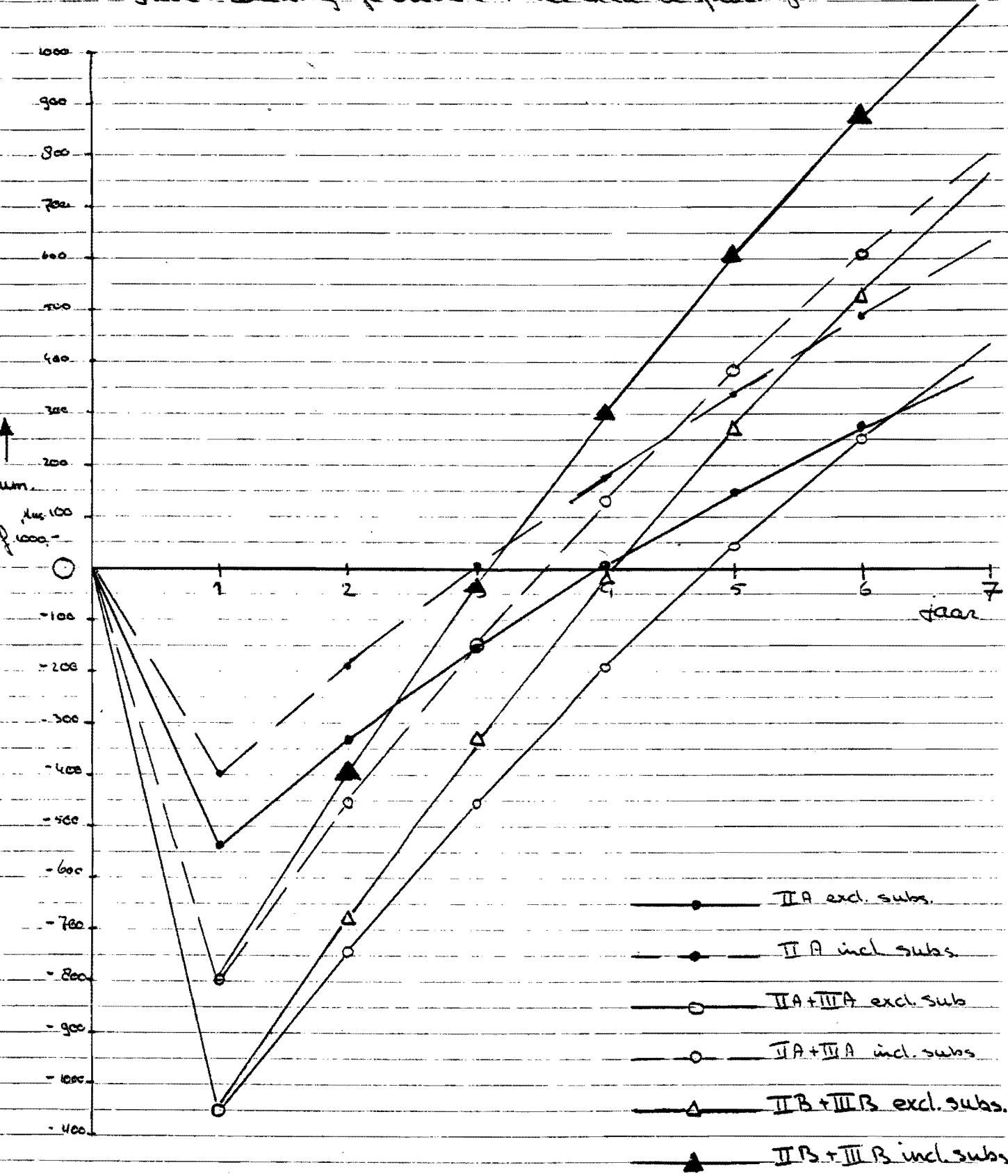
In al het voorgaande is er geen rekening gehouden met besparingen welke voortvloeien uit het kwalitatief betere product dat op de nieuwe machines gemaakt wordt.

- Extra besparingen zijn:
- besparingen bij het lassen (het robotlassen heeft minder bijstellen nodig)
 - Het insaaien van een nieuw schip zodt geeft minder werk.
 - Materiaalbesparing b.g.v. vesting

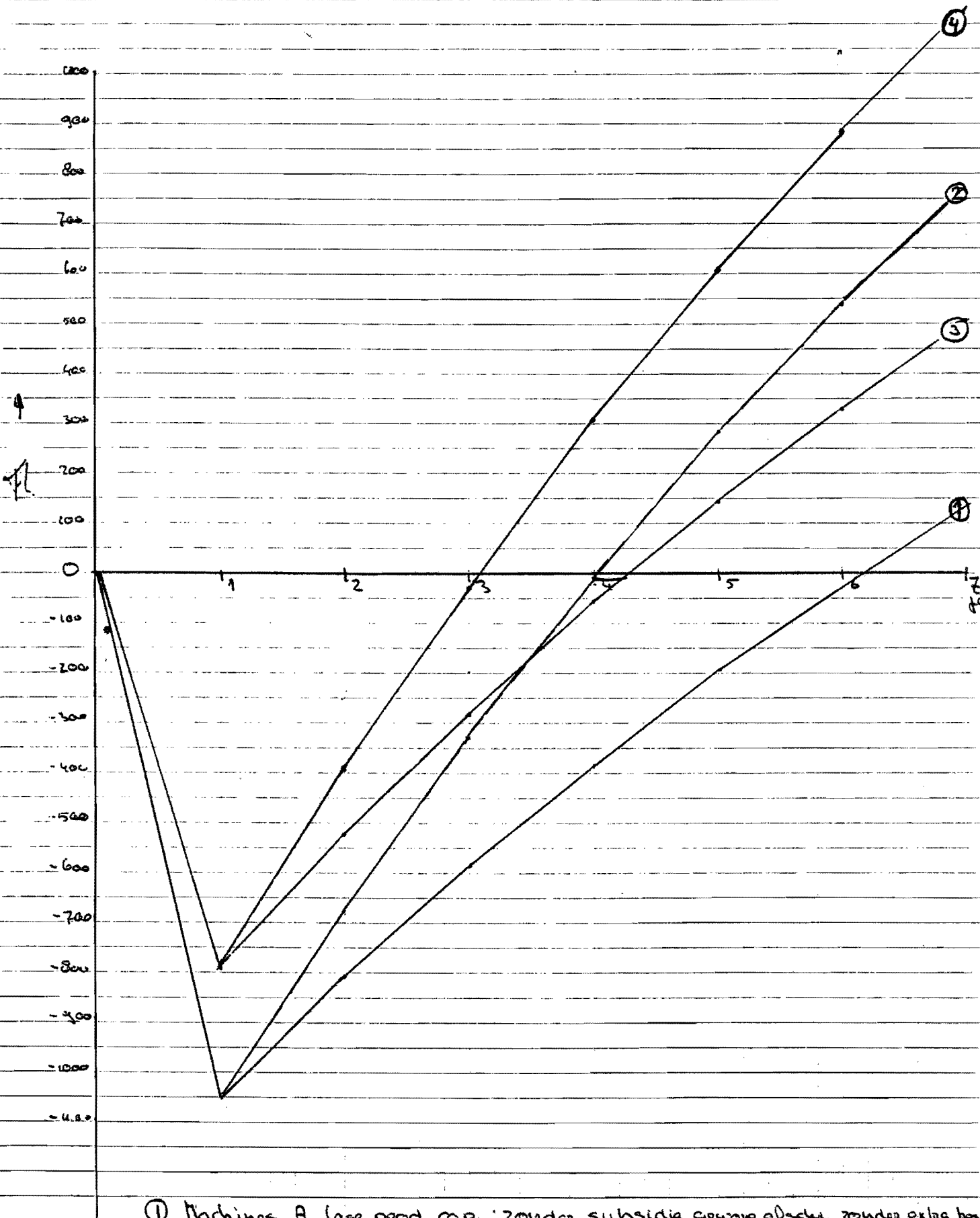
Als we deze besparingen schatten op f 50.000,- excl. mat. voordeel en f 65.000 incl. mat. voordeel krijgen we de volgende kosten plaatjes

| Cum. Surplus: | 1 | 2 | 3 | 4 | 5 | 6 |
|--------------------------------|----------|----------|---------|---------|--------|----------|
| Machine II A excl. subs. | -533250 | -331031 | -155461 | 4148 | 149247 | 281.155 |
| Mach II A incl. subs. | -399940 | -187512 | 5604 | 181.164 | 340764 | 485.855 |
| II A + III A excl. subs. | -1057725 | -749970 | -454920 | -193966 | 43265 | 258929 |
| II A + III A incl. subsidie | -793294 | -457280 | -151813 | 125884 | 378336 | 607837,- |
| II B + III B excl. subs. | -1057725 | -6750325 | -327688 | -11655 | 275647 | 536832,- |
| II B + III B incl. subs. | -793294 | -350962 | -25206 | 307299 | 609577 | 884376,- |
| 2x III A excl. subs. | -1049575 | -738084 | -448620 | -190197 | 44732 | 258304 |
| 2x III A incl. subs. | | | | | | |

Buden rekening gehouden is met extra besparingen



Aankoop machine II en III onder diverse omstandigheden



- ① Machines A lage prod cap; zonder subsidie gewone afsch. zonder extra bon
- ② Machines B hoge " " " " " " met " "
- ③ Machines A lage prod cap; met " " " " " " zonder " "
- ④ Machines B hoge " " " " " " met " "

Bij aanschaf van machine I^d B in tweeploegendienst

kan men ca 78,1% vld productie aan en de resterende

21,9% ^{Voorbereiden. Het afwerken hiervan} kan men in dagdienst met 2 man en 0,25% van de oude machines aan.

De situatie wordt dan als volgt:

| | | |
|-------------------|-----------------|------------------|
| Loon | 4 x 55000 | 220000,- |
| Ploegbestag | 15% van 55000 | 8.250,- |
| Afschrijving | 23% van 793.000 | 158.600,- |
| Rente | 5% van 693.875 | 34.700,- |
| Differeenschap | | 43.000,- |
| E+O+R + diversen | | 31.850,- |
| 25% oude situatie | | 89.750,- |
| | | <u>508.150,-</u> |

De jaarlijkse besparingen zijn dan! f 265.850

| | 1 | 2 | 3 | 4 | 5 | 6 |
|-------------|---------|---------|--------|--------|--------|---------|
| Invest | 693875 | | | | | |
| Besp | - | | | | | |
| Afsch. | 158600 | | | | | |
| Kassb. | 158600 | 385863 | 350785 | 318896 | 289905 | 263550 |
| Cum Surplus | -535275 | -149412 | 201373 | 520269 | 810174 | 1073724 |

Indien subsidie wordt toegeleend ^{24 jaar} zijn de jaarlijkse besparingen f 590.500

De jaarlijkse besparingen zijn dan f 313.500

| | 1 | 2 | 3 | 4 | 5 | 6 |
|-------------|---------|------------|--------|--------|--------|---------|
| Invest | 520.410 | | | | | |
| Besp | - | 313500/1,1 | | | | |
| Afsch. | 118950 | 118950/1,1 | | | | |
| Kassb. | 118950 | 393.136 | 357357 | 324906 | 295369 | 268517 |
| Cum surplus | -401460 | -8324 | 349073 | 673979 | 969348 | 1237865 |

201 jaar

Bij aanschaf van een machine III A kan men in dagdienst met 1 bedieningsman ca 55% van de productie aan. De resterende 45% wordt gemaakt door 5 man en 60% van het ^{oude} machinepark.

De jaarlijkse kosten zijn dan:

| | | |
|---------------------------------------|--|-----------|
| loon | | 330.000 |
| Afschrijving mach III 20% van 922 | | 184.000 |
| Gen rente 5% van 806 | | 40.300 |
| gereedschap II | | 45.000 |
| Energie (ouderhand + diev 13% van 452 | | 58.200 |
| 60% oude mach park | | 215.400 |
| | | <hr/> |
| Totaal | | 873.400,- |

Dit is een jaarlijks verlies van f 19.400,-

Een globale schatting vdi TVT = $\frac{806750}{184000 - 19400} = 4,9$ jaar

| | 1 | 2 | 3 | 4 | 5 | 6 |
|--------------|-----------|-----------|---------|---------|---------|--------|
| Invest | 806.750 | - | - | - | - | - |
| besparing | - | 19400/11 | | | | |
| Afschrijving | 184000 | 184000/11 | | | | |
| Kasstoaar | 184000 | 149636 | 136033 | 123666 | 112424 | 102200 |
| Cum Surpl. | -622750,- | -473114 | -337081 | -213415 | -100991 | 1213 |

5,5

Indien subsidie wordt toegeleend dan bedragen de

jaarlijkse kosten f 814.600,- Dit is een jaarlijkse

besparing van f 39.400,- $TVT = \frac{605000}{39400 + 138300} = 3,4$ jaar

| | 1 | 2 | 3 | 4 | 5 | 6 |
|--------|---------|-----------|--------|--------|--------|--------|
| Invest | 605.000 | - | | | | |
| besp | - | 39400/11 | | | | |
| Afschr | 138300 | 138300/11 | | | | |
| Kasst | 138300 | 161545 | 146860 | 133509 | 121372 | 110330 |

Bij aanschaf van machine III A kan men in 2 ploegendienst (16 uur/dag) ~~aan~~ ca 83% v/d productie aan
 De resterende 17% kan men in dagdienst met 2 mensen en 25% v/d oude machinepark maken.

De jaarlijkse kosten worden dan

| | | |
|-------------------|----------------|---------|
| Loon | 4 x 55000 | 220.000 |
| Ploegendoeslag | 15% x 55.000 | 8.250 |
| Afschrijving | 20% van 922000 | 184.000 |
| Gen. Reuk | | 40.300 |
| Gereedschap | | 45.000 |
| E + O + Div. | | 58.700 |
| 25% Oude machines | | 89.750 |

Totaal 646.000,-

Dit levert een jaarlijkse besparing van 208.000,-

Globaal TVT = $\frac{806750}{184000 + 208000} \approx 2,1$ jaar

| | 1 | 2 | 3 | 4 | 5 | 6 |
|------------|---------|------------|--------|--------|--------|--------|
| Invest. | 806750 | - | | | | |
| besp. | - | 208000/1,1 | | | | |
| Afschr. | 184000 | 84000/1,1 | | | | |
| Kasshr. | 184000 | 356364 | 323967 | 294516 | 267742 | 243402 |
| Cum Surpl. | -622750 | -266386 | +57584 | 352097 | 619839 | 863241 |

2,1 jaar

Indien subsidie wordt toegeend: jaar kosten 587.250,-

Dan jaarlijkse besparingen 266.750,-

| | 1 | 2 | 3 | 4 | 5 | 6 |
|------------|---------|------------|---------|--------|--------|----------|
| Invest. | 605000 | | | | | |
| besp. | - | 266750/1,1 | | | | |
| Afschr. | 138300 | 138300/1,1 | | | | |
| Kasshr. | 138300 | 368227 | 334752 | 304320 | 276695 | 251505 |
| Cum Surpl. | -466700 | -98473 | +236279 | 540599 | 817254 | 1.068.75 |

2,4

Bij aanschaf van machine III B kan men in 2 ploegen dienst (16 uur/dag) 90,8% vld productie aan en ca 5% vld producten voorbereiden zodat de resterende 4,2% v het nabewerk kan afbreuen in dagdienst door 1 man en ca 10% vld oude machine park: De situatie ziet er dan als volgt uit

| | |
|-----------------------------|------------------|
| Loon: 3 x 55000 | 165.000,- |
| Ploegenbeslag 15% van 55000 | 8.250,- |
| Afschrijving | 184.000,- |
| Rente | 40.300,- |
| Gereedschap | 45.000,- |
| E+O+Div. | 58.700,- |
| 10% oude machines | 35.900,- |
| Totaal | 537.150,- |

De jaarlijkse besparingen zijn dan f 316.850,-

Globale TVT = $\frac{806750}{316850 + 184000} = 1,6$ jaar

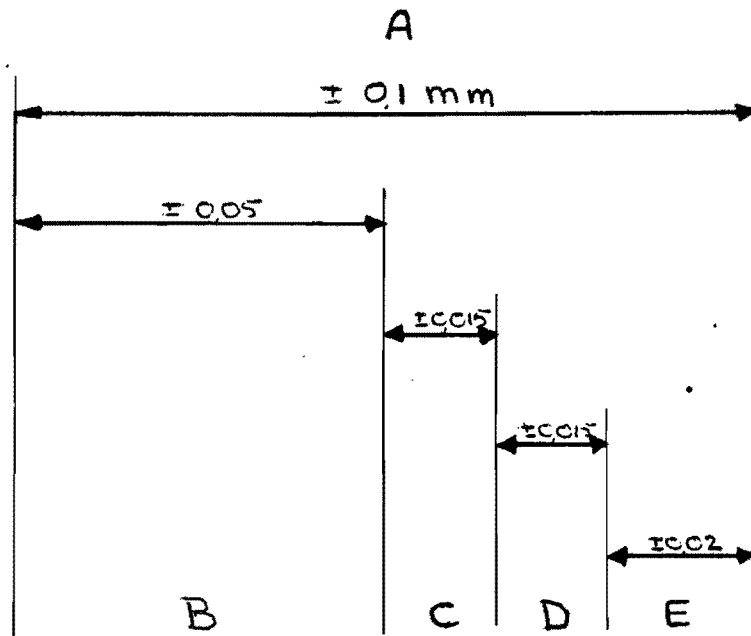
| | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|---------|------------|-----------|--------|--------|----------|
| Invest. | 806750 | | | | | |
| besp. | - | 316850/1,1 | | | | |
| Afsche | 184000 | 184000/1,1 | | | | |
| Kassh. | 184000 | 455318 | 463925 | 376296 | 342087 | 310988 |
| Cum Surpl | -622750 | -167432 | +246493,- | 625784 | 967876 | 1.278864 |

2,6 jaar

Indien subsidie wordt toegelend zijn de jaarlijkse kosten f 478.375,-
De jaarlijkse besparingen zijn dan f 375600,-

| | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|---------|------------|--------|--------|----------|-----------|
| Invest. | 605000 | | | | | |
| besp. | - | 375600/1,1 | | | | |
| Afsch | 138300 | 138300/1,1 | | | | |
| Kassh. | 138300 | 467182 | 424711 | 386101 | 351001 | 319092 |
| Cum Surpl | -466700 | +482 | 425193 | 811254 | 1.162255 | 1.481.387 |

1,29 jaar



A = Gewenste positioneer nauwkeurigheid van de punten t.o.v. het referentiestab

B = Positioneerfout t.o.v. de sabelkromheid, bij een gewenste hartafstand van 1000 mm en een max. schuiflijnsnelheid van de strip $\alpha = 0,57^\circ$



C en D = Positioneer nauwkeurigheid posunits in x-

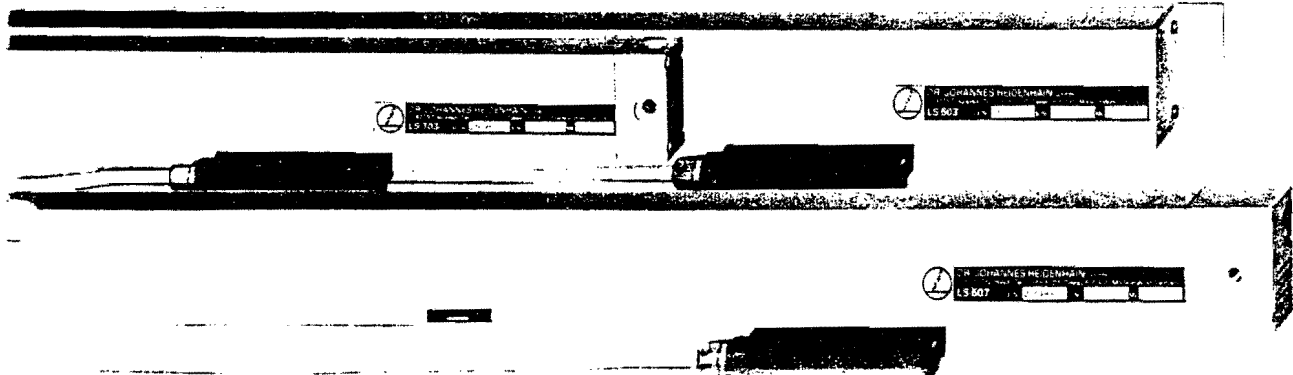
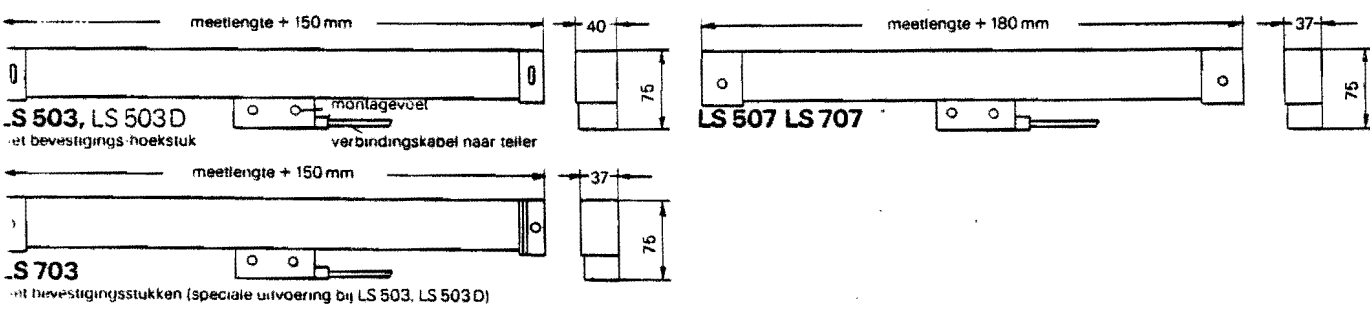
richting: max fout op de pen schuifspindel $\pm 0,005 \text{ mm}$
 Stapgrootte overbrenging $\pm 0,010 \text{ mm}$
 Totaal $\pm 0,015 \text{ mm}$

E = Vereiste positioneer nauwkeurigheid striptransport-systeem.

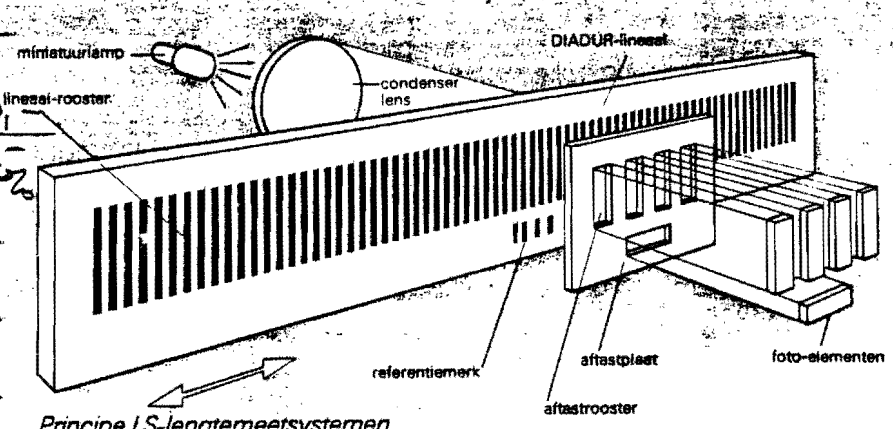
Lengtemeetsystemen



| | | |
|---|---|--|
| Delingsperiode (roosterconstante) | 40 µm | LS 503, 507, 803 |
| | 20 µm | LS 503D/703, 903/803D |
| Referentiemerken op de lineaal | 1 op het midden van de meetlengte | LS 503, 503D, 507/703, 707 |
| | 2 referentiemerken | LS 803, 803D/903 |
| Lichtbron | | Miniatuurlamp 5V/0.6W |
| Jitgangssignalen | | foto-elementen-aftastsignalen: 2 periodieke fase verschoven) en referentiemerksignaal |
| Standaard meetlengten | 170/220/270/320/370/420/470/520/620/720/770/820/920/1020/1140/1240/1340/1440/1540/1640/1740/1840/2040/2240/2440/2640/2840/3040 mm | LS 503, 503D/703 |
| | 170/220/270/320/370/420/470/520/620/720/770/820/920/1020/1140/1240/1340/1440/1540/1640/1740 mm | LS 507/707 |
| | 70/100/120/140/170/220/270/320/370/420/470/520/620/720/770/820/920/1020/1140/1240 mm | LS 803, 803D/903 |
| Meetnauwkeurigheid (nauwkeurigheidsklassen) | ±10/±5 µm | LS 503, 503D, 507, 803, 803D |
| | ±5 µm/1 m ±3 µm/1 m | LS 703, 903 |
| | ±1 µm | LS 703 voor 170/220/270 mm |
| Machinefout-kompensatie | korrektie instelbaar, ±50 µm/m, lineair | LS 507/707 |
| toelaatbare verplaatsingssnelheid | 60 m/min. | 48 m/min. LS 503, 507, 803 24 m/min. LS 503D, 803D 30 m/min. LS 703, 707, 903 |
| toelaatbare versnelling | | 30 m/s ² LS... |
| benodigde verplaatsingskracht | | maks. 10 N LS 503, 503D, 507, 703, 707 maks. 6 N LS 803, 803D/903 |
| stof- en spuitwaterdicht | | IP 53 (DIN 40050) bij aanbouw konform |
| temperatuurbereik | bedrijf 0...50°C (32...122°F) opslag -20...70°C (-4...158°F) | LS... |
| gewicht | 0,7 kg + 2 kg/m meetlengte | LS 503, 503D/703 |
| | 0,8 kg + 2 kg/m meetlengte | LS 507/707 |
| | 0,1 kg + 0,5 kg/m meetlengte | LS 803, 803D/903 |
| lengte | | aan LS (met stekker) 3 m; verlenging 2 m |



5 μ → afstandkop 780,-
 state lin: grond patroon 1710,
 2500,-
 MICRID - 10²



| | |
|---------------|----------------------------------|
| LS | |
| LS 300 | 100 μm |
| LS 300 | 1 op het midden van een deelstuk |

Principe LS-lengtemeetsystemen

bij benadering sinusvormige) signalen (90° in

| | |
|---------------|---|
| LS 300 | 400 mm... 20 m, samengesteld uit deelstukken van 200 mm resp. 600/800/1000 en 1200 mm lengte. |
|---------------|---|

| | |
|---------------|------------|
| LS 300 | ±10 μm/1 m |
|---------------|------------|

| | |
|---------------|--|
| LS 300 | aanpasbaar ¹⁾ maks. ±100 μm |
|---------------|--|

| | |
|---------------|---------|
| LS 300 | 30 min. |
|---------------|---------|

| | |
|---------------|---------------------|
| LS 300 | 30 m/s ² |
|---------------|---------------------|

| | |
|---------------|------------|
| LS 300 | maks. 10 N |
|---------------|------------|

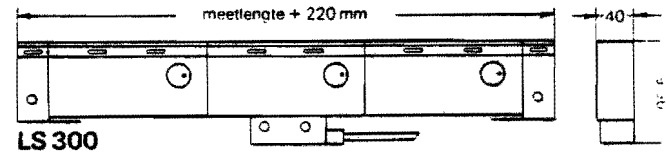
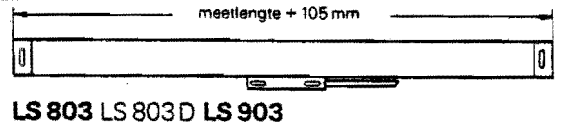
montagehandleiding

| | |
|---------------|------------------------------------|
| LS 300 | bedrijf 0... 40°C opslag 0... 70°C |
|---------------|------------------------------------|

| | |
|---------------|----------------------------|
| LS 300 | 1,5 kg + 4 kg/m meetlengte |
|---------------|----------------------------|

spec. lengten op aanvraag/maks. 20 m

¹⁾ elke 200 mm



Werkingswijze Als drager van het af te tasten donker-licht patroon dient een - volgens het HEIDENHAIN DIADUR-procedé - vervaardigde glaslineaal met streepverdeling (delingperiode 40 μm resp. 20 μm of 100 μm en „absoluut referentiemark“). Deze lineaal wordt foto-elektrisch afgetast. Bij een onderlinge relatieve beweging van de lineaal t.o.v. de aftastunit worden door de foto-elementen periodieke signalen afgegeven, resp. een referentie-impuls tijdens het passeren van het referentiemark.

Spuitwaterdichte behuizing/zelfgeleiding Lineaal en aftastunit van LS-lengtemeetsystemen zijn ondergebracht in een gesloten behuizing (aluminium huis met flexibele dichtlippen aan de onderzijde) en zodoende beschermd tegen spanen, stof en spuitwater. De zelfgeleiding van het compleet afgeregeld meetstelsel maakt een eenvoudige aanbouw mogelijk. Voor montage zijn geen doorgaande platte vlakken noodzakelijk.

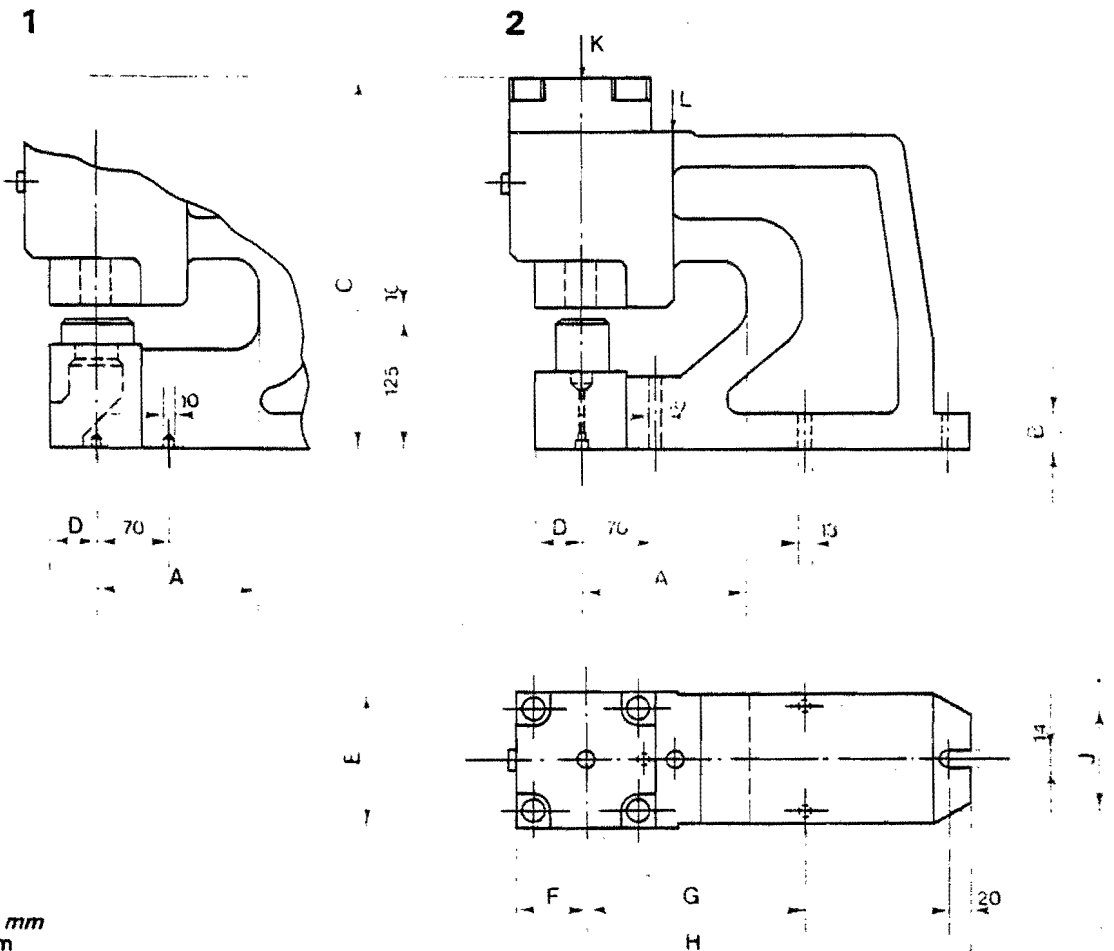
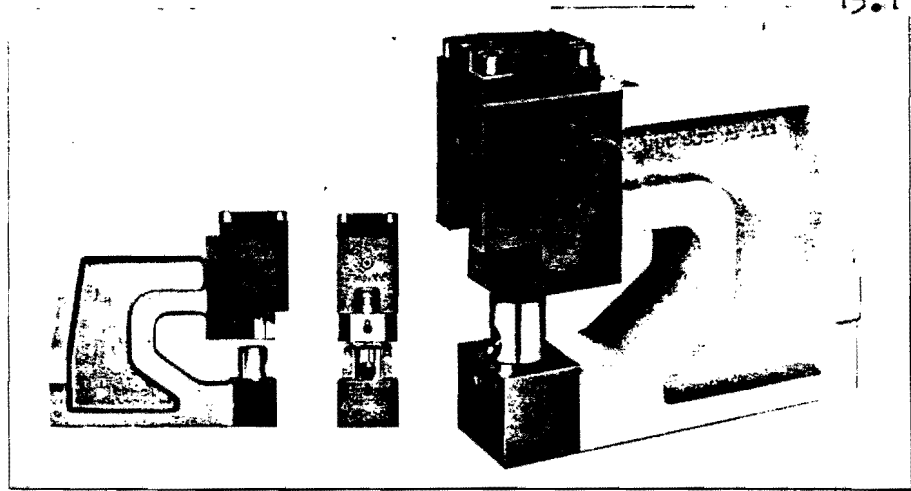
Heidenhain 5041 7010

| | | |
|---------------|---------------|---|
| LS 503 | LS 703 | universele lengtemeetsystemen |
| LS 503D | | diameter-indikatie (afleesstap = dubbele meetstap) |
| LS 507 | LS 707 | corrigeerbare lengtemeetsystemen |
| | | compensatie van machine-afwijkingen door gedefinieerd stukken van de glaslineaal |
| LS 803 | LS 903 | geminiaturiseerd lengtemeetsysteem |
| | | weinig aanbouwruijmtte benodigd |
| LS 803D | | diameter-indikatie (afleesstap = dubbele meetstap) |
| LS 300 | - | Lengtemeetsystemen voor grote meetlengten de totale meetlengte wordt verkregen door aan elkaar voegen van separate deelstukken |

Typ/Type H-SJL

Die Einheitenreihe Typ H-SJL:
La série d'unités type H-SJL:
Type H-SJL units:

H 63 SJL 10
H 80 SJL 15
H 100 SJL 25
H 125 SJL 35



1
H 125 SJL 35

2
63 SJL 10
80 SJL 15
H 100 SJL 25

Kolbenhub: 12 mm
Course de piston: 12 mm
Piston stroke: 12 mm

Die Einheiten des Typs H-SJL eignen sich vorwiegend zum:

- Rund- und Formlochstanzen
 - Ausklinken
- in Blechtafeln, Profile (U, I, T, L) usw. in Dicken bis 8 mm.

Les unités du type H-SJL sont particulièrement indiquées pour

- le poinçonnage de trous ronds et de forme
 - l'encochage
- de tôles en feuilles, de profilés (U, I, T, L), etc., dans des épaisseurs jusqu'à 8 mm.*

The H-SJL punching units are especially suitable for:

- punching round and shaped holes
 - notching
- in sheets or sections (channel, joist, T, angle, etc.) up to 8 mm thick.

Allgemeine Angaben Indications générales General data

| Einheit Unité Unit | bis jusqu'à up to ø mm (1) | Ausladung Col de cygne Throat depth mm | Druck Pression Force kN (2) | Ölbedarf Besoin en huile Oil volume Liter/litre (3) |
|--------------------------|-------------------------------------|---|--------------------------------------|--|
| H 63 SJL 10 | 10 | 150/250 | 62 | 0,05 |
| H 80 SJL 15 | 15 | 150/250 | 100 | 0,08 |
| H 100 SJL 25 | 25 | 150/250 | 156 | 0,12 |
| H 125 SJL 35 | 35 | 150 | 244 | 0,18 |

- (1) für Rund und darin enthaltene Formen
pour rond et formes s'inscrivant dans ce diamètre
for round holes, and shapes within this diameter
(2) bei /à/ at 200 bar
(3) pro Hub /par course/ per stroke

Abmessungen Cotes Dimensions

| Einheit Unité Unit | A | B | C | D | E | F | G | H | J | K | L | Gewicht Poids Weight ~ kg |
|--------------------------|-----|----|-----|----|-----|----|-----|-----|-----|--|--------|------------------------------------|
| | | | | | | | | | | Anschlüsse Raccorderm. Connections | | |
| H 63 SJL 10 | 150 | 25 | 330 | 30 | 80 | 45 | 180 | 380 | 52 | R 3/8" | R 3/8" | 35 |
| | 250 | 25 | 330 | 30 | 80 | 45 | 280 | 495 | 52 | R 3/8" | R 3/8" | 47 |
| H 80 SJL 15 | 150 | 25 | 340 | 35 | 100 | 55 | 180 | 410 | 72 | R 3/8" | R 3/8" | 50 |
| | 250 | 25 | 340 | 35 | 100 | 55 | 280 | 520 | 72 | R 3/8" | R 3/8" | 64 |
| H 100 SJL 25 | 150 | 30 | 355 | 45 | 130 | 65 | 210 | 435 | 106 | R 3/8" | R 3/8" | 107 |
| | 250 | 30 | 355 | 45 | 130 | 65 | 310 | 550 | 106 | R 3/8" | R 3/8" | 127 |
| H 125 SJL 35 | 150 | 30 | 390 | 60 | 160 | 80 | 220 | 485 | 130 | R 3/8" | R 3/8" | 160 |

Sonderanfertigungen auf Anfrage
Exécutions spéciales sur demande
Custom-made units on request

Stempel und Matrizen

Verwendung finden Werkzeuge der RASKIN-JL-Typenreihe entsprechend der Stanzkapazität der H-SJL-Einheit.

Poinçons et matrices

Les outils provenant du type RASKIN JL sont également utilisés dans les unités H-SJL, ceci en fonction de la capacité de poinçonnage de chacune d'elles.

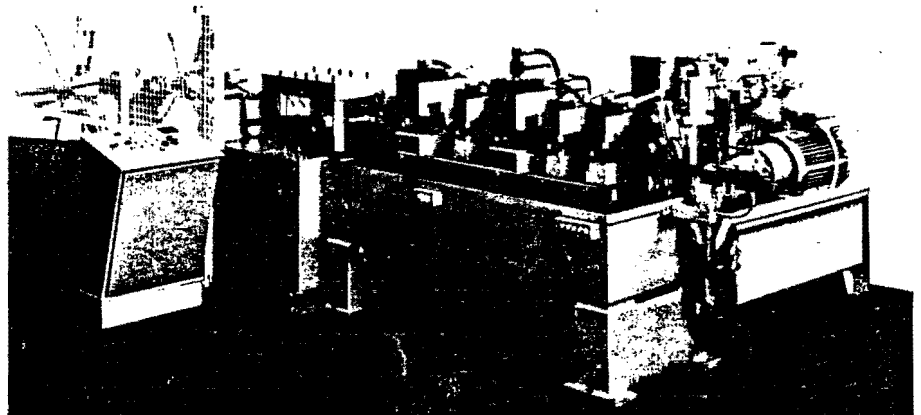
Punches and dies

The tools from the RASKIN JL range can be used, corresponding to the punching capacity of the H-SJL unit.

H-SJL-Einheiten, verbunden mit Haspel, Vorschub-Richtmaschine, bilden die Hauptstation in einer automatischen Band-Bearbeitungseinrichtung.

Des unités H-SJL, combinées avec dévidoir et dispositif d'amenage/redressage, forment la station principale d'une chaîne de production automatique pour l'usinage de tôles en bande.

H-SJL units, set up in series with a roll-unwinder, a feed device and a flattener, are the principle components of this automatic strip machining line.



Aandrijving en positionering van de sensoren

Bereken volgens lit. [8]

Geeïste positioneringsnauwkeurigheid $\pm 0,01$ mm

Gebruikmakend van een stappenmotor en een schroefspindel met hooglomloopmes.

Vereiste schroefspindel:

Gebruikmakend van een 5-fase stappenmotor (500 stappen/omw)

Vereiste speed $p = 500 \cdot 0,01 = 5$ mm (= aantal stappen/omw \cdot nauwke.)

Belastingskracht F van schroefspindel:

$$F = \mu \cdot g \cdot m + F_v$$

μ = wrijvingscoëfficiënt

g = valversnelling

m = te verplaatsen massa

F_v = voerspankracht

stel : massa sensor + bevestiging = 1 kg

: Voerspankracht hooglomloopmes = 50 N

dan $F = 51$ N

Gekomen schroefspindel

- Merk Steer

- Speed 5 mm gestepen draad.

- Spindel lengte $l = 400$ mm

- Spindel diameter $d = 16$ mm

- Kritisch toerenantal $\gg 2000$ omw/min.

- Max. spindel belasting $\gg 10$ kN

Vereiste stappenmotor:

Massa traagheidsmoment $I_{rot} = \frac{1}{2} \pi r^4 l \rho$

r = straal spindel

l = lengte spindel

ρ = soortelijke massa

$$I_{rot.} = \frac{1}{2} \pi \cdot 0,8^4 \cdot 40 \cdot 7,85 \cdot 10^{-3} = 0,202 \text{ kg cm}^2$$

$$I_{translatie} = m \left(\frac{p}{2\pi} \right)^2$$

te verplaatsen

m = massa

p = speed

$$I_{trans} = 1 \cdot \left(\frac{0,5}{2\pi} \right)^2 = 0,006 \text{ kg cm}^2$$

$$\text{last moment } M = F \left(\frac{p}{2\pi\eta} + r_i \mu_i \right) \frac{1}{c}$$

η = rendement spil-mes

r_i = radius spil-lager

μ_i = wrijvingscoëff. spil-lager

c = overbrengverhouding

$\eta \approx 0,9$ voor kogelwaaier
 $i = 1$ bij directe koppeling tussen motor en schroefspindel
 $r_i \cdot M_i \approx 0,015$ voor wervellagers

dan last moment $M \approx 5,2 \text{ Ncm}$

Motor: Berger RDM 564/50 Ic blijft te voldoen

Bij geen stapfrequentie van 20 kHz levert deze een moment van 14 Ncm

Eigen massa-inertie $I = 0,065 \text{ kg cm}^2$

De maximale voortloopssnelheid v/d schroef is dan

$$v = \frac{f \cdot p}{z \cdot i}$$

f = stapfrequentie

p = pitch

i = overbrengverhouding

z = aantal stappen / omwenteling

$$v_{\max} = 200 \text{ mm/s}$$

De aanlooptijd welke nodig is om deze maximale snelheid te bereiken

$$T = \frac{I_{\text{tot}} \cdot 2\pi \cdot \alpha \cdot f}{360 \cdot M_v}$$

M_v = versnellingsmoment

α = staphoek

f = stapfrequentie

I_{tot} = totale massa-inertie

$$I_{\text{tot}} = 0,065 + 0,202 + 0,006 = 0,273$$

$$M_v = 14 - \text{lastmoment} = 14 - 5,2 = 8,8 \text{ Ncm}$$

$$T \approx 0,08 \text{ sec.}$$

Positioneren v.d. ponsunit in y-richting

positioneer nauwkeurigheid: $\pm 0,02 \text{ mm}$

5-fase stappenmotor + schroefspindel met kogelwaaier

Vereiste spindel:

$$\text{speed } p = 0,02 \times 500 = 10 \text{ mm}$$

Massa van ponsenheid + lede $\approx 250 \text{ kg}$

Overspankracht $\approx 250 \text{ N}$

$$F = 0,1 \cdot 250 \cdot 9,81 + 250 \approx 500 \text{ N}$$

Spindel: Merh Star :
1502-2-4023
agrod

lengte 400 mm

diameter $d = 25 \text{ mm}$

Driftisch bereik $\gg 2000 \text{ omw/min}$

Max belasting $\gg 100 \text{ kN}$

Vereiste motor

$$I_{\text{rot}} = \frac{1}{2} \pi \cdot 1,25^4 + 40 \cdot 7,85 \cdot 10^3 \approx 1,2 \text{ kg cm}^2$$

$$I_{\text{trans}} = 250 \cdot \left(\frac{1}{20}\right)^2 = 6,34 \text{ kg cm}^2$$

$$\text{last moment } M \approx 98 \text{ Ncm}$$

Motor: Berger RDM 5913 / 150 I_c veldoel

$$\text{voor } f = 10 \text{ kHz } M = 125 \text{ Ncm}$$

Eigen massa traagheid: $I \approx 1,8 \text{ kg cm}^2$

Max voortloop snelheid $v = 200 \text{ mm/s}$

$$M_v = 125 - 98 = 27 \text{ Ncm}$$

$$T = \frac{(1,8 + 7,55) \cdot 2\pi \cdot 0,72 \cdot 10^4}{360 \cdot (27) \cdot 10^2} \approx 0,44 \text{ s}$$

Positionering van de pensunit in x-richting

Pos. nauwkeurigheid $\pm 0,01 \text{ mm}$

Bij gebruik \rightarrow fase stappenmotor met schreefspindel en laag-
omkeermoer.

Vereiste spindel: Massa unit: $\approx 300 \text{ kg}$
boortromkracht $\approx 250 \text{ N}$

speed $p = 500 + 0,01 = 5 \text{ mm}$

Belastingskracht $F = 0,1 \cdot 300 \cdot 9,81 + 250 \approx 550 \text{ N}$

Spindel: merk Star lengte **100** mm
gevlagen diameter 16 mm
kritisch bereikt $>> 2000 \text{ omw/min}$
Max belasting 40 kN

Vereiste motor

$$I_{\text{rot}} = \frac{1}{2} \pi \cdot 0,01^4 \cdot 10 \cdot 7,85 \cdot 10^3 \approx 0,051 \text{ kg cm}^2$$

$$I_{\text{trans}} = 300 \left(\frac{0,5}{2\pi} \right)^2 \approx 1,9 \text{ kg cm}^2$$

$$\text{lastmoment } M = 550 \left(\frac{0,5}{2\pi \cdot 0,5} + 0,8 \cdot 0,017 \right) \approx 55 \text{ Ncm}$$

De voorloop snelheid heeft niet groot belang.

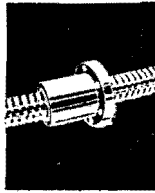
Motor: Berger RDT 596/50 voldoet.

Bij een stap frequentie van 5000 Hz $\overset{5}{\text{mm}} M = 110 \text{ Ncm}$

$$I_{\text{motor}} = 0,7 \text{ kg cm}^2$$

$$v_{\text{max}} = 25 \text{ mm/s}$$

$$T \approx 0,03 \text{ s}$$



Programmübersicht

Spindellängen, Durchmesser und Steigungen

Die Nenndurchmesser und Steigungen entsprechen DIN 69 051 Teil 2 und ISO 3408.

Die beiliegenden Maßtabellen (siehe Anhang) enthalten alle technischen Daten unserer Kugelgewindetriebe.

Standardausführung: Rechtsgewinde

Andere Steigungen, Durchmesser und Längen können ebenfalls angefertigt werden. Wir bitten um Rückfrage.

| Nenn- durch- messer (mm) d ₀ | Geschliffene Ausführung | | | Gerollte Ausführung | | |
|---|-------------------------|----|----|---------------------|-----|---------------------------------------|
| | Steigung P (mm) | | | Steigung P (mm) | | Walzwerkslängen ¹⁾ (mm) |
| | 5 | 10 | 20 | 5 | 10 | |
| 16 | ● | | | 1000 | ● | 3000-3500 |
| 20 | ● | | | 1200 | ● | 3000-3500 |
| 25 | ● | ● | | 1500 | ● ● | 4500-5000 |
| 32 | ● | ● | | 2000 | ● ● | 4500-5000 |
| 40 | ● | ● | | 4000 | ● ● | 4500-5000 |
| 50 | ● | ● | | 4000 | ● ● | 5000-6000 |
| 63 | | ● | ● | 5000 | ● | 5500-6000 |
| 80 | | ● | ● | 6000 | ○ | 5500-6000 |
| 100 | | ● | ● | 6000 | | |
| 125 | | ● | ● | 4600 | | |

Tabelle 1

○ Diese Größe ist in Vorbereitung.

¹⁾ Gerollte Walzwerkslängen sind an den gekennzeichneten Enden (ca. 150 bis 200 mm) nicht maßhaltig.

Genauigkeitsklassen

Die Gesamtsteigungsabweichung errechnet sich wie folgt:

Klassen 5 bis 50 (geschliffen)

$$\Delta P_{\text{ges}} = \Delta P_{300} \cdot \left(\frac{l}{300}\right)^{0.7}$$

Klassen 50 bis 200 (gerollt)

$$\Delta P_{\text{ges}} = \Delta P_{300} \cdot \frac{l}{300}$$

Auf Kundenwunsch kann die Gesamtsteigungsabweichung bei der geschliffenen Ausführung in den Minusbereich gelegt werden.

Die Kugelgewindetrieb-Abnahmebedingungen mit Genauigkeitsklassen können Sie der DIN 69 051 Teil 3 (Entwurf) entnehmen.

| Kugelgewindetrieb | Klasse | Gesamtsteigungsabweichung ΔP_{ges} (μm) bei Gewindelänge l (mm): | | | | | | |
|----------------------------|-------------------|---|-----|-----|------|------|------|------|
| | | 300 | 600 | 900 | 1200 | 1500 | 2000 | 3000 |
| Geschliffene Ausführung | 5 | 5 | 8 | 11 | 13 | 15 | 19 | 25 |
| | 10 | 10 | 16 | 22 | 26 | 31 | 38 | 50 |
| | 25 | 25 | 41 | 54 | 66 | 77 | 94 | 125 |
| | 50 | 50 | 81 | 108 | 132 | 154 | 189 | 250 |
| Gerollte Ausführung | 50 ²⁾ | 50 | 100 | 150 | 200 | 250 | 333 | 500 |
| | 100 ²⁾ | 100 | 200 | 300 | 400 | 500 | 666 | 1000 |
| | 200 | 200 | 400 | 600 | 800 | 1000 | 1333 | 2000 |

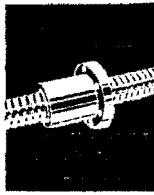
Tabelle 2

²⁾ Eignet sich besonders für spielfreie Muttereinheiten.

Lieferzeiten

Im allgemeinen sind lieferbar:

- Einzeilmutter mit gerollter Spindel
 - Spielfreie Einzeilmutter mit gerollter Spindel
 - Spielfreie Einzeilmutter mit geschliffener Spindel
 - Flanschdoppelmutter mit gerollter oder geschliffener Spindel
 - Andere Ausführungen
- ab Lager
 - ab Lager
 - kurzfristig
 - kurzfristig
 - auf Anfrage



Lebensdauerdiagramm

Die Lebensdauer in Stunden (L_h) kann auch graphisch nach Abbildung 5 ermittelt werden. Sie ist abhängig vom Verhältnis F_m/C und der Drehzahl n_m .

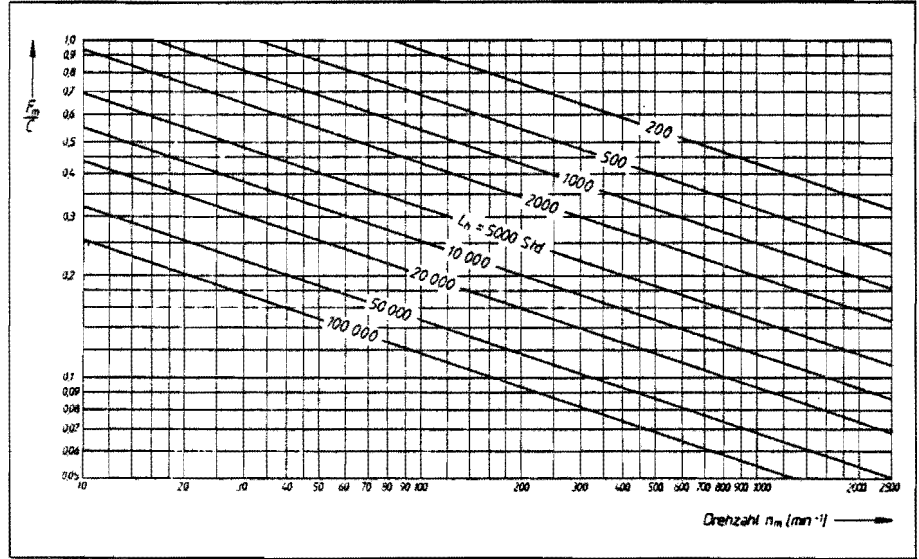


Abbildung 5

Kritische Drehzahl

Die kritische Drehzahl ist abhängig von Spindeldurchmesser, Einbauart und Länge l_n (siehe Abbildung 6). Eine Führung durch die Mutter darf nicht berücksichtigt werden. Die Betriebsdrehzahl sollte nur max. 80% der kritischen Drehzahl betragen.

Beispiel:
 Spindeldurchmesser 63 mm
 Länge l_n 2,4 m
 Einbauart II (fest - gestützt)

Nach Abbildung 6 ergibt sich eine kritische Drehzahl von 1850 min^{-1} . Die zulässige Betriebsdrehzahl beträgt $1850 \text{ min}^{-1} \times 0,8 = 1480 \text{ min}^{-1}$.

Die maximale Betriebsdrehzahl im Berechnungsbeispiel von $n_4 = 1000 \text{ min}^{-1}$ liegt somit unterhalb der zulässigen Betriebsdrehzahl.

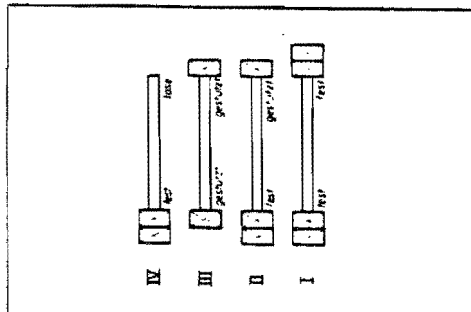
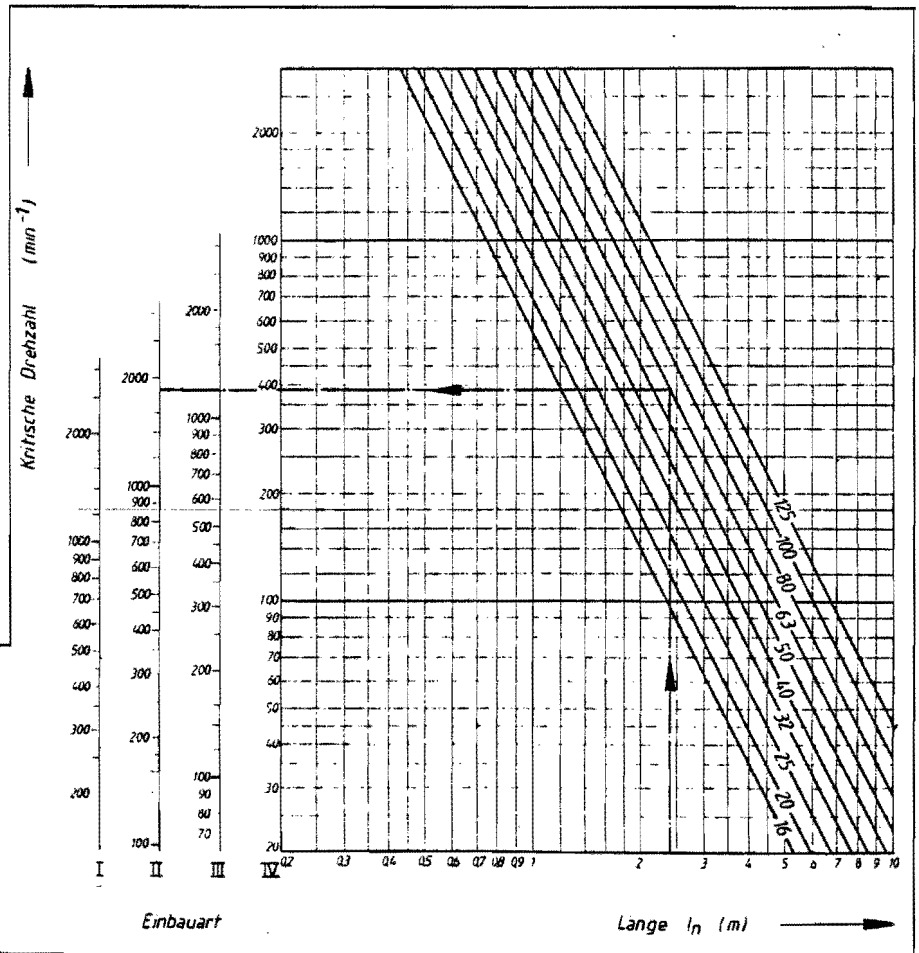
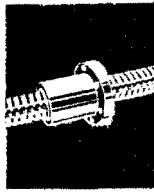


Abbildung 6



Zulässige axiale Spindelbelastung (Knickung)

Die zulässige axiale Spindelbelastung ist abhängig von Spindeldurchmesser, Einbauart und der nicht gestützten

Länge l_k (siehe Abbildung 8). Für die Axialbelastung sollte ein Sicherheitsfaktor $\nu \geq 2$ berücksichtigt werden.

Beispiele für Einbauarten

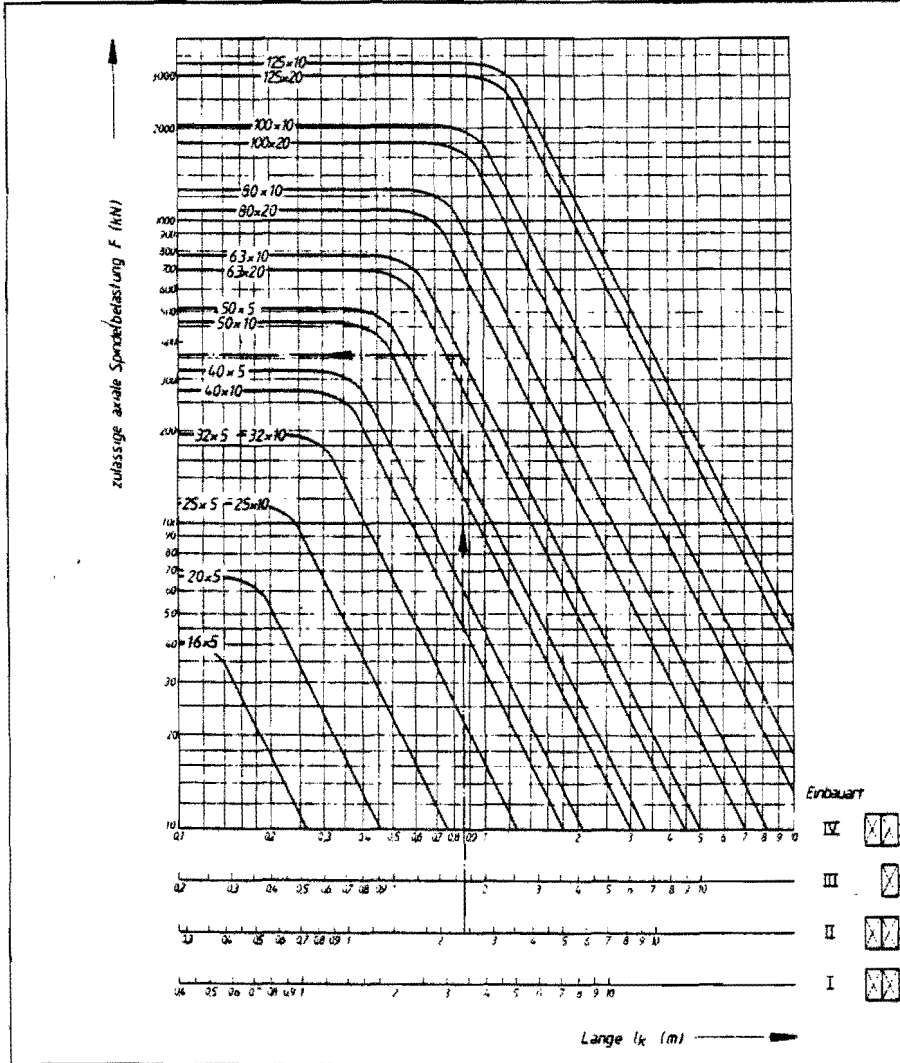


Abbildung 8

Beispiel:
 Spindeldurchmesser x Steigung
 63 x 10
 Länge l_k
 2,4 m
 Einbauart
 II (fest - gestützt)

Nach Abbildung 8 beträgt die theoretisch zulässige Axialbelastung 360 kN. Mit dem Sicherheitsfaktor 2 ergibt sich eine im Betrieb zulässige axiale Spindelbelastung von 360 kN: $2 = 180$ kN.

Sie liegt somit über der maximalen Betriebsbelastung von $F_1 = 50$ kN nach dem Berechnungsbeispiel auf Seite 7.

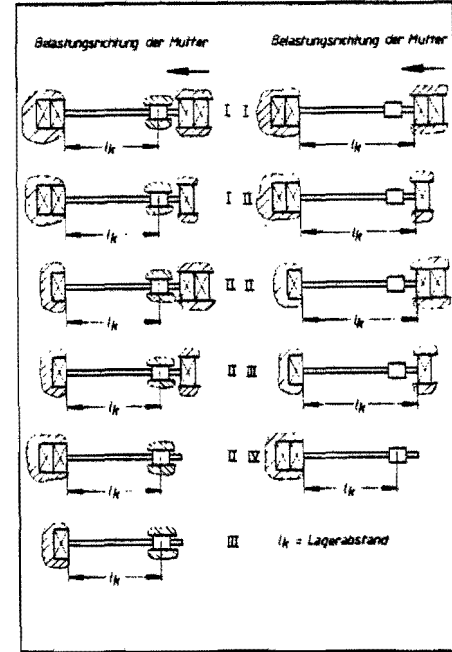


Abbildung 7

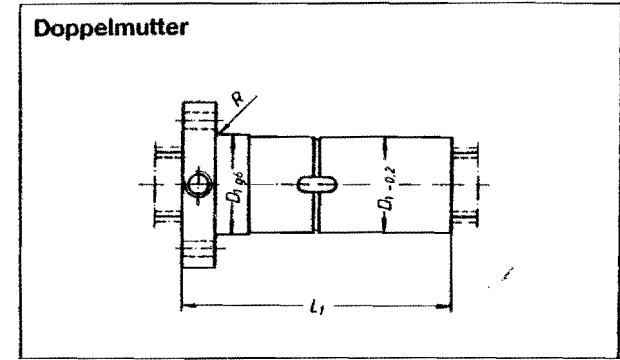
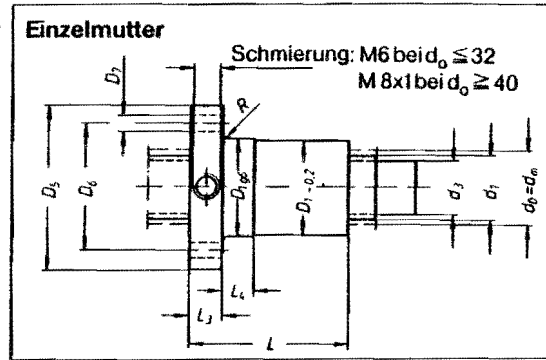
Kugelgewindetrieb



Ausführung mit geschliffener Spindel und Flanschnutter

Lieferzeiten:

Kurzfristige Liefermöglichkeit für geschliffene und gerollte Spindeln (bis 80x10) mit Doppelmutter.



| Teilenummern Einzelmutter | Teilenummern Doppelmutter ¹⁾ | Nenn- durch- messer d ₀ | Steig- ung P | Umläufe (Anzahl) i | Maße (mm) | | | | | | | | | | Bohr- ungen (Anzahl) R | L | L ₁ | L ₃ | L ₄ | Axial- spiel Einzel- mutter max. | Tragzahlen (N) | | Steifig- keit (N/μm) Doppel- mutter c _{KK} |
|------------------------------|--|---|--------------------|--------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----|---------------------------------|----|----------------|----------------|----------------|--|----------------|--|---|
| | | | | | d ₁ | d ₃ | D ₁ | D ₅ | D ₆ | D ₇ | d ₅ | d ₆ | d ₇ | C | | | | | | | C ₀ | | |
| 1502-0-1001 | 1502-0-1023 | 16 | 5 | 4 | 15 | 12,7 | 28 | 53 | 40 | 6,6 | 4 | 0,5 | 45 | 82 | 12 | 15 | 0,04 | 14400 | 21000 | 860 | | | |
| 1502-1-1001 | 1502-1-1023 | 20 | 5 | 4 | 19 | 16,7 | 33 | 58 | 45 | 6,6 | 6 | 0,5 | 45 | 82 | 12 | 15 | 0,04 | 15000 | 26500 | 1060 | | | |
| 1502-2-1005 | 1502-2-1023 | 25 | 5 | 4 | 24 | 21,7 | 38 | 63 | 50 | 6,6 | 6 | 0,5 | 45 | 82 | 12 | 15 | 0,04 | 16100 | 34700 | 1250 | | | |
| 1502-2-4001 | 1502-2-4023 | 25 | 10 | 4 | 24 | 21,7 | 38 | 63 | 50 | 6,6 | 6 | 0,5 | 64 | 120 | 12 | 15 | 0,04 | 16100 | 34700 | 1250 | | | |
| 1502-3-1001 | 1502-3-1023 | 32 | 5 | 4 | 31 | 28,2 | 48 | 73 | 60 | 6,6 | 6 | 0,8 | 48 | 88 | 13 | 15 | 0,05 | 21500 | 51100 | 1520 | | | |
| 1502-3-4005 | 1502-3-4023 | 32 | 10 | 5 | 31 | 28,2 | 48 | 73 | 60 | 6,6 | 6 | 0,8 | 77 | 146 | 13 | 15 | 0,05 | 25300 | 64500 | 1970 | | | |
| 1502-4-1001 | 1502-4-1023 | 40 | 5 | 5 | 39 | 36,2 | 56 | 80 | 68 | 6,6 | 6 | 0,8 | 54 | 100 | 15 | 15 | 0,05 | 26800 | 81400 | 2410 | | | |
| 1502-4-4001 | 1502-4-4023 | 40 | 10 | 4 | 38 | 33,6 | 63 | 95 | 78 | 9,0 | 6 | 1,0 | 70 | 140 | 15 | 15 | 0,09 | 52200 | 105600 | 1970 | | | |
| 1502-4-4002 | 1502-4-4024 | 40 | 10 | 6 | 38 | 33,6 | 63 | 95 | 78 | 9,0 | 6 | 1,0 | 90 | 180 | 15 | 15 | 0,09 | 70100 | 161100 | 2980 | | | |
| 1502-5-1001 | 1502-5-1023 | 50 | 5 | 5 | 49 | 46,2 | 68 | 98 | 82 | 9,0 | 6 | 1,0 | 54 | 100 | 15 | 20 | 0,05 | 28600 | 103000 | 2910 | | | |
| 1502-5-4001 | 1502-5-4023 | 50 | 10 | 4 | 48 | 43,6 | 72 | 110 | 90 | 11,0 | 6 | 1,0 | 70 | 140 | 18 | 20 | 0,09 | 56100 | 139000 | 2470 | | | |
| 1502-5-4002 | 1502-5-4024 | 50 | 10 | 6 | 48 | 43,6 | 72 | 110 | 90 | 11,0 | 6 | 1,0 | 90 | 180 | 18 | 20 | 0,09 | 75500 | 212000 | 3600 | | | |
| 1502-6-4001 | 1502-6-4023 | 63 | 10 | 4 | 61 | 56,6 | 85 | 125 | 105 | 11,0 | 6 | 1,0 | 70 | 140 | 22 | 20 | 0,09 | 58400 | 173000 | 2840 | | | |
| 1502-6-4002 | 1502-6-4024 | 63 | 10 | 6 | 61 | 56,6 | 85 | 125 | 105 | 11,0 | 6 | 1,0 | 90 | 180 | 22 | 20 | 0,09 | 78500 | 264000 | 4170 | | | |

¹⁾ Auch mit gerollter Spindel (Klasse 50 bis Größe 80x10) lieferbar

Standardausführung: Rechtsgewinde, Nenndurchmesser und Steigungen entsprechen ISO 3408; andere Ausführungen auf Anfrage.

Die Steifigkeit c_{KK} (Steifigkeit im Kugelbe-

spannkraft F_v = 0,13 C (13% der dyn. Tragzahl) zugrunde gelegt. Steifigkeit c_{MK} (Steifigkeit der Mutter-einheit) beträgt ≈ 0,6 bis 0,8 · c_{KK}. Weitere Angaben zur Auslegung eines Kugelgewindetriebes finden Sie im Ka-

Steigungsabweichung:

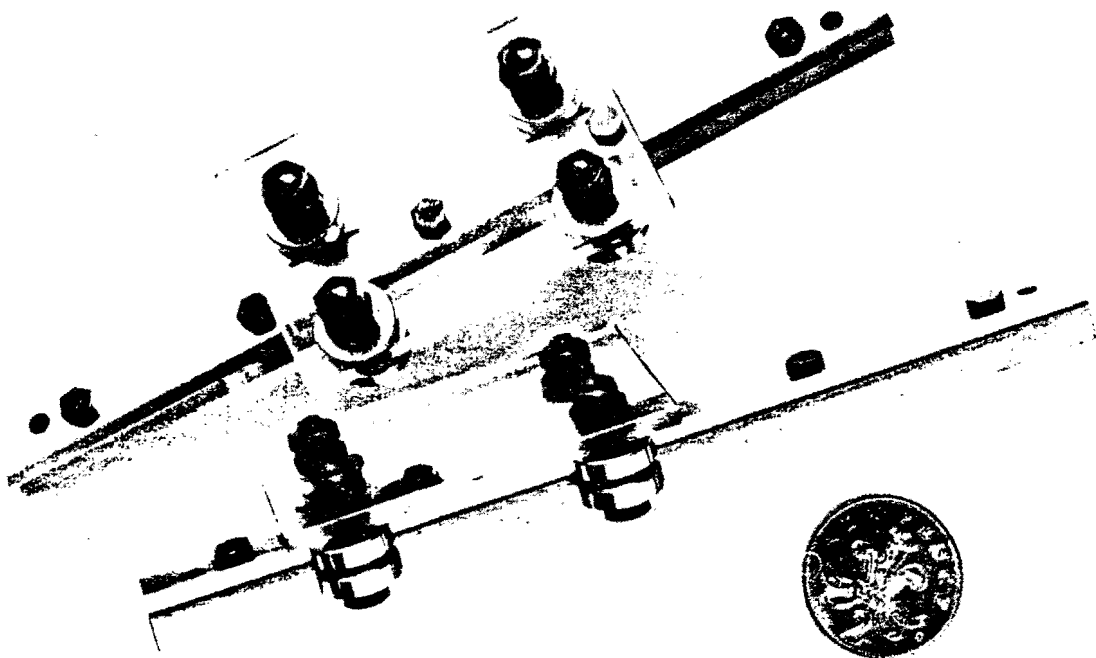
- ΔP₃₀₀ = 5 μm
- ΔP₃₀₀ = 10 μm
- ΔP₃₀₀ = 25 μm
- ΔP₃₀₀ = 50 μm

Deutsche Star
Kugelhalter GmbH
Postfach 1160
D-8720 Schweinfurt 1

Tabelle
15/003-01

Precisie miniatuur rechtgeleidingen

De introductie van de miniatuur serie is een belangrijke aanvulling op de Hepco rechtgeleidingen, waardoor nieuwe toepassingen mogelijk zijn en waarmee zulke compacte ontwerpen gemaakt kunnen worden als tot nu toe voor onmogelijk werd gehouden. Een sterk ontwikkelde lagertechniek en moderne produktiemethoden hebben het ons mogelijk gemaakt deze miniatuur rechtgeleiding te ontwikkelen. De onderdelen worden met een zeer hoge graad van precisie gemaakt en hebben alle voordelen en eigenschappen van onze grotere series die hun veelzijdigheid en betrouwbaarheid onder alle bedrijfsomstandigheden bewezen hebben.



SPECIFIEKE TOEPASSINGEN VOOR DE PRECISIE MINIATUUR RECHTGELEIDINGEN

- ETIKETTEER EN KODEERMACHINES
- COMPUTER PRINTERS
- WETENSCHAPPELIJKE EN MEDISCHE APPARATUUR
- ZEER SNELLE CONTROLE WEEGAPPARATUUR
- INSTRUMENTEN EN MEETAPPARATUUR

Gegevens van deze serie kunt U aantreffen op blz. 23 en 24, de glijplaten onder de aanduiding MS en de lagerunits onder de aanduiding MJ.

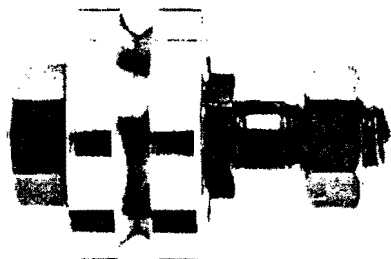
GLIJPLATEN

| TYPE | A | B | C | D | E | F | Aantal Gaten |
|-----------|-----|----|-----|------|----|----|-----------------|
| MS/60/12 | 60 | 12 | 3 | 3.3 | 15 | 30 | 2 |
| MS/90/12 | 90 | 12 | 3 | 3.3 | 15 | 30 | 3 |
| MS/120/12 | 120 | 12 | 3 | 3.3 | 15 | 30 | 4 |
| MS/150/12 | 150 | 12 | 3 | 3.3 | 15 | 30 | 5 |
| MS/240/12 | 240 | 12 | 3 | 3.3 | 15 | 30 | 8 |
| MS/330/12 | 330 | 12 | 3 | 3.3 | 15 | 30 | 11 |
| S/150/1 | 150 | 25 | 4.5 | 6.5 | 30 | 90 | 2 |
| S/240/1 | 240 | 25 | 4.5 | 6.5 | 30 | 90 | 3 |
| S/330/1 | 330 | 25 | 4.5 | 6.5 | 30 | 90 | 4 |
| S/420/1 | 420 | 25 | 4.5 | 6.5 | 30 | 90 | 5 |
| S/510/1 | 510 | 25 | 4.5 | 6.5 | 30 | 90 | 6 |
| S/690/1 | 690 | 25 | 4.5 | 6.5 | 30 | 90 | 8 |
| S/870/1 | 870 | 25 | 4.5 | 6.5 | 30 | 90 | 10 |
| S/960/1 | 960 | 25 | 4.5 | 6.5 | 30 | 90 | 11 |
| S/150/2 | 150 | 50 | 4.5 | 6.5 | 30 | 90 | 2 |
| S/240/2 | 240 | 50 | 4.5 | 6.5 | 30 | 90 | 3 |
| S/330/2 | 330 | 50 | 4.5 | 6.5 | 30 | 90 | 4 |
| S/420/2 | 420 | 50 | 4.5 | 6.5 | 30 | 90 | 5 |
| S/510/2 | 510 | 50 | 4.5 | 6.5 | 30 | 90 | 6 |
| S/690/2 | 690 | 50 | 4.5 | 6.5 | 30 | 90 | 8 |
| S/870/2 | 870 | 50 | 4.5 | 6.5 | 30 | 90 | 10 |
| S/960/2 | 960 | 50 | 4.5 | 6.5 | 30 | 90 | 11 |
| M/150/44 | 150 | 44 | 6 | 6.5 | 30 | 90 | 2 |
| M/240/44 | 240 | 44 | 6 | 6.5 | 30 | 90 | 3 |
| M/330/44 | 330 | 44 | 6 | 6.5 | 30 | 90 | 4 |
| M/420/44 | 420 | 44 | 6 | 6.5 | 30 | 90 | 5 |
| M/510/44 | 510 | 44 | 6 | 6.5 | 30 | 90 | 6 |
| M/690/44 | 690 | 44 | 6 | 6.5 | 30 | 90 | 8 |
| M/870/44 | 870 | 44 | 6 | 6.5 | 30 | 90 | 10 |
| M/960/44 | 960 | 44 | 6 | 6.5 | 30 | 90 | 11 |
| M/150/3 | 150 | 76 | 6 | 6.5 | 30 | 90 | 2 |
| M/240/3 | 240 | 76 | 6 | 6.5 | 30 | 90 | 3 |
| M/330/3 | 330 | 76 | 6 | 6.5 | 30 | 90 | 4 |
| M/420/3 | 420 | 76 | 6 | 6.5 | 30 | 90 | 5 |
| M/510/3 | 510 | 76 | 6 | 6.5 | 30 | 90 | 6 |
| M/690/3 | 690 | 76 | 6 | 6.5 | 30 | 90 | 8 |
| M/870/3 | 870 | 76 | 6 | 6.5 | 30 | 90 | 10 |
| M/960/3 | 960 | 76 | 6 | 6.5 | 30 | 90 | 11 |
| L/240/3 | 240 | 76 | 9 | 10.5 | 30 | 90 | 3 |
| L/330/3 | 330 | 76 | 9 | 10.5 | 30 | 90 | 4 |
| L/420/3 | 420 | 76 | 9 | 10.5 | 30 | 90 | 5 |
| L/510/3 | 510 | 76 | 9 | 10.5 | 30 | 90 | 6 |
| L/690/3 | 690 | 76 | 9 | 10.5 | 30 | 90 | 8 |
| L/870/3 | 870 | 76 | 9 | 10.5 | 30 | 90 | 10 |
| L/960/3 | 960 | 76 | 9 | 10.5 | 30 | 90 | 11 |

BASISPLATEN

| TYPE | A | B | C | D | E | F | Aantal Gaten |
|------------|-----|----|------|---------|----|----|-----------------|
| MBP/60/12 | 60 | 8 | 6.35 | M3x.5 | 15 | 30 | 2 |
| MBP/90/12 | 90 | 8 | 6.35 | M3x.5 | 15 | 30 | 3 |
| MBP/120/12 | 120 | 8 | 6.35 | M3x.5 | 15 | 30 | 4 |
| MBP/150/12 | 150 | 8 | 6.35 | M3x.5 | 15 | 30 | 5 |
| MBP/240/12 | 240 | 8 | 6.35 | M3x.5 | 15 | 30 | 8 |
| MBP/330/12 | 330 | 8 | 6.35 | M3x.5 | 15 | 30 | 11 |
| BP/150/1 | 150 | 20 | 12 | M6x1 | 30 | 90 | 2 |
| BP/240/1 | 240 | 20 | 12 | M6x1 | 30 | 90 | 3 |
| BP/330/1 | 330 | 20 | 12 | M6x1 | 30 | 90 | 4 |
| BP/420/1 | 420 | 20 | 12 | M6x1 | 30 | 90 | 5 |
| BP/510/1 | 510 | 20 | 12 | M6x1 | 30 | 90 | 6 |
| BP/690/1 | 690 | 20 | 12 | M6x1 | 30 | 90 | 8 |
| BP/870/1 | 870 | 20 | 12 | M6x1 | 30 | 90 | 10 |
| BP/960/1 | 960 | 20 | 12 | M6x1 | 30 | 90 | 11 |
| BP/150/2 | 150 | 40 | 12 | M6x1 | 30 | 90 | 2 |
| BP/240/2 | 240 | 40 | 12 | M6x1 | 30 | 90 | 3 |
| BP/330/2 | 330 | 40 | 12 | M6x1 | 30 | 90 | 4 |
| BP/420/2 | 420 | 40 | 12 | M6x1 | 30 | 90 | 5 |
| BP/510/2 | 510 | 40 | 12 | M6x1 | 30 | 90 | 6 |
| BP/690/2 | 690 | 40 | 12 | M6x1 | 30 | 90 | 8 |
| BP/870/2 | 870 | 40 | 12 | M6x1 | 30 | 90 | 10 |
| BP/960/2 | 960 | 40 | 12 | M6x1 | 30 | 90 | 11 |
| BP/150/44 | 150 | 35 | 18 | M6x1 | 30 | 90 | 2 |
| BP/240/44 | 240 | 35 | 18 | M6x1 | 30 | 90 | 3 |
| BP/330/44 | 330 | 35 | 18 | M6x1 | 30 | 90 | 4 |
| BP/420/44 | 420 | 35 | 18 | M6x1 | 30 | 90 | 5 |
| BP/510/44 | 510 | 35 | 18 | M6x1 | 30 | 90 | 6 |
| BP/690/44 | 690 | 35 | 18 | M6x1 | 30 | 90 | 8 |
| BP/870/44 | 870 | 35 | 18 | M6x1 | 30 | 90 | 10 |
| BP/960/44 | 960 | 35 | 18 | M6x1 | 30 | 90 | 11 |
| BP/150/3 | 150 | 60 | 20 | M6x1 | 30 | 90 | 2 |
| BP/240/3 | 240 | 60 | 20 | M6x1 | 30 | 90 | 3 |
| BP/330/3 | 330 | 60 | 20 | M6x1 | 30 | 90 | 4 |
| BP/420/3 | 420 | 60 | 20 | M6x1 | 30 | 90 | 5 |
| BP/510/3 | 510 | 60 | 20 | M6x1 | 30 | 90 | 6 |
| BP/690/3 | 690 | 60 | 20 | M6x1 | 30 | 90 | 8 |
| BP/870/3 | 870 | 60 | 20 | M6x1 | 30 | 90 | 10 |
| BP/960/3 | 960 | 60 | 20 | M6x1 | 30 | 90 | 11 |
| BP/240/L | 240 | 60 | 20 | M10x1.5 | 30 | 90 | 3 |
| BP/330/L | 330 | 60 | 20 | M10x1.5 | 30 | 90 | 4 |
| BP/420/L | 420 | 60 | 20 | M10x1.5 | 30 | 90 | 5 |
| BP/510/L | 510 | 60 | 20 | M10x1.5 | 30 | 90 | 6 |
| BP/690/L | 690 | 60 | 20 | M10x1.5 | 30 | 90 | 8 |
| BP/870/L | 870 | 60 | 20 | M10x1.5 | 30 | 90 | 10 |
| BP/960/L | 960 | 60 | 20 | M10x1.5 | 30 | 90 | 11 |

Standaard lagerunits

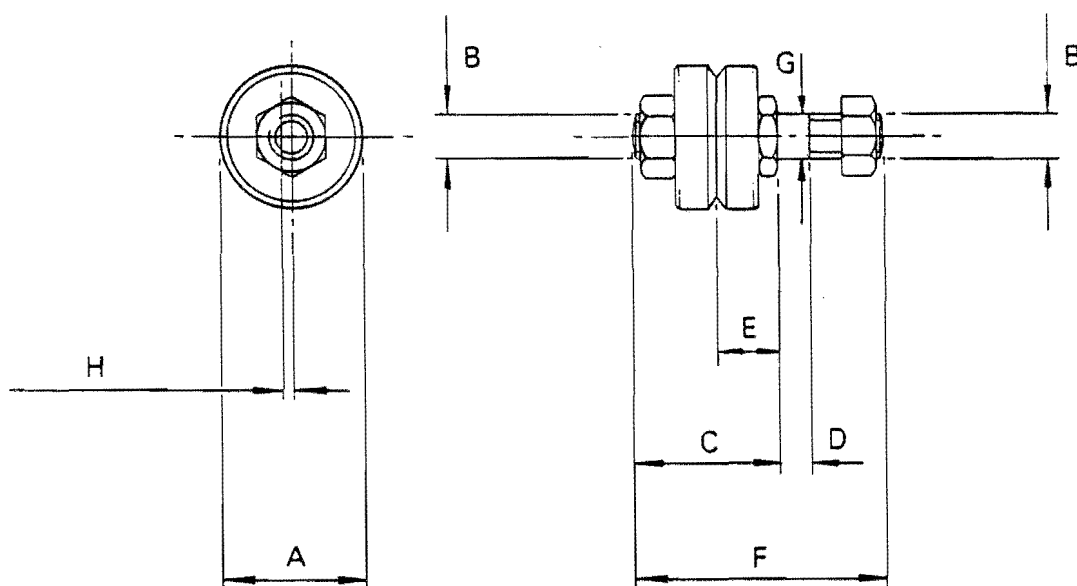


De speciale lagers die in de lagerunits worden gebruikt, worden volgens de door de I.S.O. voorgeschreven normen gefabriceerd. De standaard units hebben lagers met stalen stofplaten en behoeven niet te worden nagesmeerd. Deze lagers zijn voor de meeste toepassingen geschikt. Voor die gevallen waar een betere afdichting wordt verlangd, kunnen de lagers worden geleverd in een met neopreen afgedichte uitvoering.

Bij het bestellen van met neopreen afgedichte typen gelieve U het achtervoegsel N.S. achter het nummer van het onderdeel te vermelden, bijv. JA/7/C/N.S.

Voor een correcte montage verwijzen wij U naar blz. 5. Het is aan te raden om de excentrische lagerunits alleen door middel van het smalle centrale zeskant af te stellen.

Voor dit doel kunnen speciale sleutels worden geleverd; zie hieronder voor het codenummer van deze sleutels.



| TYPE | Voor gebruik bij glijplaat | A | B | C | D | E | F | G | H | Montage Sleutel |
|----------|----------------------------|------|------------|-------|------|-------|----|-------------|-----|-----------------|
| MJ/187/E | TYPE MS | 12.7 | M4 x .7 | 13.97 | 3.17 | 7.13 | 22 | 4.00— 3.97 | .5 | AS/187 |
| JA/7/E | TYPE S | 25 | M6 x 1 | 24 | 5 | 11.00 | 43 | 6.00— 5.97 | 1.5 | AS/7 |
| JA/10/E | TYPE M | 34 | M10 x 1.25 | 31 | 6 | 13.00 | 52 | 10.00— 9.97 | 1.5 | AS/10 |
| JA/20/E | TYPE L | 54 | M14 x 1.5 | 46 | 11 | 22.00 | 74 | 14.00—13.96 | 2.7 | AS/20 |

| TYPE | Voor gebruik bij glijplaat | A | B | C | D | E | F | G | H | Montage Sleutel |
|----------|----------------------------|------|------------|-------|------|-------|----|-------------|---|-----------------|
| MJ/187/C | TYPE MS | 12.7 | M4 x .7 | 13.97 | 3.17 | 7.13 | 22 | 4.00— 3.97 | — | AS/187 |
| JA/7/C | TYPE S | 25 | M6 x 1 | 24 | 5 | 11.00 | 43 | 6.00— 5.97 | — | AS/7 |
| JA/10/C | TYPE M | 34 | M10 x 1.25 | 31 | 6 | 13.00 | 52 | 10.00— 9.97 | — | AS/10 |
| JA/20/C | TYPE L | 54 | M14 x 1.5 | 46 | 11 | 22.00 | 74 | 14.00—13.96 | — | AS/20 |

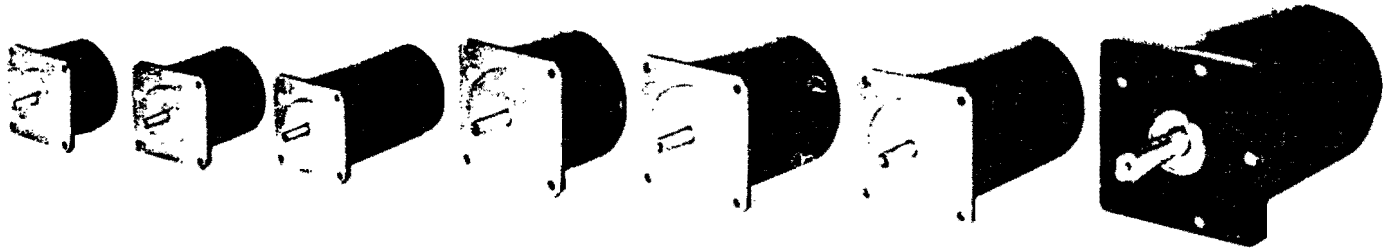
Roestvrijstalen lagerunits

De lagerunits uit de serie MJ/187, JA/7 en JA/10 kunnen in roestvrij staal worden geleverd; de lagers in AISI 440 C en de bouten in EN56AM

Bij het bestellen van roestvrijstalen lagerunits gelieve U het voorvoegsel S.S. voor het onderdeelnummer te vermelden bijv. SS/JA/7/C.

5-Phasen-Schrittmotoren-Reihe

Übersicht



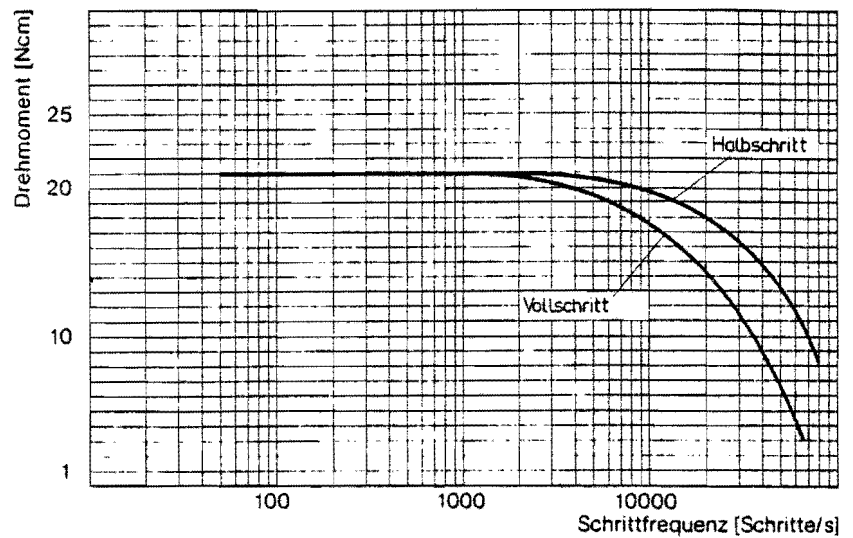
| MOTOR - TYP | RDM 564/50 | RDM 566/50 | RDM 569/50 | RDM 586/50 | RDM 599/50 | RDM 5913/50 | RDM 51117/50 |
|--|-----------------------|-----------------------|------------|------------------------|------------------------|-------------|--------------|
| Schrittwinkel [Grad] | 0,72 | 0,72 | 0,72 | 0,72 | 0,72 | 0,72 | 0,72 |
| Anlaufdrehmoment [Ncm] | 22 | 37 | | 115 | 210 | 310 | |
| max. Drehmoment [Ncm] | 22 | 37 | | 115 | 210 | 310 | |
| Haltemoment, erregt [Ncm] | 25 | 40 | | 125 | 220 | 400 | |
| max. Leistung [W] bei kHz | 19,3 14 | 22,1 16 | | 48 10 | 60 10 | | |
| Rotorträgheitsmoment [kgcm ²] | 0,065 | 0,13 | | 0,7 | 1,4 | | |
| zul. Lastträgheitsmoment [kgcm ²] bei Hz | 2,65 500 | 3,35 600 | | 5,7 800 | 6,4 1000 | | |
| Schritte / Umdrehung | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| Positionierfehler [Minuten] | ± 3' | ± 3' | ± 3' | ± 3' | ± 3' | ± 3' | ± |
| max. Schrittfrequenz [kHz] | 40 | 40 | | 30 | 30 | | |
| max. Drehzahl [min ⁻¹] | 4800 | 4800 | | 3600 | 3600 | | |
| max. Start-Stop-Frequenz [kHz] | 3 | 2,8 | | 2,4 | 1,9 | | |
| max. Start-Stop-Drehzahl [min ⁻¹] | 360 | 336 | | 288 | 228 | | |
| Resonanzfrequenzbereich [Hz] | 140-170 | 140-170 | | 140-170 | 140-170 | | |
| Resonanzdrehzahlbereich [min ⁻¹] | 16,8-20,4 | 16,8-20,4 | | 16,8-20,4 | 16,8-20,4 | | |
| Hochlaufzeitkonstante [ms] linear | 10 | 23 | | 20 | 33 | | |
| z. Pkt. max. Leist. optimal | 7,5 | 14 | | 14 | 19 | | |
| Frequenzänderung/s [s ⁻²] linear | 1,4 · 10 ⁶ | 0,7 · 10 ⁶ | | 0,5 · 10 ⁶ | 0,3 · 10 ⁶ | | |
| optimal | 1,9 · 10 ⁶ | 1,1 · 10 ⁶ | | 0,71 · 10 ⁶ | 0,53 · 10 ⁶ | | |
| max. Strom / Wicklung [A] | 0,75 | 0,75 | 1,4 | 1,25 | 1,15 | 2,8 | |
| Widerstand / Wicklung [Ω] | 2,5 | 4 | 2,3 | 2,1 | 3,25 | 1 | |
| Gewicht [kg] | 0,5 | 0,75 | 1,3 | 1,5 | 2,5 | 3,5 | |
| Schutzart | IP 54 | | | IP 55 | | | |

* ±2' Winkelabweichungen auf Anfrage

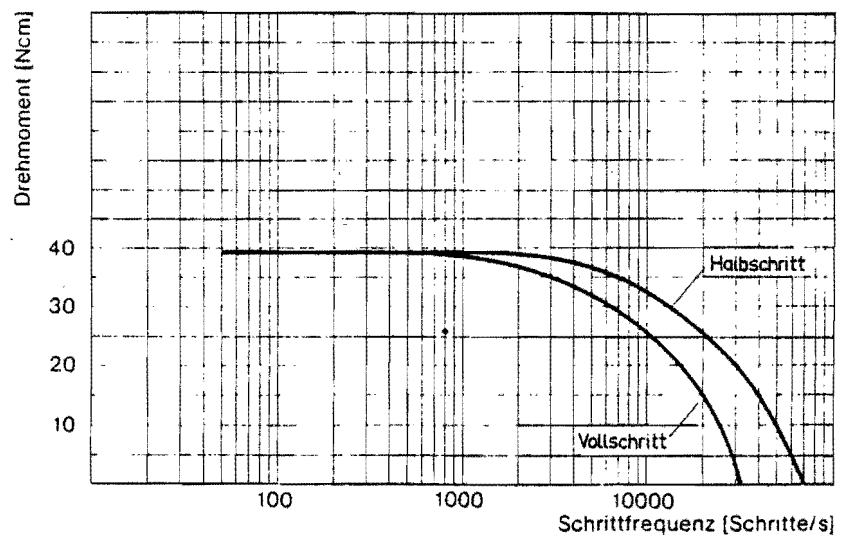
Vorwiderstandswerte (bei Konstantspannungsbetrieb) siehe Blatt »Vorwiderstandstabelle«

Motorkennlinien (I_C -Betrieb)

Motortyp: **RDM 564/50**
Konstantstrombetrieb



Motortyp: **RDM 566/50**
Konstantstrombetrieb



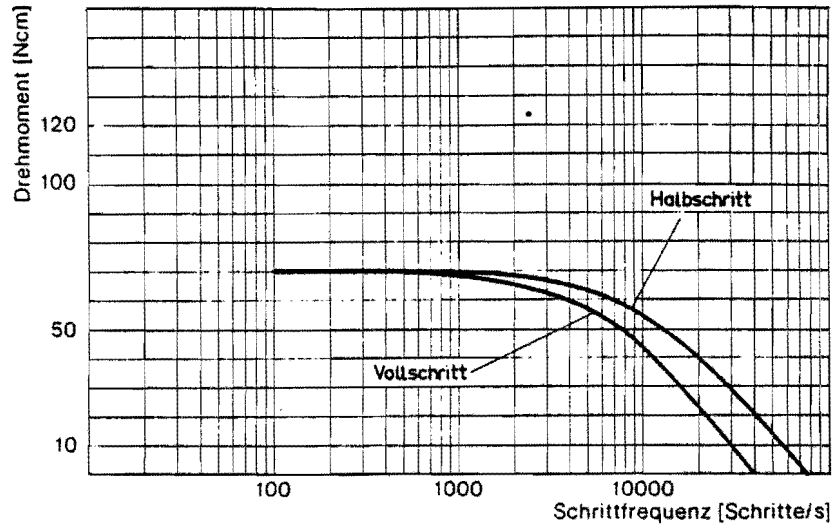
I_C = Konstantstrom

Motorkennlinien (I_C - Betrieb - Standardwicklung)

Motortyp: **RDM 569/50**

Konstantstrombetrieb

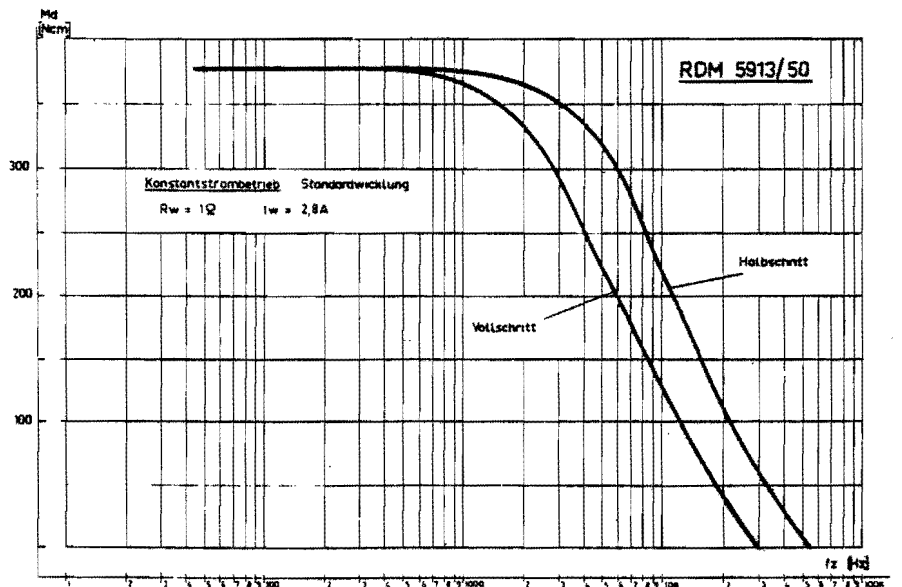
$R_w = 2,3 \Omega$ $I_w = 1,4 A$



Motortyp: **RDM 5913/50**

Konstantstrombetrieb

$R_w = 1 \Omega$ $I_w = 2,8 A$



Präzisions führungsschienen
Linear roller bearings
Guide a rulli di precisione
Precisie leibanen



| Typ Type Tipo Type | Länge Length Lunghezza Lengte | A | B | C | D | E | F | J | K | L | Belastung pro rolle Load per Roller Carico ammesso per Rullo Draagvermogen per Rol Kg | Rollen- abstand Distance between rollers Distanza fra i Rulli Rol- afstand mm | G | H | Gewicht p Satz Weight p set Peso p serie Gewicht p stel Kg | |
|-----------------------------|--|-------|-----|----|-----|-----|-----|------|------|-----|---|---|----|------|--|-------|
| No. | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | | mm | mm | mm | Kg | |
| R1 | 1030 | 30 | | | | | | | | | | | | | 0,015 | |
| | 1040 | 40 | | | | | | | | | | | | | 0,020 | |
| | 1050 | 50 | 8.5 | 4 | 4.5 | 2 | M2 | 3 | 3.9 | 1.6 | 1.5 | 4 | 3 | 10 | 5 | 0,025 |
| | 1060 | 60 | | | | | | | | | | | | | 0,030 | |
| | 1070 | 70 | | | | | | | | | | | | | 0,035 | |
| | 1080 | 80 | | | | | | | | | | | | | 0,040 | |
| R3 | 3050 | 50 | | | | | | | | | | | | | 0.10 | |
| | 3075 | 75 | | | | | | | | | | | | | 0.10 | |
| | 3100 | 100 | | | | | | | | | | | | | 0.15 | |
| | 3125 | 125 | | | | | | | | | | | | | 0.20 | |
| | 3150 | 150 | | | | | | | | | | | | | 0.25 | |
| | 3175 | 175 | 18 | 8 | 11 | 3.5 | M4 | 5.8 | 8.2 | 3.2 | 3 | 10 | 5 | 25 | 12.5 | 0.30 |
| | 3200 | 200 | | | | | | | | | | | | | 0.35 | |
| | 3225 | 225 | | | | | | | | | | | | | 0.45 | |
| | 3250 | 250 | | | | | | | | | | | | | 0.50 | |
| | 3275 | 275 | | | | | | | | | | | | | 0.55 | |
| 3300 | 300 | | | | | | | | | | | | | 0.60 | | |
| R6 | 6100 | 100 | | | | | | | | | | | | | 0.80 | |
| | 6150 | 150 | | | | | | | | | | | | | 1.00 | |
| | 6200 | 200 | | | | | | | | | | | | | 1.40 | |
| | 6250 | 250 | | | | | | | | | | | | | 1.80 | |
| | 6300 | 300 | 31 | 15 | 19 | 6 | M6 | 9.5 | 14 | 5 | 6 | 40 | 12 | 50 | 25 | 2.20 |
| | 6350 | 350 | | | | | | | | | | | | | 2.50 | |
| | 6400 | 400 | | | | | | | | | | | | | 2.80 | |
| | 6450 | 450 | | | | | | | | | | | | | 3.20 | |
| 6500 | 500 | | | | | | | | | | | | | 3.60 | | |
| R9 | 9200 | 200 | | | | | | | | | | | | | 3.00 | |
| | 9300 | 300 | | | | | | | | | | | | | 4.20 | |
| | 9400 | 400 | | | | | | | | | | | | | 5.50 | |
| | 9500 | 500 | | | | | | | | | | | | | 6.70 | |
| | 9600 | 600 | 44 | 22 | 26 | 9 | M8 | 10.5 | 19.7 | 6.5 | 9 | 100 | 15 | 100 | 50 | 7.90 |
| | 9700 | 700 | | | | | | | | | | | | | 9.10 | |
| | 9800 | 800 | | | | | | | | | | | | | 10.40 | |
| | 9900 | 900 | | | | | | | | | | | | | 11.60 | |
| | 91000 | 1000 | | | | | | | | | | | | | 12.80 | |
| | R12 | 12200 | 200 | | | | | | | | | | | | | 4.5 |
| 12300 | | 300 | | | | | | | | | | | | | 6.7 | |
| 12400 | | 400 | | | | | | | | | | | | | 8.8 | |
| 12500 | | 500 | | | | | | | | | | | | | 11.0 | |
| 12600 | | 600 | 58 | 28 | 34 | 12 | M10 | 13.5 | 25.9 | 8.5 | 12 | 175 | 20 | 100 | 50 | 13.2 |
| 12700 | | 700 | | | | | | | | | | | | | 14.4 | |
| 12800 | | 800 | | | | | | | | | | | | | 17.6 | |
| 12900 | | 900 | | | | | | | | | | | | | 19.8 | |
| 121000 | | 1000 | | | | | | | | | | | | | 22.0 | |

HÄRTE ca. Rc 63

HARDNESS ca. Rc 63

DUREZZA ca. Rc 63

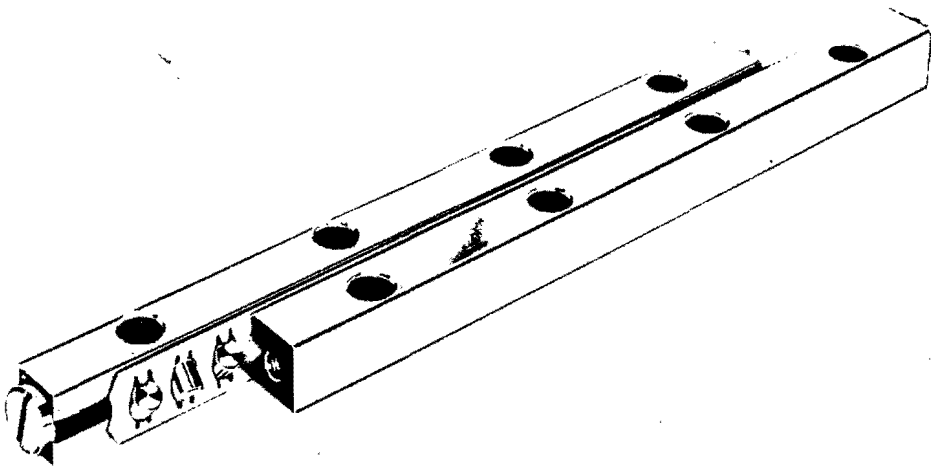
HARDHEID ca. Rc 63

Für Vertikal-einbau werden verstärkte Rollenkäfige geliefert. Bitte bei Bestellung angeben.

For vertical assembly strengthened roller cages are supplied. Please mention when ordering.

Per la costruzione verticale verranno fornite gabbie a rulli rinforzate. Preghiamo richiederlo al momento dell'ordinazione

Voor vertikale inbouw worden versterkte rollenkooien geleverd. Bij bestelling s.v.p. vermelden.



| | |
|-------------------|-----------------------------|
| 1 Satz enthält | 4 Schienen und |
| 1 Set contains | 2 Rollenkäfige mit Rollen |
| 1 Serie comprende | 4 Guide beams and |
| 1 Stel bevat | 2 Roller cages with Rollers |
| | 4 Guide e |
| | 2 Gabbie con rulli |
| | 4 Leibanen en |
| | 2 Rollenkooien met rollen |

Berechnung eines geeigneten Rollenkäfiges

Beispiel: K = Käfiglänge
 L = Schienenlänge
 H = Hub
 K = $L \times 0,5$ weil der Rollenkäfig nur den halben Weg der Schienenlängen zurücklegt.

Method of calculating the corrector roller cage

Example: K = cage length
 L = beam length
 H = stroke
 K = $L \times 0,5$, because the roller cage only covers half the distance of the length of the guide beam.

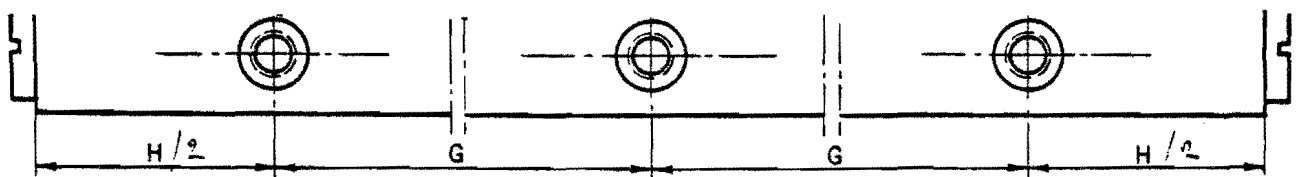
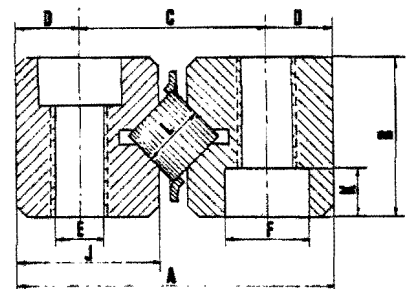
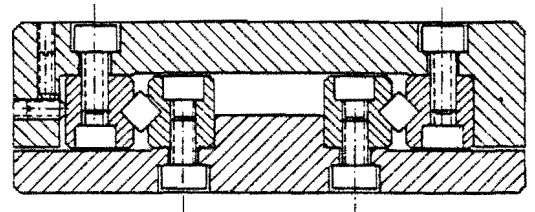
Calcolo di una gabbia con rulli appropriate

Esempio: K = lunghezza di gabbia
 L = lunghezza di guida
 H = corsa
 K = $L \times 0,5$ visto che la gabbia con rulli percorre metà cammino della lunghezza di guida.

Berekening van een passende rollenkooi

Voorbeeld: K = kooilengte
 L = leibaanlengte
 H = slag
 K = $L \times 0,5$ aangezien de rollenkooi de halve weg van de leibaanlengte aflegt.

EINBAU BEISPIEL EXAMPLE OF USE ESEMPIO DI MONTAGGIO INBOUWVOORBEELD



Als Wegmeßsystem bei kleineren Meßeinrichtungen, Kreuztischen o. ä. verwendbar. Ankopplung durch eine nur in der Meßrichtung steife Kupplung oder durch Andruckfeder.

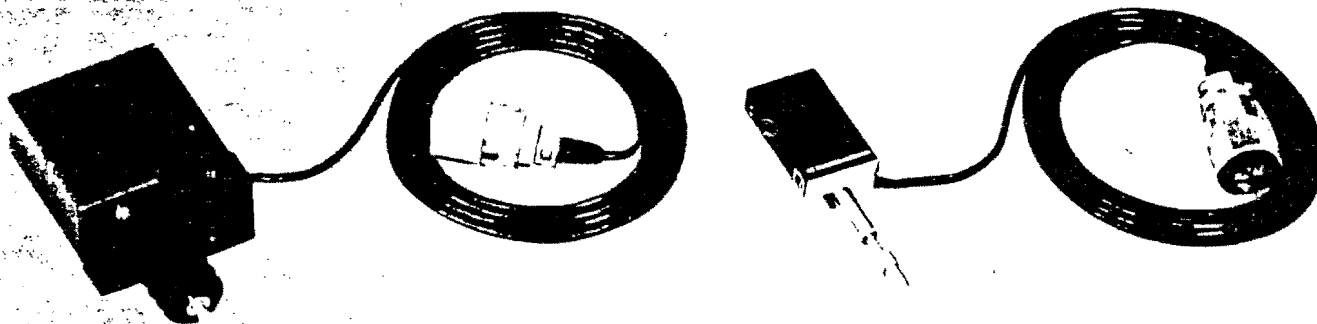
„Mechanische Referenzmarke“

Die Meßtaster besitzen einen mechanischen Anschlag, der als Bezugsposition verwendet werden kann (Reproduzierbarkeit: 1 µm).

Meßlänge 10 bzw. 30 mm

Teilungsperiode 10 µm

empfohlener Meßschritt 1 µm



MT 10W

MT 10
MT 10B
MT 10P

| Mechanische Kennwerte | MT 10 | MT 10W | MT 30 | MT 30W | |
|---|---|---|---|---|-------------------------------------|
| Meßverkörperung | Glasmaßstab mit DIADUR-Gitterteilung Teilungsperiode 10 µm | | | | |
| Systemgenauigkeit | ± 1 µm | | | | |
| Meßweg | 10 mm | | 30 mm | | |
| Meßbolzenführung | Gleitführung | Kugelführung | Gleitführung | Kugelführung | |
| Gebrauchslage | beliebig | | | | |
| bewegte Masse | 11 g | 15 g | 17 g | 25 g | |
| Meßkraft | vertikal nach unten vertikal nach oben horizontal | 0,3 ... 0,8 N 0,1 ... 0,6 N 0,2 ... 0,7 N | 1 ... 2,5 N 1 ... 2,5 N 1 ... 2,5 N | 0,5 ... 0,9 N 0,2 ... 0,6 N 0,3 ... 0,8 N | 1 ... 4 N 1 ... 4 N 1 ... 4 N |
| max. Verfahrgeschwindigkeit | 250 mm/s | | | | |
| zulässige Querkraft | 0,1 ... 0,2 N | 0,8 N | 0,1 ... 0,2 N | 0,8 N | |
| Betriebstemperatur | 0 ... 50°C | | | | |
| Lagertemperatur | - 20 ... 70°C | | | | |
| Gewicht | 160 g | 360 g | 300 g | 630 g | |
| Belegung | Einspannschaft Ø 8 ^{h11} l = 21 mm | Fläche 62 × 15 mm 2 Schrauben | Einspannschaft Ø 8 ^{h10} l = 21 mm | Fläche 62 × 15 mm 2 Schrauben | |
| Anschlußkabel zur Meßwertanzeige | 1,5 m | | | | |
| Gewinde für Kupplung bzw. für Meßeinsätze | M2,5 (6 tief) DIN 878 | | | | |

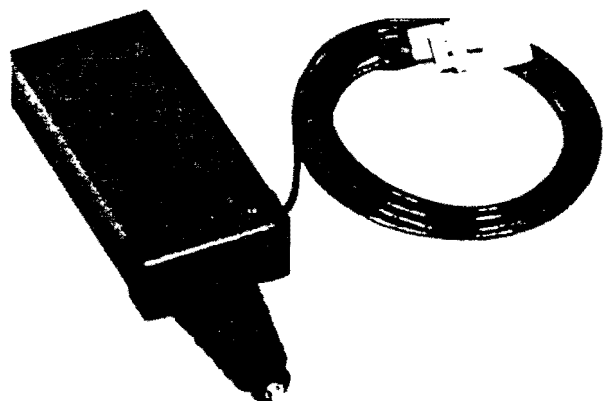
Meßtaster-Versionen:

MT 10, MT 30 mit Gleitführung; ggf. mechanische Abhebung.

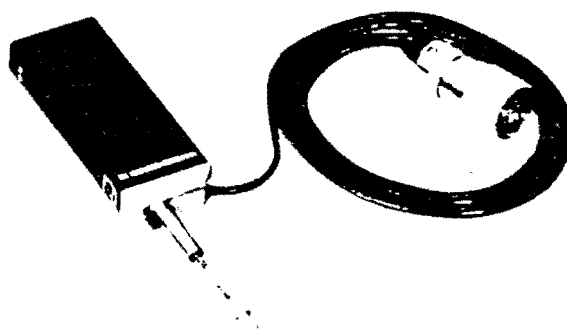
MT 10B, MT 30B mit Kugelführung; ggf. mechanische Abhebung.

MT 10P, MT 30P mit Kugelführung; pneumatische Betätigung.

MT 10W, MT 30W, Taster MT 10B bzw. MT 30B in wasserdichtem Schutzgehäuse.



MT 30W

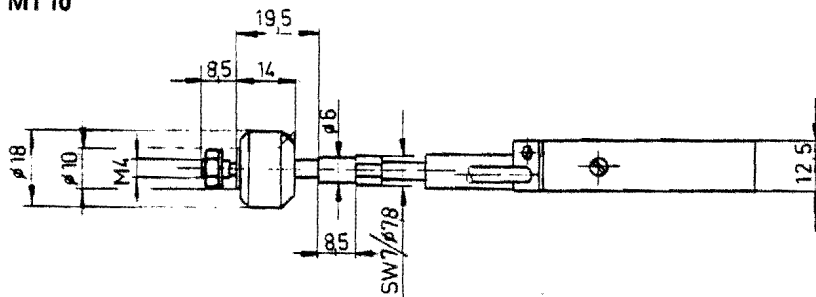


MT 30
MT 30B
MT 30P

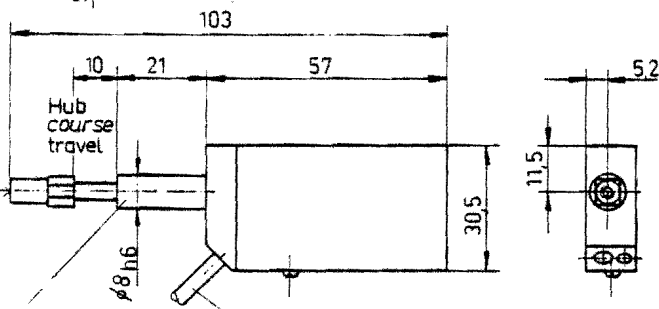
Elektrische Kennwerte**MT 10, MT 10W, MT 30, MT 30W**

| | |
|--------------------------------------|--|
| Lichtquelle | Miniaturlampe 5 V/0,6 W |
| Spannungsversorgung | 5 V \pm 5 %/120 mA |
| Ausgangs-Signale | Inkremental-Signale 2 annähernd sinusförmige Signale I_{e1} und I_{e2} |
| | |
| Signalgröße bei Last 1 k Ω | I_{e1} ca. 7 ... 16 μ A _{rms} I_{e2} ca. 7 ... 16 μ A _{rms} |
| zulässige Kabellänge, gesamt | 20 m |

MT 10



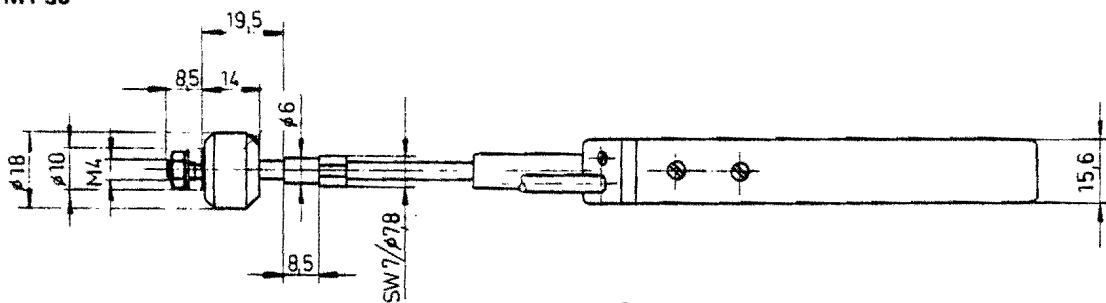
M 2,5
für Meßeinsatz nach DIN 878
bzw. Kupplung
pour pointe de mesure
interchangeable suivant
DIN 878 ou accouplement
for measuring contact to DIN 878
or coupling



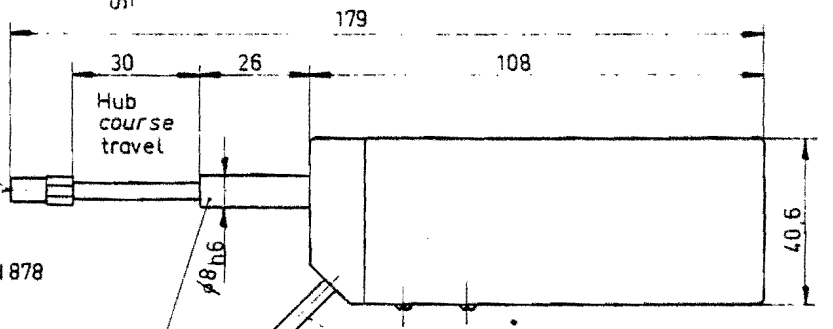
Einspannschaft
tige de serrage
clamping shaft

Kabel zur Elektronik 1,5 m lang
câble vers électronique longueur 1,5 m
cable to electronics 1.5 m long

MT 30



M 2,5
für Meßeinsatz nach DIN 878
bzw. Kupplung
pour pointe de mesure
interchangeable suivant
DIN 878 ou accouplement
for measuring contact to DIN 878
or coupling



Einspannschaft
tige de serrage
clamping shaft

Kabel zur Elektronik 1,5 m lang
câble vers électronique longueur 1,5 m
cable to electronics 1.5 m long

Bepaling van de knipkracht

Volgens lit. [5] is de perskracht bij het knippen van exponentieel versleuwend materiaal te bepalen m.b.v. de formule:

$$K = l(h_0 - s) \frac{C}{\sqrt{3}} \left(\sqrt{\frac{3}{n}} \ln \frac{h_0}{h_0 - s} \right)$$

hierin is:

- K : perskracht
- l : sneedelengte
- h_0 : materiaaldikte
- s : indringdiepte van het mes in het materiaal
- C : specifieke spanning van het te knippen materiaal
- n : versleuwigings exponent.

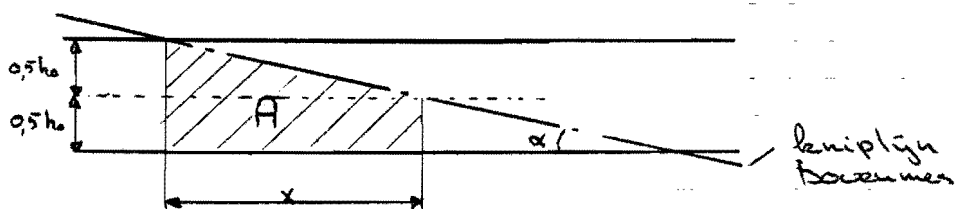
De maximale perskracht treedt op indien $\frac{dK}{ds} = 0$

dan geldt: $K_{max} = l \cdot h_0 \frac{C}{\sqrt{3}} \left(\frac{\sqrt{3n}}{e} \right)^n$

$l \cdot h_0 = A =$ oppervlakte onder het mes: ~~in het~~

Indien het mes schuin staat (zie tekening) is het afschuif oppervlakte aanvankelijk kleiner dan $l \cdot h_0$

Als er ook nog rekening gehouden wordt met het feit dat het materiaal halverwege de dikte afbreekt dan is het afschuif oppervlakte gelijk aan $A = 0,5 h_0 \cdot \left\{ \frac{1}{2} \cdot x + x \right\}$ (zie tekening)



De maximale materiaaldikte $h_0 = 2,5 \text{ mm}$

Volgens dr. Brink is de maximaal toegestane kniphoek $\alpha = 2,5^\circ$

Dan geldt: $x = \frac{0,5 \cdot 2,5}{\tan 2,5} \approx 97,4 \text{ mm}$

Het afschuifoppervlak $A = 621 \text{ mm}^2$

De specifieke spanning voor St-37: $C \approx 670 \text{ N/mm}^2$

De versterkings-exponent $n = 0,22$

De maximale schuifkracht is dan:

$$K_{\max} = 621 \cdot \frac{670}{\sqrt{3}} \left(\frac{\sqrt{0,661}}{e} \right)^{0,22} \approx 184,2 \text{ kN}$$

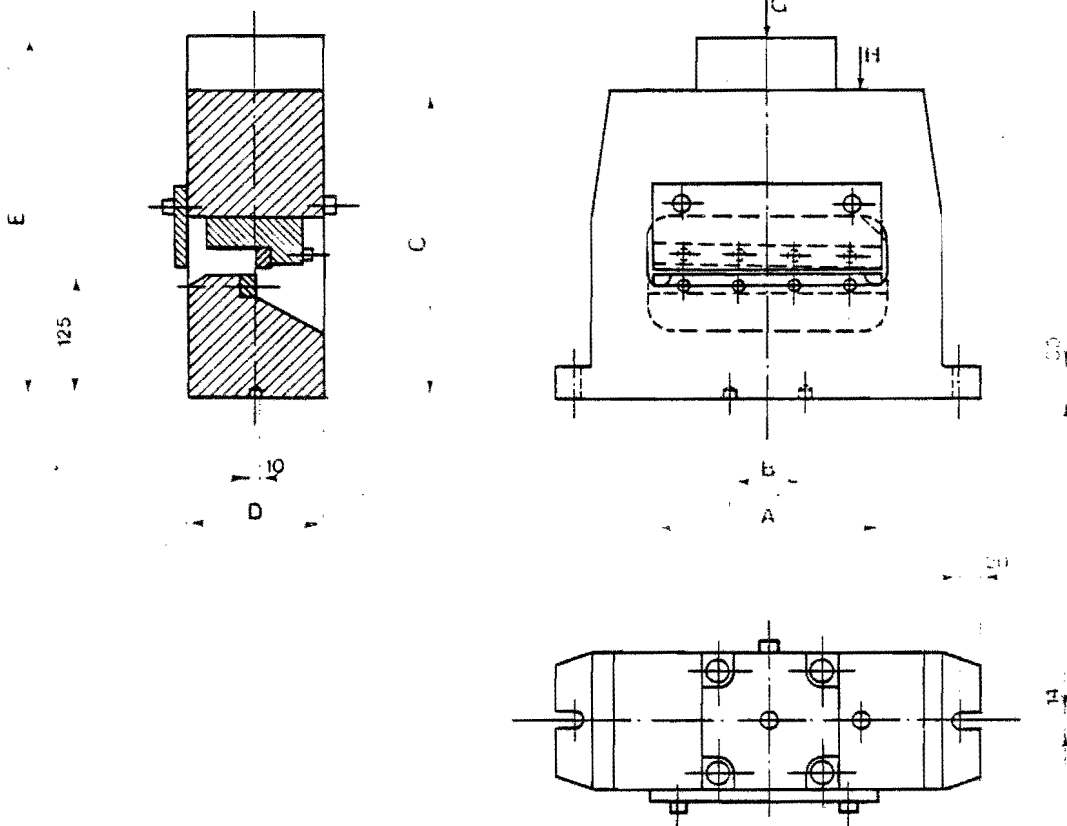
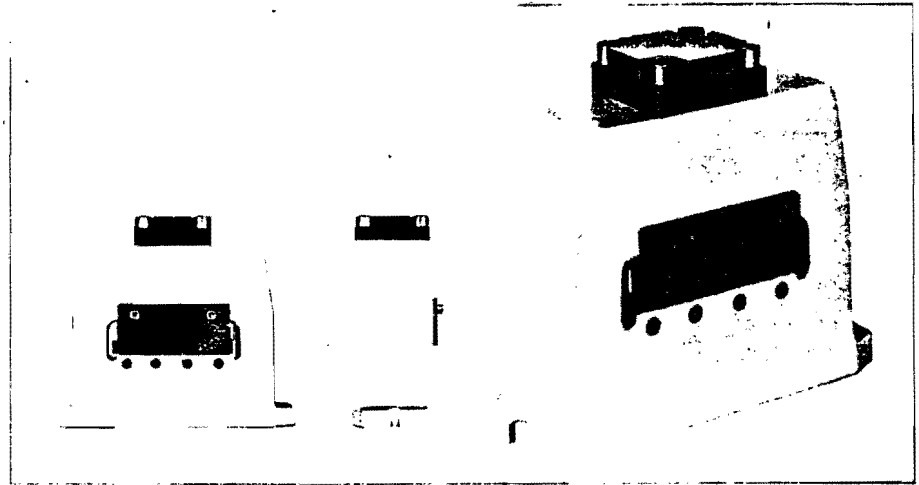
Typ/Type

H-M

Einheitenreihe Typ H-M:

La série d'unités type H-M:
Type H-M units:

| | |
|-------|-------|
| H 80 | M 125 |
| H 100 | M 210 |
| H 100 | M 420 |
| H 100 | M 650 |
| H 100 | M 850 |



Kolbenhub: 12 mm
Course de piston: 12 mm
Piston stroke: 12 mm

Die Einheiten des Typs H-M sind bestimmt zum:

- Trennschneiden, z.B. von Teilstücken,
in Dicken bis zu 6 mm, wobei die erforderliche Druckkraft berücksichtigt werden muss.

Les unités du type H-M s'utilisent pour

*- le cisailage, p. ex. le débitage,
dans des épaisseurs jusqu'à 6 mm, tout en tenant compte de la force nécessaire au découpage.*

The H-M units are intended for:

- shearing off (e.g. separating stamped-out parts),
up to 6 mm thick, according to the punching force required.

Allgemeine Angaben
Indications générales
General data

| Einheit Unité Unit | Schnittbreite Largeur de coupe Cut length Max. mm | Druck Pression Force kN (1) | Ölbedarf Besoin en huile Oil volume Liter / litre (2) |
|--------------------------|--|--------------------------------------|--|
| H 80 M 125 | 120 | 100 | 0,08 |
| H 100 M 210 | 200 | 156 | 0,12 |
| H 100 M 420 | 420 | 312 | 0,24 |
| H 100 M 650 | 650 | 312 | 0,24 |
| H 100 M 850 | 850 | 312 | 0,24 |

(1) bei \dot{a} / at 200 bar

(2) pro Hub / per course / per stroke

Abmessungen
Cotes
Dimensions

| Einheit Unité Unit | A | B | C | D | E | F | G | H | Gewicht Poids Weight ~ kg |
|--------------------------|-----|-----|-----|-----|-----|------|--|--------|------------------------------------|
| | | | | | | | Anschlüsse Raccordements Connections | | |
| H 80 M 125 | 140 | 70 | 300 | 100 | 340 | 320 | R 3/8" | R 3/8" | 55 |
| H 100 M 210 | 219 | 70 | 310 | 130 | 360 | 400 | R 3/8" | R 3/8" | 95 |
| H 100 M 420 | 438 | 400 | 315 | 130 | 445 | 760 | R 3/8" | R 3/8" | 220 |
| H 100 M 650 | 657 | 500 | 315 | 130 | 445 | 890 | R 3/8" | R 3/8" | 265 |
| H 100 M 850 | 876 | 700 | 315 | 130 | 445 | 1100 | R 3/8" | R 3/8" | 330 |

Sonderanfertigungen auf Anfrage

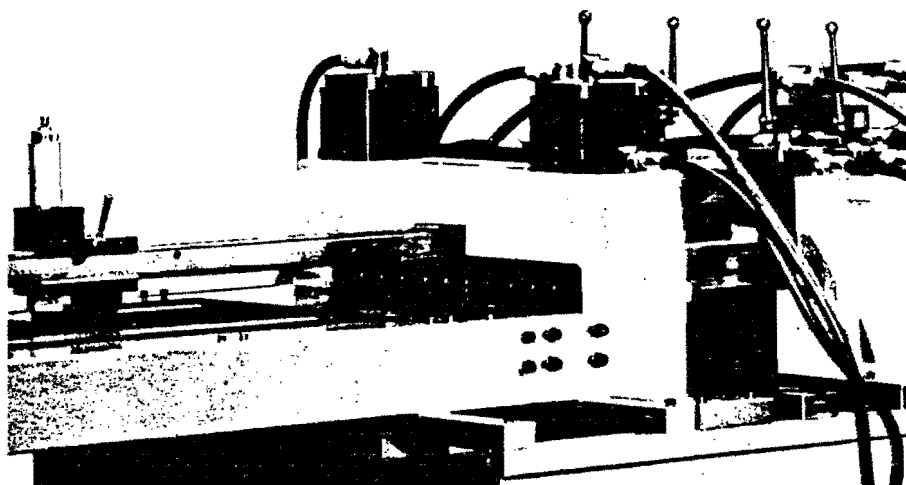
Exécutions spéciales sur demande

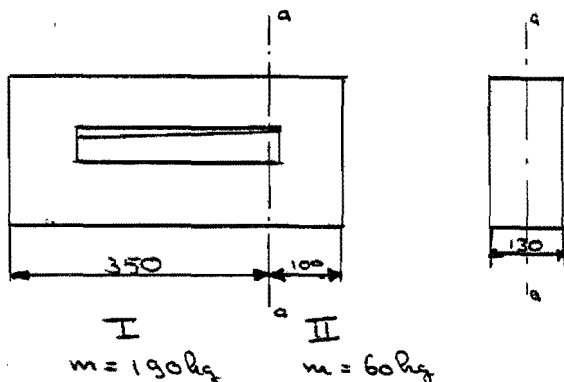
Custom-made units on request

Die Ausführung H 100 M 420 aus der H-M-Reihe wird mit zwei Druckzylindern ausgerüstet. Dieses Parallellauf-System ermöglicht auch aussermittiges Schneiden.

Le modèle H 100 M 420 de la série des H-M est équipé de deux vérins. Cette conception à fonctionnement en parallèle permet également le cisailage décentré.

The type H-100 M 420 unit from the H-M range is fitted with two hydraulic cylinders. This parallel loading system gives off-centre punching capability.



Bepaling draaisnelheid van de schaar.

a-a = rotatieas

massa schaar \approx 250 kg

Massatraagheidsmoment tov a-a:

$$J_I = \frac{1}{3} m_I l_1^2 = \frac{1}{3} \cdot 190 \cdot 0,35^2 = 7,76 \text{ kg m}^2$$

$$J_{II} = \frac{1}{3} m_{II} l_2^2 = \frac{1}{3} \cdot 60 \cdot 0,1^2 = 0,2 \text{ kg m}^2$$

$$J_{\text{tot}} = J_I + J_{II} = 7,96 \text{ kg m}^2$$

Stel de wil de schaar 45° verdraaien binnen 1 seconde vanuit stilstand naar stilstand

0,5 seconde versnellen en 0,5 seconde vertragen

$$\text{Op } t=0,5 \text{ geldt: } \alpha_1 = \frac{1}{2} \ddot{\alpha} t^2 = 0,125 \ddot{\alpha}$$

$$\dot{\alpha}_1 = \ddot{\alpha} \cdot t = 0,5 \ddot{\alpha}$$

$$\text{Voor } 0,5 < t \leq 1 \text{ geldt: } \alpha = \alpha_1 + \dot{\alpha}_1(t-0,5) - \frac{1}{2} \ddot{\alpha} (t-0,5)^2$$

$$\text{Voor } t=1 \text{ geldt: } \frac{1}{4} \pi = 0,125 \ddot{\alpha} + 0,5 \dot{\alpha}_1 - 0,125 \ddot{\alpha}$$

$$\frac{1}{4} \pi = 0,5 \cdot 0,5 \ddot{\alpha} = 0,25 \ddot{\alpha} \Rightarrow \ddot{\alpha} = \pi \text{ rad/s}^2$$

Hierin is: α = gewenste draaihoek
 t = tijd
 $\dot{\alpha} = \frac{d\alpha}{dt}$ = hoeksnelheid
 $\ddot{\alpha} = \frac{d^2\alpha}{dt^2}$ = hoekversnelling

$$\text{Voorts geldt: } M = J \ddot{\alpha}$$

M = aandrijfmoment
 J = massatraagheidsmoment

De benodigde hoekversnelling $\ddot{\alpha} = \pi \text{ rad/s}^2$

Gelouwen is gebruik te maken een servomotor met

harmonie drive: Harmonic Drive System GmbH

Type: HT 25-2514 met tachometer

Nominaal draaimoment $M = 54 \text{ Nm}$

Massatraagheidsmoment $J_A = 4,97 \text{ kg m}^2$

Het gevraagde draaimoment is dan: $M = \ddot{\alpha} \cdot (J_{\text{tot}} + J_{\text{aandrijving}})$

$$J_{\text{tot}} + J_{\text{aandrijving}} = 7,96 + 4,97 = 12,93 \text{ kg m}^2$$

$$M_{\text{gevraagd}} = \pi \cdot 12,93 = 40,6 \text{ Nm}$$

Dit kan dus door deze aandrijving geleverd worden.

De mechanische tijdconstante van deze aandrijving is:

$$T = 0,016 \text{ s}$$

Om de schaar binnen 1 seconde te positioneren restteert

$$\text{dan } t \text{ sec: } 1 = \sqrt{t^2 + T^2} \Rightarrow t = 0,9999 \text{ s}$$

Indien de helft van de tijd wordt gebruikt om te versnellen en de andere helft om te vertragen, dan geldt:

$$\alpha_1 = \frac{1}{2} \ddot{\alpha} (0,4999)^2 = 0,52 \text{ rad}$$

$$\dot{\alpha}_1 = \ddot{\alpha} \cdot 0,4999 = 2,08 \text{ rad/s}$$

$$\text{na 1 sec geldt: } \alpha = 0,52 + 0,4999 \cdot 2,08 - \frac{1}{2} \ddot{\alpha} (0,4999)^2$$

$$\alpha = 1,04 \text{ rad} \approx 59,7^\circ$$

$$\dot{\alpha} = 0,52 - 0,4999 \cdot \ddot{\alpha} = 0 \text{ rad/s}$$

Bij deze berekening zijn wel enkele dingen verwaarloosd zoals de massa van de op de schaar gemonteerde cilinder en de wrijvingsverliezen in de lagers van de draaias.

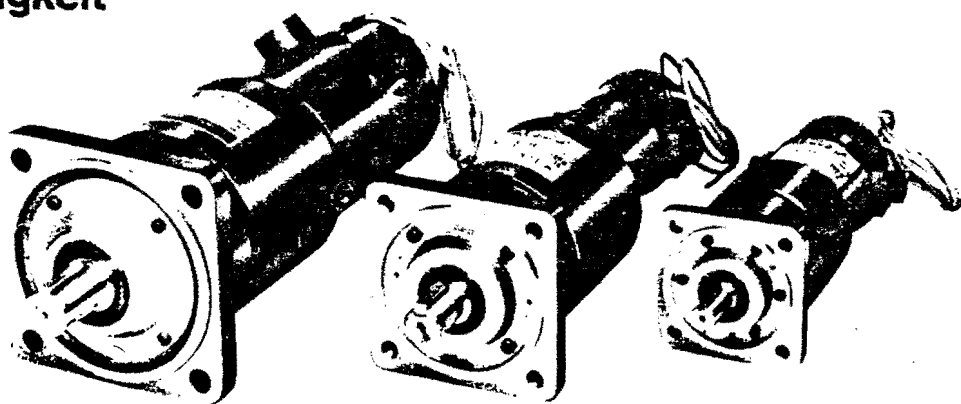
Ik zou welk dan dat de aanname van de positioneer snelheid van de schaar gemaakt is hoofdstuk 5 reël is.

HarmonicDrive HT¹⁴ HT²⁰ HT²⁵

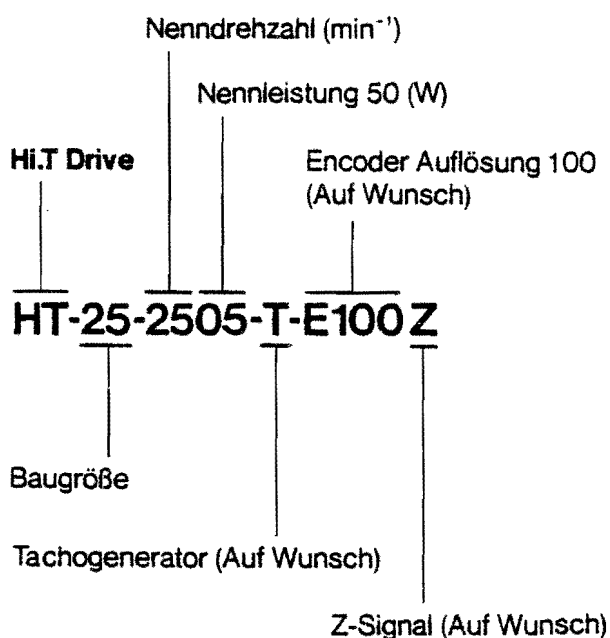
Hi.T Drive Servoantriebe

Höchste Positionier- und Wiederholgenauigkeit

- Spiel am Abtrieb unter drei Winkelminuten
- Sehr hohe Getriebe-
steifigkeit

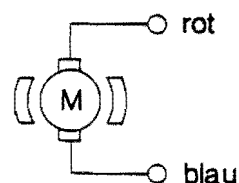


Bezeichnung

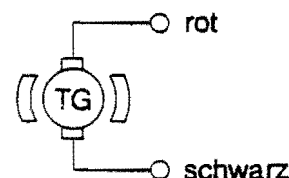


Wicklung

Motor:
Drehung im
Uhrzeigersinn
bei + an rot.



Tachogenerator:
Dem Motor
entsprechend
anschießen.



Zuverlässigkeit und Sicherheit der **Hi.T Drive** Servoantriebe wird durch Anwendung unserer Steuereinheiten der HS-220-Serie erreicht.

Spezifikation

Betriebsweise: kontinuierlich
Erregung: Permanentmagnet
Motorisolierung: Klasse F
Durchschlagsfestigkeit: 50/60Hz · 500V · 1 min

Isolierwert: 100 MΩ
Drehrichtung: Links- und Rechtslauf
Bauweise: geschlossen
Farbe: schwarz
Temperatur-Bereich: 0-40°C

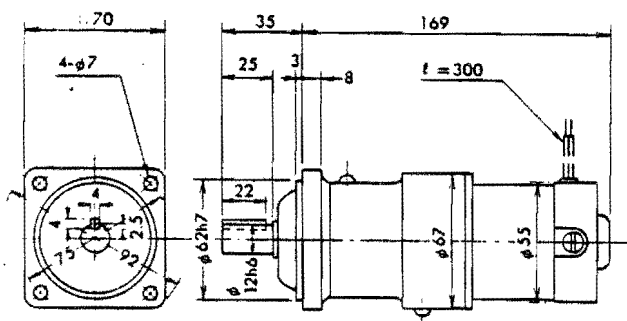
Technische Daten

| Typ | | HT14 | HT14 | HT20 | HT20 | HT25 | HT25 | HT25 |
|-------------------------------|---------------------|------|------|------|-------|------|------|-------|
| | | 3401 | 1901 | 3802 | 1902 | 5005 | 3805 | 250 |
| Nennleistung | W | 12 | 9 | 20 | 20 | 46 | 51 | 51 |
| Nenn Drehmoment | Nm | 3,4 | 4,6 | 5,0 | 10 | 9 | 13 | 20 |
| Nennspannung | V | 24 | 24 | 24 | 24 | 48 | 48 | 48 |
| Nennstrom | A | 1,5 | 1,1 | 2,5 | 2,5 | 3,3 | 3,3 | 3,3 |
| Nenn Drehzahl | min ⁻¹ | 34 | 19 | 38 | 19 | 50 | 38 | 25 |
| Maximales Drehmoment | Nm | 15 | 15 | 45 | 70 | 60 | 90 | 135 |
| Maximaler Strom | A | 3,8 | 2,4 | 10,8 | 8,7 | 9,5 | 8,3 | 10 |
| Maximale Drehzahl | min ⁻¹ | 56 | 30 | 60 | 30 | 83 | 62 | 41 |
| Drehmomentkonstante | Nm/A | 5 | 7,7 | 4,8 | 9,6 | 8,1 | 10,8 | 16,2 |
| Spannungskonstante | V/min ⁻¹ | 0,55 | 0,78 | 0,53 | 1,06 | 0,83 | 1,11 | 1,67 |
| Massenträgheitsmoment | kgm ² | 0,21 | 0,21 | 0,39 | 1,6 | 0,84 | 1,48 | 3,34 |
| Reibungsdrehmoment | Nm | 4,1 | 3,9 | 7,0 | 14,0 | 16,7 | 22,6 | 33,5 |
| Anschlußwiderstand | Ω | 3 | 6 | 1,7 | 1,7 | 1,7 | 1,7 | 1,7 |
| Mechanische Zeitkonstante | ms | 24 | 22 | 28 | 28 | 22 | 22 | 22 |
| Maximal zulässige Radialkraft | N | 800 | 800 | 1400 | 1400 | 3000 | 3000 | 3000 |
| Maximal zulässige Axialkraft | N | 800 | 800 | 1400 | 1400 | 3000 | 3000 | 3000 |
| Integrierte Untersetzung | | 1:88 | 1:88 | 1:80 | 1:150 | 1:60 | 1:80 | 1:120 |
| Gewicht | kg | 1,4 | 1,4 | 2,8 | 2,8 | 7 | 7 | 7 |

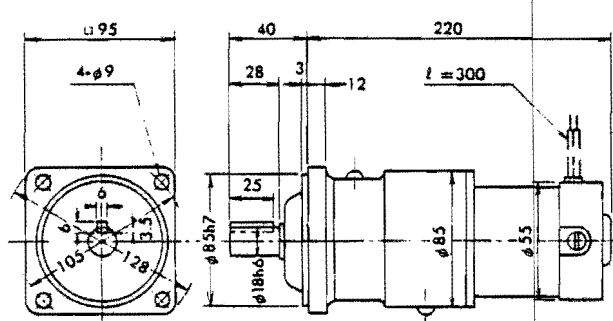
¹⁾ Werte bei ausgeglichener Temperatur des Servoantriebes · ²⁾ Diese Maximalwerte dürfen nicht überschritten.

Abmessungen

HT14

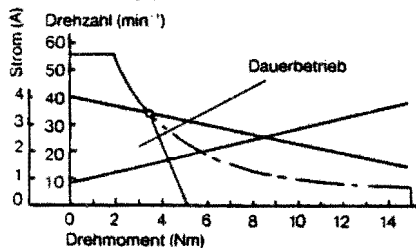


HT20

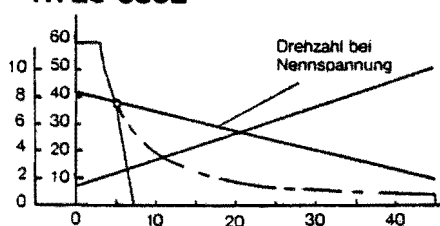


Durchschnittliche Leistungscharakteristiken

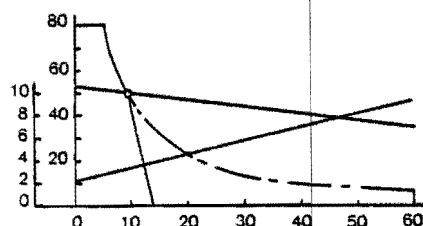
HT14-3401



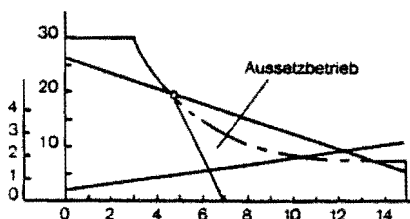
HT20-3802



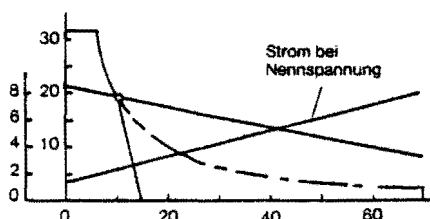
HT25-5005



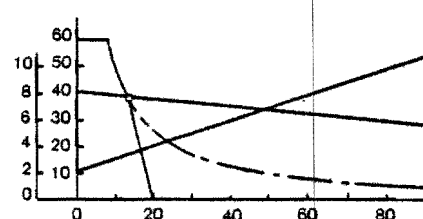
HT14-1901



HT20-1902



HT25-3805

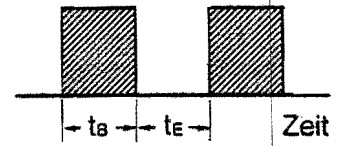
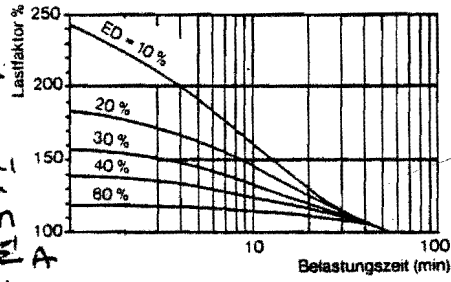


Betrieb bei Überlastung
HT14, HT20, HT25-5005 ~ 1505

$$\text{Lastfaktor \%} = \frac{J}{J_N} \cdot 100\%$$

J = Stromaufnahme
 J_N = Nennstrom

| HT25 5013 | HT25 3814 | HT25 2514 | |
|--------------|--------------|--------------|-----------------------|
| 128 | 140 | 139 | 1) P |
| 25 | 36 | 54 | M _{push} Mom |
| 48 | 48 | 48 | ✓ |
| 5,4 | 5,4 | 5,4 | 4 |
| 50 | 38 | 25 | |
| 60 | 90 | 135 | M _{rot} Nm |
| 9,6 | 10,3 | 10,3 | 2) A |
| 83 | 62 | 41 | n |
| 8,2 | 11,0 | 16,4 | mi |
| 0,85 | 1,13 | 1,69 | |
| 1,24 | 2,2 | 4,97 | I |
| 19,4 | 23,2 | 34,8 | M _w |
| 0,9 | 0,9 | 0,9 | 3) Ω |
| 16 | 16 | 16 | τ _{me} |
| 3000 | 3000 | 3000 | F _r |
| 3000 | 3000 | 3000 | F _a |
| 1:60 | 1:80 | 1:120 | |
| 7,5 | 7,5 | 7,5 | kg |

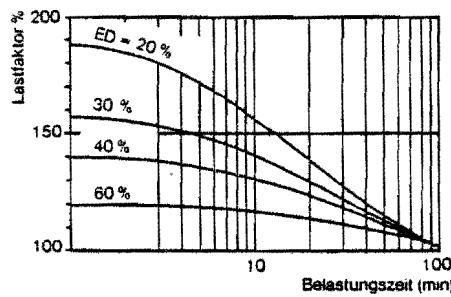


t_B = Belastungszeit
 t_E = Entlastungszeit

$$ED \% = \frac{t_B}{t_B + t_E} \cdot 100\%$$

ED = Einschaltdauer

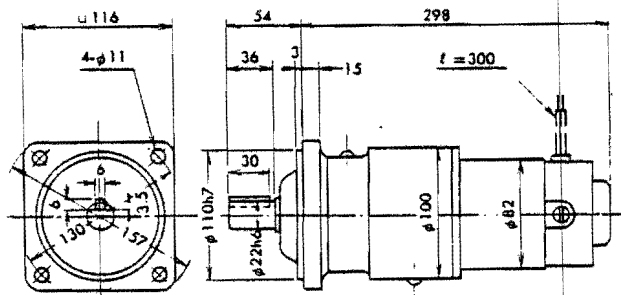
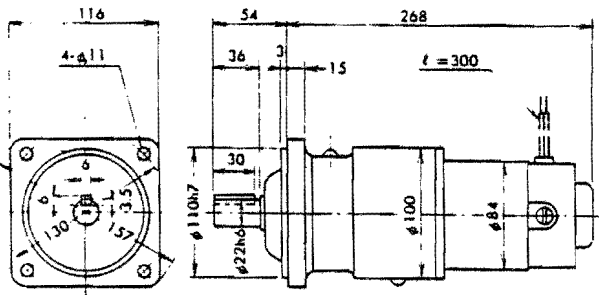
HT 25-5013 ~ 2514



Werte bei 25°C

HT 25-5005 ~ 1505

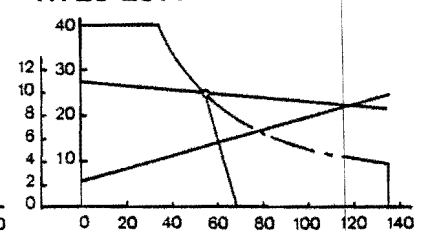
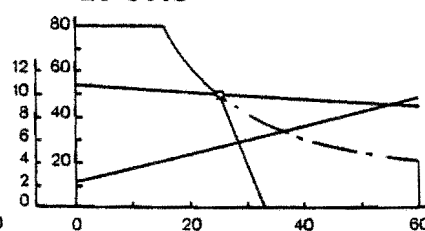
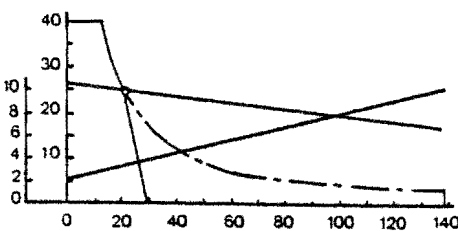
HT 25-5013 ~ 2514



HT 25-2505

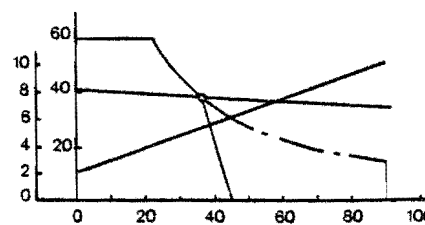
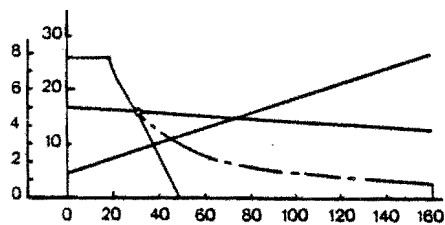
HT 25-5013

HT 25-2514



HT 25-1505

HT 25-3814

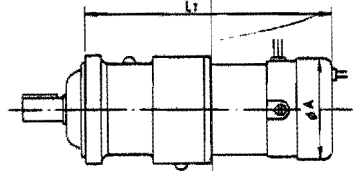


Tachogenerator

| | | | |
|------------------------------------|---------|--------------|----------|
| Ausgangsspannung bei Nenn Drehzahl | V | HT14-1901 | 11 ± 10% |
| | | alle anderen | 21 ± 10% |
| Linearität | % max. | ± 1 | |
| Welligkeit | % max. | 5 (7) | |
| Minimaler Lastwiderstand | kΩ min. | 7 | |
| Wicklungswiderstand | Ω | 70 ± 20% | |
| Wicklungsinduktivität | mH | 16 ± 30% | |

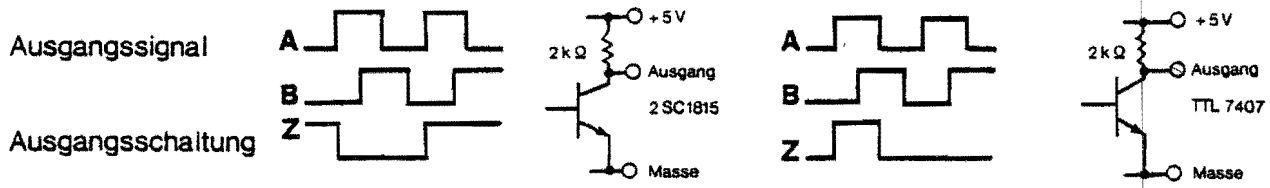
Abmessungen mit Tachogenerator

| Typ | HT14 | HT20 | HT25-5005 ~ 1505 | HT25-5013 ~ 2515 |
|----------------|-------|-------|------------------|------------------|
| L _T | 202,5 | 253,5 | 280,2 | 310,2 |
| ØA | 65 | 65 | 79 | 79 |



Encoder

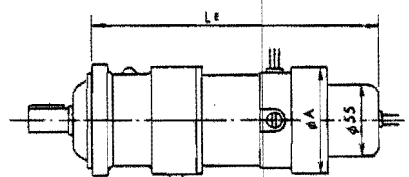
| Typ | Standard Auflösung | Hohe Auflösung |
|------------|------------------------------|----------------------|
| | 40, 50, 100, 125, 180, 200 | |
| Auflösung | 250, 256, 300, 360, 400, 500 | 600, 720, 1000, 1024 |
| Versorgung | 5V, 30mA | 5V, 100mA |



| | | |
|----------|------------------------------|-----------------|
| Wicklung | Braun A Signal | Weiß = +5V |
| | Rot B Signal | Schwarz = Masse |
| | Orange Z Signal (Auf Wunsch) | |

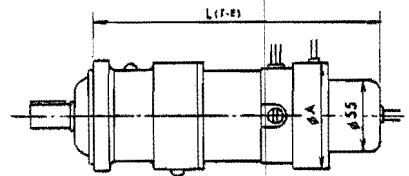
Abmessungen mit Encoder

| | HT14 | HT20 | HT25-5005 ~ 1505 | HT25-5013 ~ 2515 |
|--------------------|----------------------|-------|------------------|------------------|
| Standard Auflösung | L _E 230 | 281 | 337,2 | 367,2 |
| | ØA 71 | 71 | 90 | 90 |
| Hohe Auflösung | L _E 245,7 | 296,7 | 352,9 | 382,9 |
| | ØA 71 | 71 | 90 | 90 |



Abmessungen mit Tachometer und Encoder

| | HT14 | HT20 | HT25-5005 ~ 1505 | HT25-5013 ~ 2515 |
|--------------------|--------------------------|-------|------------------|------------------|
| Standard Auflösung | L _(T+E) 261,7 | 312,7 | 337,2 | 367,2 |
| | ØA 71 | 71 | 90 | 90 |
| Hohe Auflösung | L _(T+E) 276,4 | 327,4 | 352,9 | 382,9 |
| | ØA 71 | 71 | 90 | 90 |



Harmonic Drive System GmbH

Postfach 1369 · Robert-Bosch-Straße 24
 D-6070 Langen/Hessen (West-Germany)
 Telefon (061 03) 7887 · Telex 041-5041

Technische Änderungen vorbehalten.

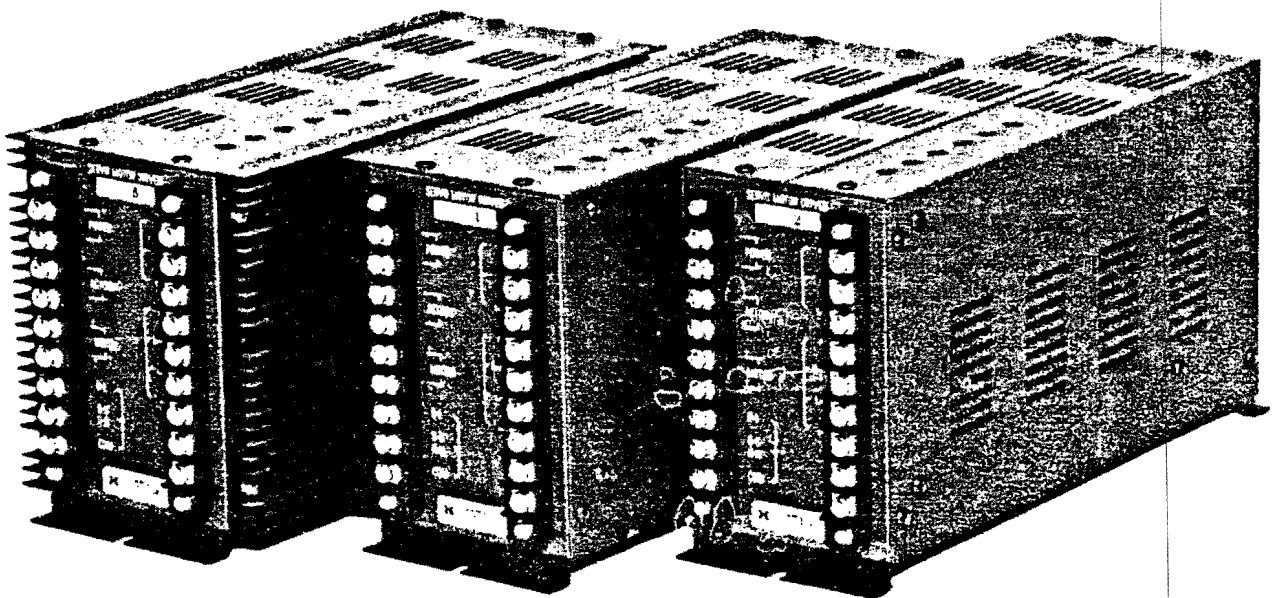
Handwritten notes:
 3300
 Resistor
 neu 1050
 740, - ex
 incl 700, excl

HarmonicDrive **HS 220**

Hi.T Drive Servoantriebe

HS 220 Steuereinheiten

- Sehr hohe Positioniergenauigkeit
- Drehzahlregelung im Bereich 1000:1
- Drehzahlstabilität
- Gleichmäßiger Lauf auch bei sehr kleinen Drehzahlen
- Stromversorgung für **Hi.T Drive** Servoantriebe
- Integrierte Sicherheitsfunktionen
 - Einschaltverzögerung
 - Einstellbare Strombegrenzung
 - Einstellbare Drehzahlbegrenzung
 - Einstellbarer Überlastungsschutz
 - Temperaturüberwachung



Technische Daten

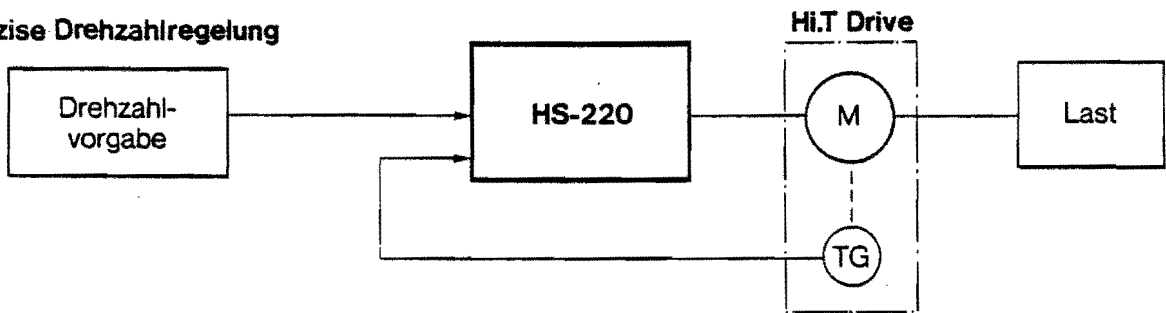
| Typ | HS 220-2 | HS 220-4 | HS 220-6 |
|--|---------------------|-----------------------|-----------------------|
| Für Servoantriebe im Nenndrehmomentenbereich | HT 8 HT14, HT14B | HT 20 HT 25 (50 W) | HT 25 (150W) HT 32 |
| Versorgung Wechselstrom | 110V oder 220V | 110V oder 220V | 110V oder 220V |
| Max. Ausgangsspannung Gleichstrom | 80V | 80V | 80V |
| Nennstrom Ausgang | ± 2 A | ± 4 A | ± 6 A |
| Max. Strom (bis 30 Sekunden) | ± 4 A | ± 5 A | ± 10 A |
| Drehzahlsignal Eingang Gleichstrom | 0 - ± 12V | 0 - ± 12V | 0 - ± 12V |
| Abmessungen (LxBxH) | 250x81x130 | 250x93x130 | 250x105x130 |
| Gewicht | 2,0 kg | 2,6 kg | 3,2 kg |

Bitte fordern Sie unser Manual an!

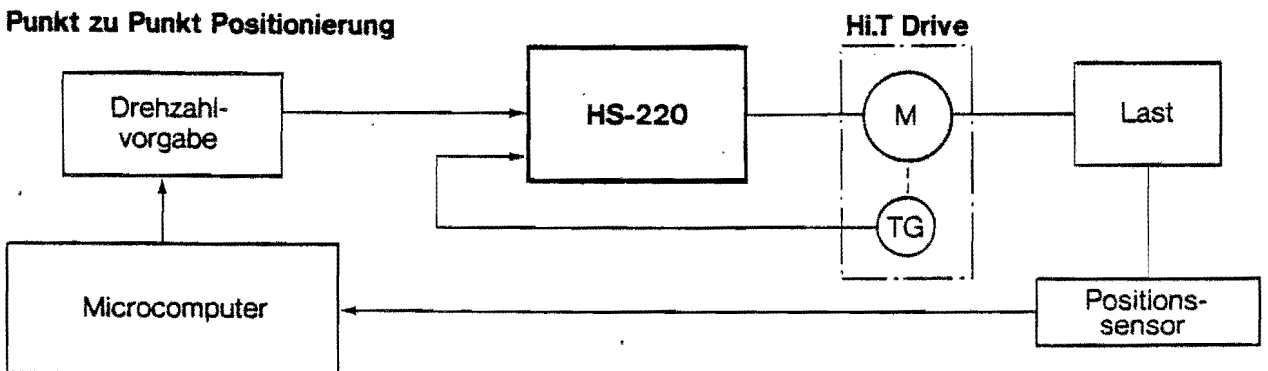
Technische Änderungen vorbehalten.

Anwendungsbeispiele

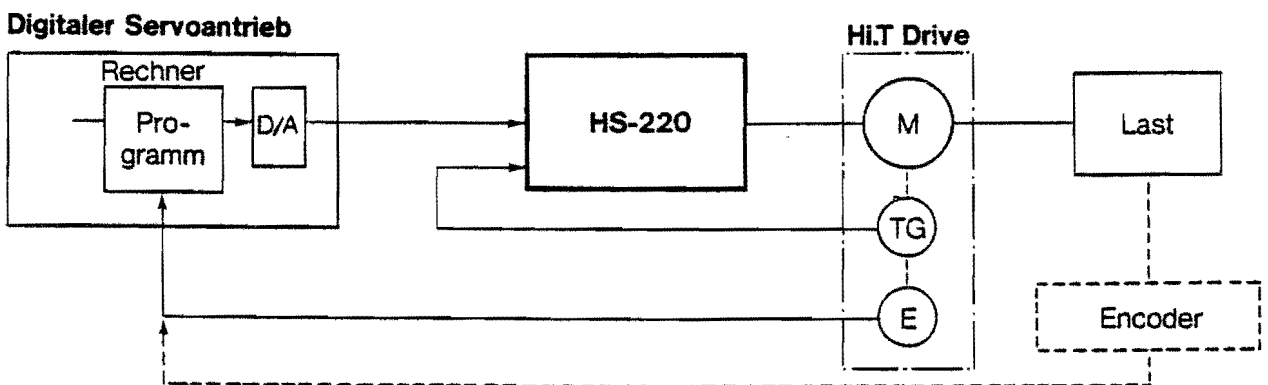
Präzise Drehzahlregelung



Punkt zu Punkt Positionierung

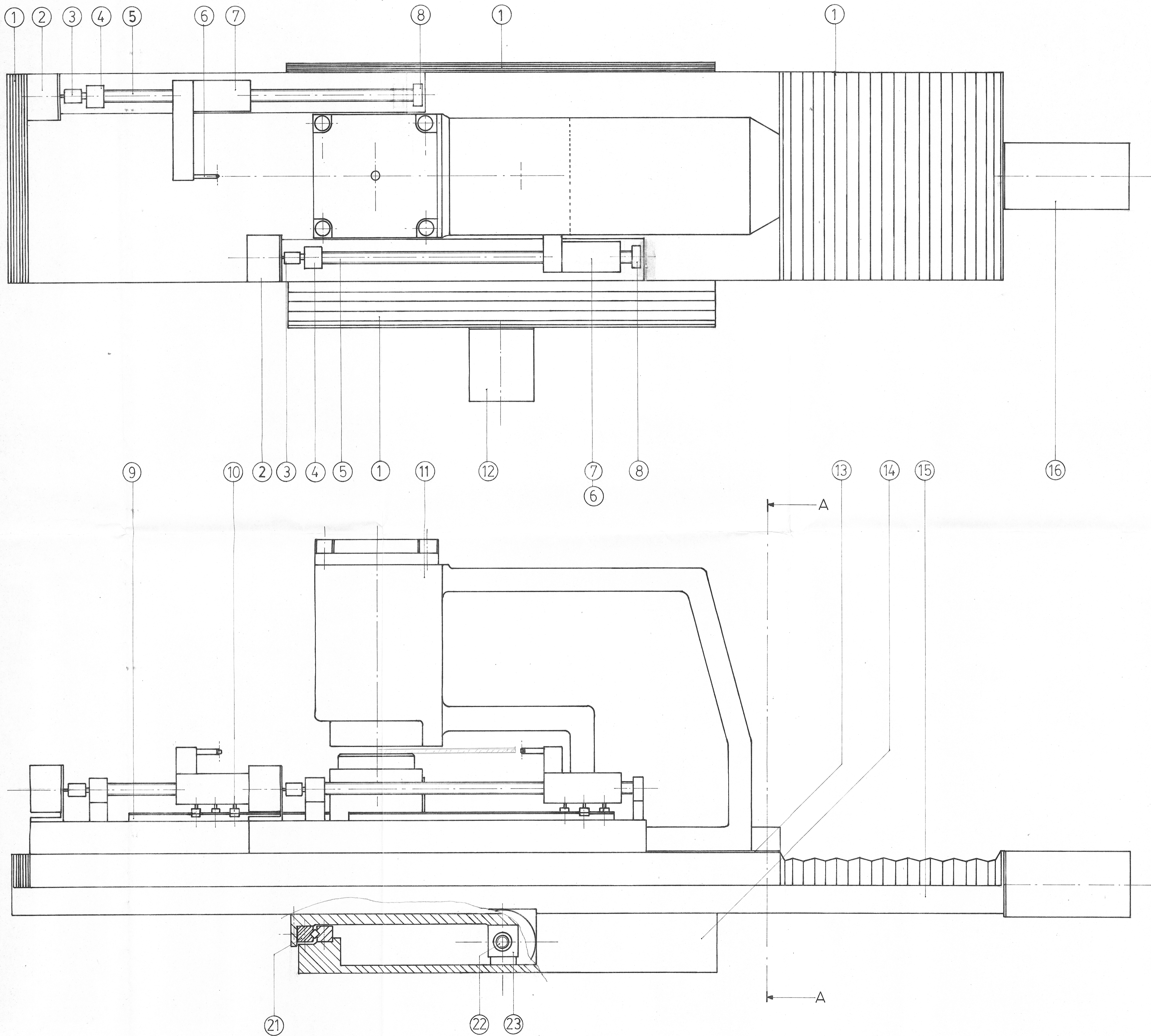


Digitaler Servoantrieb

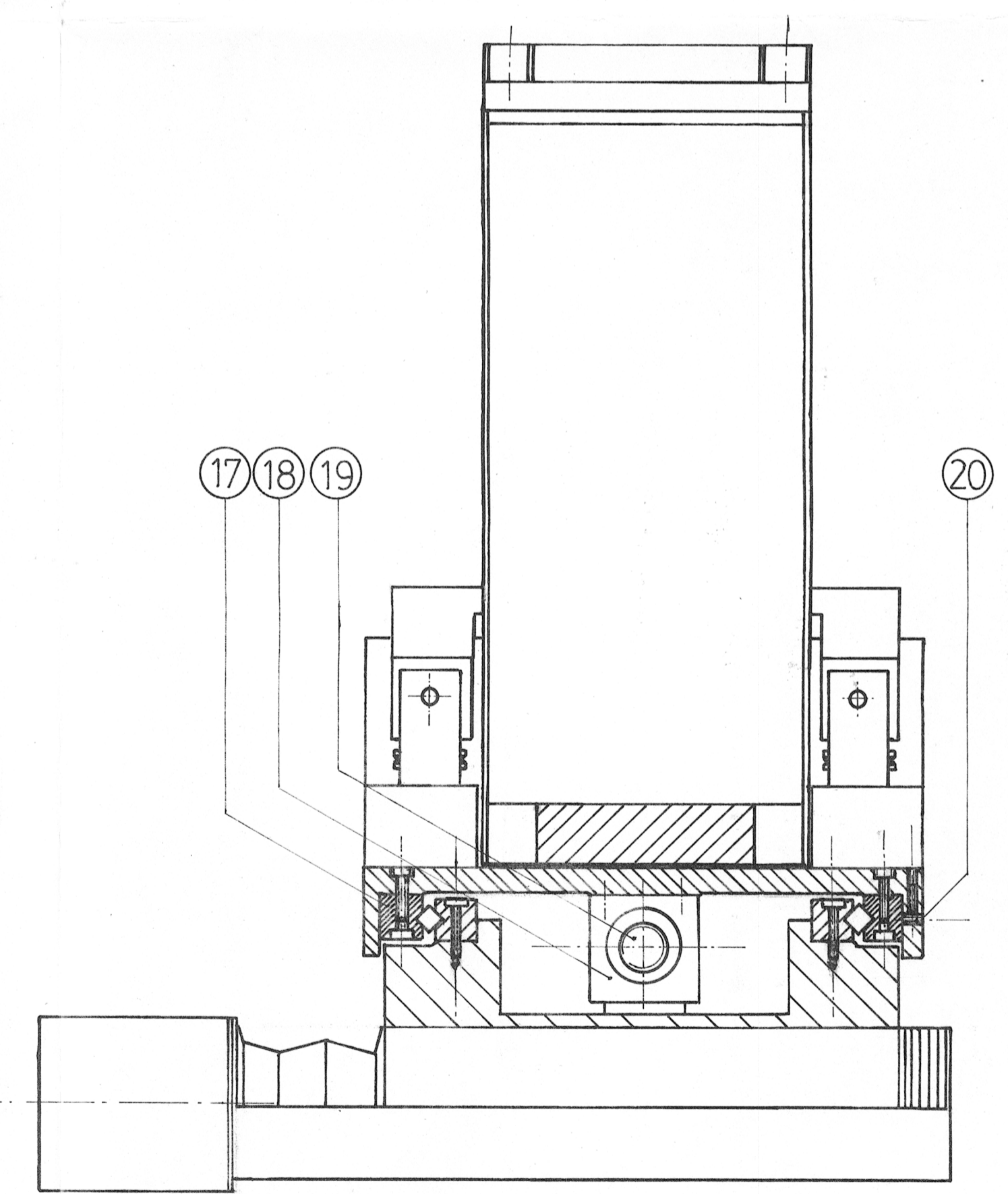


Harmonic Drive System GmbH

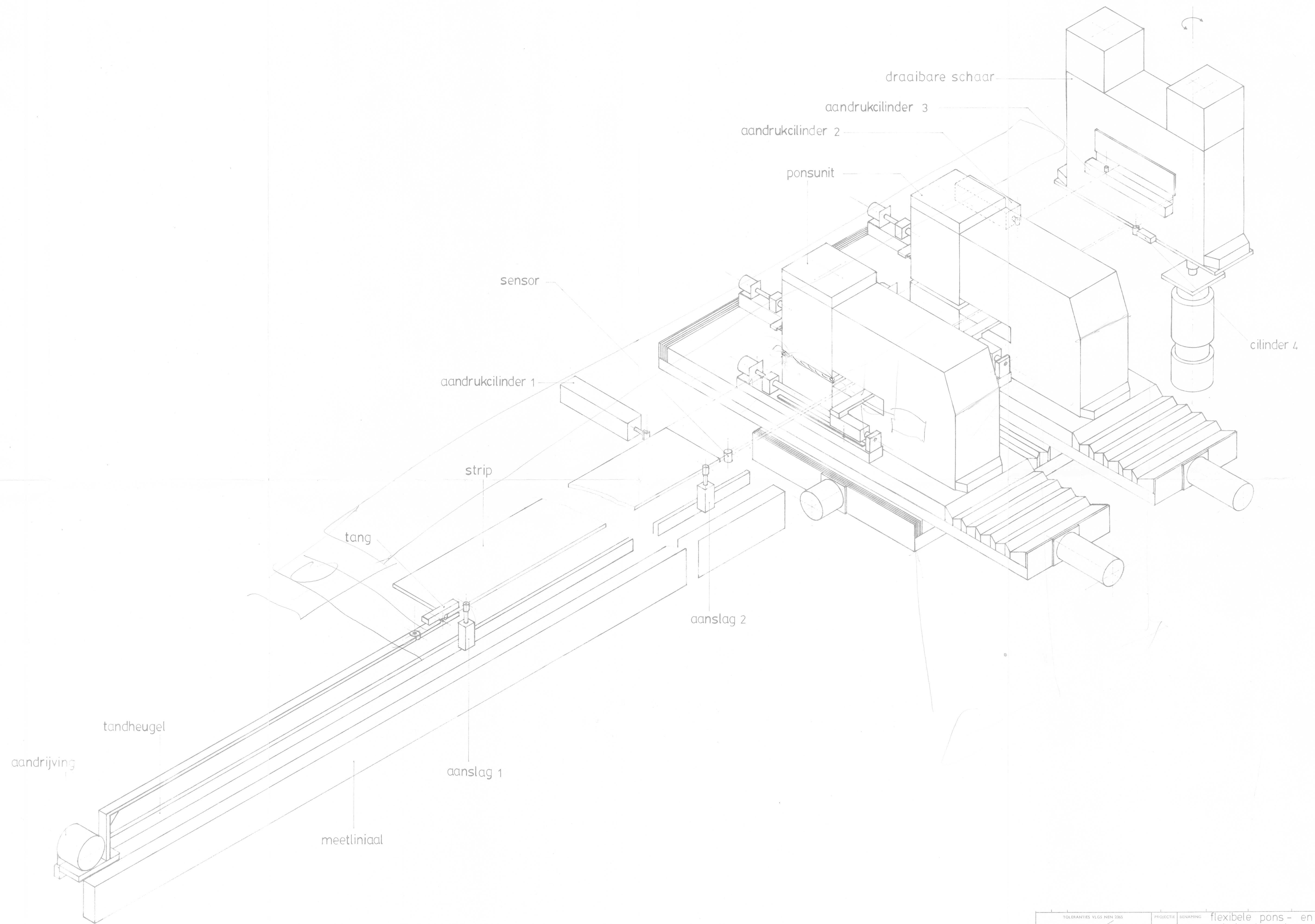
Postfach 1369 · Robert-Bosch-Straße 24
D-6070 Langen/Hessen (West-Germany)
Telefon (061 03) 7887 · Telex 041-5041



DOORSNEDE A-A



| | | | | | |
|---|---------------------------------|-----------|-----------|----------|-------------|
| TOLERANTIES VLGS NEN 2365 | | PROJECTIE | BENAMING | PONSUNIT | |
| b.v. $\pm 0,15$ σ $+0,10$ $-0,25$ | | | AM | A. | |
| PASSINGEN VLGS N 802 | RUIWHEIDSWAARDEN VLGS NEN 630 | AANTAL | MATERIAAL | DATEM | TEKENINGNR. |
| | TECHNISCHE HOGESCHOOL EINDHOVEN | SCHAAL | 1:2,5 | bh | 50-00 |
| AFDELING: | GROEP: | GET.: | WIJZIGING | | |
| | | | | | A1 |



| | | | |
|----------------------------------|--|-----------|---------------------------------|
| TOLERANTIES VLGs NEN 3365 | | PROJECTIE | BENAMING |
| b.v. $8 \pm 0,15$ | $8 \begin{matrix} +0,10 \\ -0,25 \end{matrix}$ | AM | flexibele pons- en knipautomaat |
| PASSINGEN VLGs N 802 | SLUWHEIDSWAARDEN VLGs NEN 430 | AANTAL | MATERIAAL |
| | | | |
| TECHNISCHE HOOGESCHOOL EINDHOVEN | | SCHAAL | DATUM |
| AFDELING: Wpb | | GET.: bh | WPB 150-01 |
| GROEP: | | GEZ. | WIZIGING |
| | | | |