5996

POUFNE

PRZEMYSŁOWY INSTYTUT AUTOMATYKI I POMIARÓW
MERA-PIAP
Al. Jerozolimskie 202 02-222 Warszawa Telefon 23-70-81

Ośrodek Automatyzacji Procesów Produkcji

440 A

Poufne egz nr 1.

Główny wykonawca

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Nr zlecenia 9493

Etap 3 "Wykonanie zmian w oprogramowaniu układu sterowania IRb-6 dla wykonania badań prototypu części manipulacyjnej IRp-6L"

Zleceniodawca praca własna

Pracę rozpoczęto dnia 87.09.01 zakończono dnia 88.01.15

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Praca zawiera:

stron

rysunków

fotografii

tabel

tablic

załączników 4

Nr rejestr. 5996

Rozdzielnik - ilość egz:

Egz. 1 BOINTE

Egz. 2 ~~OAP~~

Egz. 3 ~~OAP~~

Egz. 4

Egz. 5

Egz. 6

Analiza deskryptorowa roboty przemysłowe, oprogramowanie, program sterujący

Analiza dokumentacyjna

Sprawozdanie zawiera tabulogram programu obliczania tablic współczynników korekcji do wykonywania ruchu prostoliniowego dla robota IRb-6L. Dołączono instrukcję posługiwania się programem i wydruki z wynikami obliczeń.

Tytuły poprzednich sprawozdań

338.45:62/69].002.1/.2 Roboty przemysłowe

UKD

PIAP-252/83-6000

Spis treści

1. Wstęp.

Przedmiotem pracy była adaptacja standardowego oprogramowania robota IRb-6 dla robota IRb-6L z wydłużonym ramieniem. W związku ze zmianą modelu kinematycznego robota, konieczne było wprowadzenie zmian w programie sterującym robota IRb-6 polegających na zmianie tablic korekcji wykorzystywanych przy ruchu manipulatora w osiach α i θ. Tablice te o nazwach AKTAB i TKTAB zawierają odpowiednio 454 i 382 współczynniki korekcji, przy czym jedno ośmiobitowe słowo zawiera dwie poprawki /4 starsze i 4 młodsze bity/. Do obliczenia nowych tablic został wykorzystany program firmy ASEA o nazwie "Program for calculation and control of the correction tables for α and θ axes" napisany w języku Fortran IV. Program, ten został zaimplementowany na komputer IBM PC.

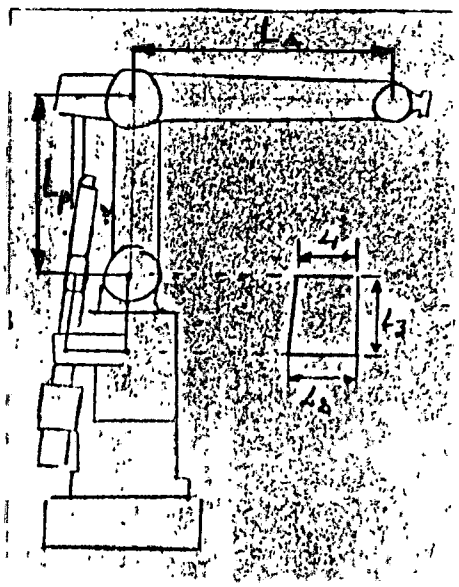
Poprawność działania programu sprawdzono obliczając tablice korekcji dla manipulatora IRb-6 i porównując je z tablicami zawartymi w programie sterującym firmy ASEA dla IRb-6.

Dołączono tabulogram programu obliczeń /dolne i górne części tablic/, oraz wydruk zawierający wyniki obliczeń dla IRb-6 i IRp-6L.

2. Instrukcja ładowania i uruchamiania programów.

Programy obliczające górne i dolne części tablic są wykonywane po podaniu komend KORG i KORD /KORG - górne części tablic korekcji, KORD - dolne części tablic korekcji/. Ze względu na wykorzystanie kompilatora firmy Microsoft po uruchomieniu programów należy podać nazwy urządzeń wejściowego i wyjściowego /odpowiednio numery 5 i 6/.

Dane wejściowe programu są wprowadzane w następującej kolejności:



L_1
L_2
L_3
θ_0 / = 10^0 dla IRb - 60,15° IRb-6/
s /skok śr./
L_p
L_A
n /liczba inkrem. na obr. sil/
α min
α max
θ min
θ max
R_o /IRb-6 $R_o=Z_o=0$, IRb-60 $R_o=80, Z_o=$ 400mm/
Z_o

Dla IRb-6 i IRp-6L parametry wejściowe mają następujące wartości:

	IRb-6	IRp-6L
L_1	140	140
L_2	155	155
L_3	183	183
θ_o	15	15
s	5	5
L_p	450	670
L_A	670	670
n	200	200
α min	0	0
α max	25	25
θ min	0	0
θ max	40	40

	IRb-6	IRp-6L
R_o	0	0
Z_o	0	0

Dla dolnej części tablic α min, α max, θ min, θ max wynoszą odpowiednio: 40, 0, 0, - 40.

Wyniki obliczeń w zależności od zdeklarowanego urządzenia wyjściowego są wprowadzane na ekran monitora, drukarkę lub są zapisywane w zbiorze dyskowym.

3. Załączniki.

Załączniki zawierają kolejno:
- tabulogramy programów KORG i KORD
- wyniki obliczeń górnych części tablic dla IRb-6 i IRp-6L
- wyniki obliczeń dolnych części tablic dla IRb-6 i IRp-6L.

```
c
c                    A S E A
c
c    Program for calculation and control of the correction tables
c    for  α and θ axes.
c
c    Program oblicza gorne czesci tablic korekcji
c
c                 Main program
c                 ------------
c
c
c
      real al1,al2,al3,vnoll,stig,alp,ala,anvarv,astart
      real astopp,tstart,tstopp,rnoll,znoll,rmin,rmax,zmin,zmax
      dimension ialfak(2,999),itetak(2,999),akont(10,12),tkont(10,12)
      common s,am,v1,v2,x1,x2,x3,x4
      data pi,rad/3.141593,0.01745329/
c
c
c
c
      write(6,3000)
 3000 format(' al1,al2,al3,vnoll,stig,alp,ala,anvarv,astart',
     1' ,astopp,tstart,tstopp,rnoll,znoll')
      read(5,3001) al1,al2,al3,vnoll,stig,alp,ala,anvarv,astart
      read(5,3001) astopp,tstart,tstopp,rnoll,znoll
 3001 format(f12.3)
c
      rmin=r(astart*rad,tstart*rad,ala,alp)
      rmax=r(astopp*rad,tstopp*rad,ala,alp)
      zmax=z(astopp*rad,tstart*rad,ala,alp)
      zmin=z(astart*rad,tstopp*rad,ala,alp)

c
c
      s=stig
      am=anvarv
      v1=vnoll*rad
      v2=atan(al2/al3)
      x1=2.*al1*sqrt(al2**2+al3**2)
      x2=al1**2+al2**2+al3**2
      x3=sqrt(x2-x1*sin(v2))
      x4=sqrt(x2-x1*sin(v2-v1))
      bstart=rad*astart
      bstopp=rad*astopp
      ustart=rad*tstart
      ustopp=rad*tstopp
      do 15 i=1,999
      ialfak(1,i)=0
      ialfak(2,i)=0
      itetak(1,i)=0
      itetak(2,i)=0
 15   continue
      kopp=1
c
c     The tables should be corect on the two lines crrosing the
c     point (R0,Z0)
c
c     Calculation of table for vertical motion
c
c
      call nalfa(bstart,am1)
      call nalfa(bstopp,am2)
      m11=isign(int(abs(am1)/16.+0.94),int(am1))
      m12=isign(int(abs(am2)/16.+0.94),int(am2))
      m1=16*m11
      m2=16*m12
      am1=float(m1)
      am2=float(m2)
      ka=m12-m11
      call alfav(am1,cstart)
      teta=t(rnoll,cstart,ala,alp)
      call nteta(teta,tn1)
      itetak(1,1)=m1
      do 10 i=1,ka
      alfan=am1+float(16*i)
      call alfav(alfan,alfa)
      teta=t(rnoll,alfa,ala,alp)
      call nteta(teta,tn)
      itetak(1,i+1)=ifix(alfan)
      tn2=tn-tn1
      itetak(2,i)=ifix(sign(aint(abs(tn2)+0.5),tn2))
      tn1=tn
      il=int(float(ka+1)/125.+0.999)
 10   continue
c
c     Calculation of table for horisontal motion
c
c
      call nteta(ustart,tn1)
```

```
      ni1=isign(int(abs(tn1)/16.+0.94),int(tn1))
      ni2=isign(int(abs(tn2)/16.+0.94),int(tn2))
      n1=16*ni1
      n2=16*ni2
      tn1=float(n1)
      tn2=float(n2)
      kt=ni2-ni1
      call tetav(tn1,vstart)
      alfa=a(zno11,vstart,ala,alp)
      call nalfa(alfa,an1)
      ialfak(1,1)=n1
      do 20 i=1,kt
      tetan=tn1+float(16*i)
      call tetav(tetan,teta)
      alfa=a(zno11,teta,ala,alp)
      call nalfa(alfa,an)
      ialfak(1,i+1)=ifix(tetan)
      an2=an-an1
      ialfak(2,i)=ifix(sign(aint(abs(an2)+0.5),an2))
      an1=an
      i2=int(float(kt+1)/125.+0.999)
 20   continue
c
c     Control of table for vertical motion
c
c
      do 220 i=1,5
      rstep=rmin+(rmax-rmin)/4.*float(i-1)
      call alfav(am2,cstart)
      teta=t(rstep,cstart,ala,alp)
      zeta=z(cstart,teta,ala,alp)
      call nteta(teta,tn)
      tkont(i,1)=zeta
      tkont(i+5,1)=r(cstart,teta,ala,alp)-rstep
      ka1=int(float(ka)/11.)
      do 220 j=1,11
      k=ka+1-ka1*j
      an=float(itetak(1,k))
      do 210 l=1,ka1
      m=k+ka1-1
      tn=tn-float(itetak(2,m))
 210  continue
      if(tn.gt.tn2) go to 215
      call alfav(an,alfa)
      call tetav(tn,teta)
      ra=r(alfa,teta,ala,alp)
      zeta=z(alfa,teta,ala,alp)
      rdel=ra-rstep
      tkont(i,j+1)=zeta
      tkont(i+5,j+1)=rdel
      go to 220
 215  continue
      tkont(i,j+1)=1.e8
 220  continue
c
c     Control of table for horisontal motion
c
c
      do 240 i=1,5
      zstep=zmax-(zmax-zmin)/4.*float(i-1)
      call tetav(tn1,vstart)
      alfa=a(zstep,vstart,ala,alp)
      ra=r(alfa,vstart,ala,alp)
      call nalfa(alfa,an)
      akont(i,1)=ra
      akont(i+5,1)=z(alfa,vstart,ala,alp)-zstep
      kt1=int(float(kt)/11.)
      do 240 j=1,11
      k=1+kt1*j
      tn=float(ialfak(1,k))
      do 230 l=1,kt1
      m=k-(kt1+1)+l
      an=an+float(ialfak(2,m))
 230  continue
      if ((an.gt.am2).or.(an.lt.am1)) go to 235
      call alfav(an,alfa)
      call tetav(tn,teta)
      ra=r(alfa,teta,ala,alp)
      zeta=z(alfa,teta,ala,alp)
      zdel=zeta-zstep
      akont(i,j+1)=ra
      akont(i+5,j+1)=zdel
      go to 240
 235  continue
      akont(i,j+1)=1.e8
 240  continue
c
c
c
c     Printing of tables
c
c
      nta1=ak+1
      do 60 i=1,11
      write(6,1000) i
```

```
      if(i.ne.1) write(6,1050)
      write(6,1020)
      j=125*(i-1)
      do 60 k=1,25
      l=k+j-25
      write(6,1030) (itetak(l,25*m+1),m=1,5)
      write(6,1040) (itetak(2,25*m+1),m=1,5)
 60   continue
c
c
c
      ntal=kt+1
      do 100 i=1,i2
      write(6,1100) i
      if(i.eq.1) write(6,1110) ntal
      if(i.ne.1) write(6,1050)
      write(6,1120)
      j=125*(i-1)
      do 100 k=1,25
      l=k+j-25
      write(6,1030) (ialfak(1,25*m+1),m=1,5)
      write(6,1040) (ialfak(2,25*m+1),m=1,5)
 100  continue
c
c
c   Printing of control vertikal
c
c
      do 110 i=1,5
      if(i.eq.1) write(6,1150)
      if(i.eq.3.or.i.eq.5) write(6,1190)
      rstep=rmin+(rmax-rmin)/4.*float(i-1)
      write(6,1160) rstep
      do 110 j=1,12
      if(tkont(i,j).gt.1.e6) go to 105
      if(j.eq.1) write(6,1170) tkont(i,j),tkont(i+5,j)
      if(j.ne.1) write(6,1180) tkont(i,j),tkont(i+5,j)
      go to  110
 105  continue
      write(6,1260)
 110  continue
c
c
c
c    Printing of control horizontal
c
c
      do 120 i=1,5
      if(i.eq.1) write(6,1200)
      if(i.eq.1.or.i.eq.5.or.i.eq.7) write(6,1190)
      zstep=zmax-(zmax-zmin)/4.*float(i-1)
      write(6,1210) zstep
      do 120 j=1,12
      if (akont(i,j).gt.1.e6) go to 115
      if(j.eq.1) write(6,1220) akont(i,j),akont(i+5,j)
      if(j.ne.1) write(6,1180) akont(i,j),akont(i+5,j)
      go to 120
 115  continue
      write(6,1120)
 120  continue
c
c
c
c     Calculation of nalfa & nteta as a function of respechive angle
c
c
      write(6,1230)
      j=ifix(astopp-astart)+1
      k=ifix(tstopp-tstart)+1
      l=max0(j,k)
      do 130 i=1,l
      ialfa=ifix(astopp)+1-i
      iteta=ifix(tstopp)+1-i
      alfa=rad*float(ialfa)
      teta=rad*float(iteta)
      call nalfa(alfa,an)
      call nteta(teta,tn)
      ian=ifix(an)
      itn=ifix(tn)
      if(i.le.j.and.i.le.k) write(6,1240) ialfa,ian,iteta,itn
      if(i.gt.j) write(6,1250) iteta,itn
      if(i.gt.k) write(6,1255) ialfa,ian
 130  continue
  25  continue
c
c
c
 1000 format(1h1,'korrektiontabell for korning vertikalt',
     121x,'sid',i2)
 1010 format(//1x,'nalfa=laget hos alfa-motorn fran alfa=0',
     11x,'(inkrement)'/1x,'dif  =erforderling',
     21x,'korection hos teta-motorn'/1x,'tabellen',
     31x,'innehaller',i4,'nalfa-varden')
 1020 format(//1x,'nalfa dif'//)
 1030 format(i6,4(i14))
```

```
 1050 format(/////)
c
c
 1100 format(1h1,'korretionstabell for korning horisontellt',
     118x,'sid',i2)
 1110 format(//1x,'ntfta=laget hos teta-motorn fran teta=0',
     11x,'(inkrement)'/1x,'dif  =erforderling',
     2' korrektion hos alfa-motorn',1x,'tabellen',
     3' innehaller',i4,'nteta-varden')
 1120 format(//' nteta  dif'//)
 1130 format(i6,3(i14))
 1140 format(i10,3(i14))
c
 1150 format(1h1,'radiell avvikelse delr i mm vid korning'
     1/' vertikalt med korrektion enligt den be-'
     2/' raknade tabellen'/)
 1160 format(///' radie=',f6.0//)
 1170 format(/' z=',f8.2,2x,'delr=',f6.2)
 1180 format(/1x,f10.2,2x,f11.2)
 1190 format(1h1////)
 1200 format(1h1,' vertikal avvikelse delz i mm vid korning'
     1/' horisontellt med korrektion enligt den be-'
     2/' raknade tabellen'/)
 1210 format(///1x,'z=',f6.0//)
 1220 format(/1x,'r=',f8.2,2x,'delz=',f6.2)
 1230 format(1h1,'antal inkrement nalfa och nteta som funtion'
     1/' av resp vinkel'
     2///1x,'alfa',6x,'nalfa',10x,'teta',6x,'nteta'//)
 1240 format(i4,7x,i5,10x,i3,7x,i5)
 1250 format(26x,i3,7x,i5)
 1255 format(i4,7x,i5)
 1260 format(/9x,'ut',11x,'ut')
 2000 continue
      stop
      end
c
c
c
c
      subroutine nalfa(alfa,an)
      common s,am,v1,v2,x1,x2,x3,x4
      an=am/s*(x3-sqrt(x2-x1*sin(v2+alfa)))
      return
      end
c
c
c
c
      subroutine nteta(teta,tn)
      common s,am,v1,v2,x1,x2,x3,x4
      tn=am/s*(sqrt(x2-x1*sin(v2-v1-teta))-x4)
      return
      end
c
c
c
c
      subroutine alfav(alfan,a)
      common s,am,v1,v2,x1,x2,x3,x4
      a1=x2-(x3-s/am*alfan)**2
      a=-v2+atan(a1/sqrt(x1**2-a1**2))
      return
      end
c
c
c
c
      subroutine tetav(tetan,t)
      common s,am,v1,v2,x1,x2,x3,x4
      b=x2-(s/am*tetan+x4)**2
      t=v2-v1-atan(b/sqrt(x1**2-b**2))
      return
      end
c
c
c
      real function t(r,a,ala,alp)
      t=atan((r+ala*(1.-cos(a)))/sqrt(alp**2-(r+ala*(1.-cos(a)))
     1**2))
      return
      end
      real function a(z,t,ala,alp)
      a=atan((z+alp*(1.-cos(t)))/sqrt(ala**2-(z+alp*(1.-cos(t)))
     1**2))
      return
      end
      real function r(alfa,teta,ala,alp)
      r=alp*sin(teta)-ala*(1.-cos(alfa))
      return
      end
      real function z(alfa,teta,ala,alp)
      z=ala*sin(alfa)-alp*(1.-cos(teta))
      return
      end
```

```
c
c                    A S E A
c
c    Program for calculation and control of the correction tables
c    for  α and θ axes.
c
c    Program oblicza dolne czesci tablic korekcji
c
c                Main program
c                ------------
c
c
c
      real al1,al2,al3,vnoll,stig,alp,ala,anvarv,astart
      real astopp,tstart,tstopp,rnoll,znoll,rmin,rmax,zmin,zmax
      dimension ialfak(2,999),itetak(2,999),akont(10,12),tkont(10,12)
      common s,am,v1,v2,x1,x2,x3,x4
      data pi,rad/3.141593,0.01745329/
c
c
c
c
      write(6,3000)
 3000 format(' al1,al2,al3,vnoll,stig,alp,ala,anvarv,astart',
     1' ,astopp,tstart,tstopp,rnoll,znoll')
      read(5,3001) al1,al2,al3,vnoll,stig,alp,ala,anvarv,astart
      read(5,3001) astopp,tstart,tstopp,rnoll,znoll
 3001 format(f12.3)
      rmin=r(astart*rad,tstart*rad,ala,alp)
      rmax=r(astopp*rad,tstopp*rad,ala,alp)
      zmax=z(astopp*rad,tstopp*rad,ala,alp)
      zmin=z(astart*rad,tstart*rad,ala,alp)

c
c
      s=stig
      am=anvarv
      v1=vnoll*rad
      v2=atan(al2/al3)
      x1=2.*al1*sqrt(al2**2+al3**2)
      x2=al1**2+al2**2+al3**2
      x3=sqrt(x2-x1*sin(v2))
      x4=sqrt(x2-x1*sin(v2-v1))
      bstart=rad*astart
      bstopp=rad*astopp
      ustart=rad*tstart
      ustopp=rad*tstopp
      do 15 i=1,999
      ialfak(1,i)=0
      ialfak(2,i)=0
      itetak(1,i)=0
      itetak(2,i)=0
 15   continue
      kopp=1
c
c
c     The tables should be corect on the two lines crrosing the
c     point (R0,Z0)
c
c     Calculation of table for vertical motion
c
c
      call nalfa(bstart,am1)
      call nalfa(bstopp,am2)
      m11=isign(int(abs(am1)/16.+0.94),int(am1))
      m12=isign(int(abs(am2)/16.+0.94),int(am2))
      m1=16*m11
      m2=16*m12
      am1=float(m1)
      am2=float(m2)
      ka=m12-m11
      call alfav(am1,cstart)
      teta=t(rnoll,cstart,ala,alp)
      call nteta(teta,tn1)
      itetak(1,1)=m1
      do 10 i=1,ka
      alfan=am1+float(16*i)
      call alfav(alfan,alfa)
      teta=t(rnoll,alfa,ala,alp)
      call nteta(teta,tn)
      itetak(1,i+1)=ifix(alfan)
      tn2=tn-tn1
      itetak(2,i)=ifix(sign(aint(abs(tn2)+0.5),tn2))
      tn1=tn
      il=int(float(ka+1)/125.+0.999)
 10   continue
c
c
c     Calculation of table for horisontal motion
c
      call nteta(ustart,tn1)
```

```
      n11=isign(int(abs(tn1)/16.+0.94),int(tn1))
      n12=isign(int(abs(tn2)/16,+0.94),int(tn2))
      n1=16*n11
      n2=16*n12
      tn1=float(n1)
      tn2=float(n2)
      kt=n12-n11
      call tetav(tn1,vstart)
      alfa=a(zno11,vstart,ala,alp)
      call nalfa(alfa,an1)
      ialfak(1,1)=n1
      do 20 i=1,kt
      tetan=tn1+float(16*i)
      call tetav(tetan,teta)
      alfa=a(zno11,teta,ala,alp)
      call nalfa(alfa,an)
      ialfak(1,i+1)=ifix(tetan)
      an2=an-an1
      ialfak(2,i)=ifix(sign(aint(abs(an2)+0.5),an2))
      an1=an
      i2=int(float(kt+1)/125.+0.999)
 20   continue
c
c
c     Control of table for vertical motion
c
c
      do 220 i=1,5
      rstep=rmin+(rmax-rmin)/4.*float(i-1)
      call alfav(am2,cstart)
c
      teta=t(rstep,cstart,ala,alp)
      zeta=z(cstart,teta,ala,alp)
      call nteta(teta,tn)
      tkont(i,1)=zeta
      tkont(i+5,1)=r(cstart,teta,ala,alp)-rstep
      ka1=int(float(ka)/11.)
      do 220 j=1,11
      k=ka+1-ka1*j
      an=float(itetak(1,k))
      do 210 l=1,ka1
      m=k+ka1-l
      tn=tn-float(itetak(2,m))
 210  continue
      if(tn.gt.tn2) go to 215
      call alfav(an,alfa)
      call tetav(tn,teta)
      ra=r(alfa,teta,ala,alp)
      zeta=z(alfa,teta,ala,alp)
      rdel=ra-rstep
      tkont(i,j+1)=zeta
      tkont(i+5,j+1)=rdel
      go to 220
 215  continue
      tkont(i,j+1)=1.e8
 220  continue
c
c
c
c     Control of table for horisontal motion
c
c
c
      do 240 i=1,5
      zstep=zmax-(zmax-zmin)/4.*float(i-1)
      call tetav(tn1,vstart)
      alfa=a(zstep,vstart,ala,alp)
      ra=r(alfa,vstart,ala,alp)
      call nalfa(alfa,an)
      akont(i,1)=ra
      akont(i+5,1)=z(alfa,vstart,ala,alp)-zstep
      kt1=int(float(kt)/11.)
      do 240 j=1,11
      k=1+kt1*j
      tn=float(ialfak(1,k))
      do 230 l=1,kt1
      m=k-(kt1+1)+l
      an=an+float(ialfak(2,m))
 230  continue
      if ((an.gt.am2).or.(an.lt.am1)) go to 235
      call alfav(an,alfa)
      call tetav(tn,teta)
      ra=r(alfa,teta,ala,alp)
      zeta=z(alfa,teta,ala,alp)
      zdel=zeta-zstep
      akont(i,j+1)=ra
      akont(i+5,j+1)=zdel
      go to 240
 235  continue
      akont(i,j+1)=1.e8
 240  continue
c
c
c     Printing of tables
```

```
c
      ntal=ak+1
      do 60 i=1,i1
      write(6,1000) i
      if(i.eq.1) write(6,1010) ntal
      if(i.ne.1) write(6,1050)
      write(6,1020)
      j=125*(i-1)
      do 60 k=1,25
      l=k+j-25
      write(6,1030) (itetak(l,25*m+1),m=1,5)
      write(6,1040) (itetak(2,25*m+1),m=1,5)
 60   continue
c
c
c
      ntal=kt+1
      do 100 i=1,i2
      write(6,1100) i
      if(i.eq.1) write(6,1110) ntal
      if(i.ne.1) write(6,1050)
      write(6,1120)
      j=125*(i-1)
      do 100 k=1,25
      l=k+j-25
      write(6,1030) (ialfak(1,25*m+1),m=1,5)
      write(6,1040) (ialfak(2,25*m+1),m=1,5)
 100  continue
c
c
c     Printing of control vertikal
c
c
      do 110 i=1,5
      if(i.eq.1) write(6,1150)
      if(i.eq.3.or.i.eq.5) write(6,1190)
      rstep=rmin+(rmax-rmin)/4.*float(i-1)
      write(6,1160) rstep
      do 110 j=1,12
      if(tkont(i,j).gt.1.e6) go to 105
      if(j.eq.1) write(6,1170) tkont(i,j),tkont(i+5,j)
      if(j.ne.1) write(6,1180) tkont(i,j),tkont(i+5,j)
      go to  110
 105  continue
      write(6,1260)
 110  continue
c
c
c
c     Printing of control horizontal
c
c
      do 120 i=1,5
      if(i.eq.1) write(6,1200)
      if(i.eq.1.or.i.eq.5.or.i.eq.7) write(6,1190)
      zstep=zmax-(zmax-zmin)/4.*float(i-1)
      write(6,1210) zstep
      do 120 j=1,12
      if (akont(i,j).gt.1.e6) go to 115
      if(j.eq.1) write(6,1220) akont(i,j),akont(i+5,j)
      if(j.ne.1) write(6,1180) akont(i,j),akont(i+5,j)
      go to 120
 115  continue
      write(6,1120)
 120  continue
c
c
c
c     Calculation of nalfa & nteta as a function of respechive angle
c
c
      write(6,1230)
      j=ifix(astopp-astart)+1
      k=ifix(tstopp-tstart)+1
      l=max0(j,k)
      do 130 i=1,l
      ialfa=ifix(astopp)+1-i
      iteta=ifix(tstopp)+1-i
      alfa=rad*float(ialfa)
      teta=rad*float(iteta)
      call nalfa(alfa,an)
      call nteta(teta,tn)
      ian=ifix(an)
      itn=ifix(tn)
      if(i.le.j.and.i.le.k) write(6,1240) ialfa,ian,iteta,itn
      if(i.gt.j) write(6,1250) iteta,itn
      if(i.gt.k) write(6,1255) ialfa,ian
 130  continue
  25  continue
c
c
c
 1000 format(1h1,'korrektiontabell for korning vertikalt',
     121x,'sid',i2)
 1010 format(//1x,'nalfa=laget hos alfa-motorn fran alfa=0',
     11x,'(inkrement)'/1x,'dif  =erforderling',
```

```
     2x,'korrektion hos teta-motorn',2x,'tabellen',
     31x,'innehaller',i4,'nalfa-varden')
 1020 format(//1x,'nalfa dif'//)
 1030 format(i6,4(i14))
 1040 format(i10,4(i14))
 1050 format(/////)
c
c
 1100 format(1h1,'korretionstabell for korning horisontellt',
     118x,'sid',i2)
 1110 format(//1x,'ntfta=laget hos teta-motorn fran teta=0',
     11x,'(inkrement)'/1x,'dif  =erforderling',
     2' korrektion hos alfa-motorn',1x,'tabellen',
     3' innehaller',i4,'nteta-varden')
 1120 format(//' nteta  dif'//)
 1130 format(i6,3(i14))
 1140 format(i10,3(i14))
c
 1150 format(1h1,'radiell avvikelse delr i mm vid korning'
     1/' vertikalt med korrektion enligt den be-'
     2/' raknade tabellen'/)
 1160 format(///' radie=',f6.0//)
 1170 format(/' z=',f8.2,2x,'delr=',f6.2)
 1180 format(/1x,f10.2,2x,f11.2)
 1190 format(1h1////)
 1200 format(1h1,' vertikal avvikelse delz i mm vid korning'
     1/' horisontellt med korrektion enligt den be-'
     2/' raknade tabellen'/)
 1210 format(///1x,'z=',f6.0//)
 1220 format(/1x,'r=',f8.2,2x,'delz=',f6.2)
 1230 format(1h1,'antal inkrement nalfa och nteta som funtion'
     1/' av resp vinkel'
     2///1x,'alfa',6x,'nalfa',10x,'teta',6x,'nteta'//)
 1240 format(i4,7x,i5,10x,i3,7x,i5)
 1250 format(26x,i3,7x,i5)
 1255 format(i4,7x,i5)
 1260 format(/9x,'ut',11x,'ut')
 2000 continue
      stop
      end
c
c
c
c
      subroutine nalfa(alfa,an)
      common s,am,v1,v2,x1,x2,x3,x4
      an=am/s*(x3-sqrt(x2-x1*sin(v2-alfa)))
      return
      end
c
c
c
c
      subroutine nteta(teta,tn)
      common s,am,v1,v2,x1,x2,x3,x4
      tn=am/s*(sqrt(x2-x1*sin(v2-v1+teta))-x4)
      return
      end
c
c
c
c
      subroutine alfav(alfan,a)
      common s,am,v1,v2,x1,x2,x3,x4
      a1=x2-(x3-s/am*alfan)**2
      a=-v2+atan(a1/sqrt(x1**2-a1**2))
      return
      end
c
c
c
c
      subroutine tetav(tetan,t)
      common s,am,v1,v2,x1,x2,x3,x4
      b=x2-(s/am*tetan+x4)**2
      t=v2-v1-atan(b/sqrt(x1**2-b**2))
      return
      end
c
c
c
      real function t(r,a,ala,alp)
      t=atan((r+ala*(1.-cos(a)))/sqrt(alp**2-(r+ala*(1.-cos(a)))
     1**2))
      return
      end
      real function a(z,t,ala,alp)
      a=atan((z+alp*(1.-cos(t)))/sqrt(ala**2-(z+alp*(1.-cos(t)))
     1**2))
      return
      end
      real function r(alfa,teta,ala,alp)
      r=alp*sin(teta)-ala*(1.-cos(alfa))
      return
      end
      real function z(alfa,teta,ala,alp)
```

```
return
end
```

```
 al1,al2,al3,vnoll,stig,alp,ala,anvary,astart ,astopp,tstart,tstopp,,noll,znoll
ikorrektiontabell for korning vertikalt                    sid 1


 nalfa=laget hos alfa-motorn fran alfa=0 (inkrement)
 dif  =erforderling korection hos teta-motorn
 tabellen innehaller   inalfa-varden


 nalfa dif

    0        400        800        1200       1600
       0          2          4          5          8
   16        416        816        1216       1616
       0          2          4          6          8
   32        432        832        1232       1632
       0          2          4          6          8
   48        448        848        1248       1648
       0          2          4          6          8
   64        464        864        1264       1664
       0          2          4          6          8
   80        480        880        1280       1680
       0          2          4          6          8
   96        496        896        1296       1696
       0          2          4          6          8
  112        512        912        1312       1712
       1          2          4          6          8
  128        528        928        1328       1728
       1          2          4          6          8
  144        544        944        1344       1744
       1          2          4          6          8
  160        560        960        1360       1760
       1          2          4          6          9
  176        576        976        1376       1776
       1          3          4          6          9
  192        592        992        1392       1792
       1          3          4          6          9
  208        608       1008        1408       1808
       1          3          4          7          9
  224        624       1024        1424       1824
       1          3          5          7          9
  240        640       1040        1440       1840
       1          3          5          7          9
  256        656       1056        1456       1856
       1          3          5          7          9
  272        672       1072        1472       1872
       1          3          5          7          9
  288        688       1088        1488       1888
       1          3          5          7          9
  304        704       1104        1504       1904
       1          3          5          7          9
  320        720       1120        1520       1920
       .          3          5          7         10
  336        736       1136        1536       1936
       1          3          5          7         10
  352        752       1152        1552       1952
       2          3          5          7         10
  368        768       1168        1568       1968
       2          3          5          7         10
  384        784       1184        1584       1984
       2          3          5          7         10
ikorrektiontabell for korning vertikalt                    sid 2


 nalfa dif

 2000          0          0          0          0
      10          0          0          0          0
 2016          0          0          0          0
      10          0          0          0          0
 2032          0          0          0          0
      10          0          0          0          0
 2048          0          0          0          0
      11          0          0          0          0
 2064          0          0          0          0
      11          0          0          0          0
 2080          0          0          0          0
      11          0          0          0          0
 2096          0          0          0          0
      11          0          0          0          0
 2112          0          0          0          0
      11          0          0          0          0
 2128          0          0          0          0
```

nteta	dif	nteta	dif	nteta	dif	nteta	dif	nteta	dif
2144	11	0	0	0	0	0	0	0	0
2160	11	0	0	0	0	0	0	0	0
2176	12	0	0	0	0	0	0	0	0
2192	12	0	0	0	0	0	0	0	0
2208	12	0	0	0	0	0	0	0	0
2224	12	0	0	0	0	0	0	0	0
2240	12	0	0	0	0	0	0	0	0
2256	12	0	0	0	0	0	0	0	0
2272	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

1korretionstabell for korning horisontellt sid 1

nteta=laget hos teta-motorn fran teta=0 (inkrement)
dif =erforderling korrektion hos alfa-motorn tabeller innehaller 218nteta-varden

nteta	dif								
0	0	400	1	800	2	1200	3	1600	3
16	0	416	1	816	2	1216	3	1616	4
32	0	432	1	832	2	1232	3	1632	4
48	0	448	1	848	2	1248	3	1648	4
64	0	464	1	864	2	1264	3	1664	4
80	0	480	1	880	2	1280	3	1680	4
96	0	496	1	896	2	1296	3	1696	4
112	0	512	1	912	2	1312	3	1712	4
128	0	528	1	928	2	1328	3	1728	4
144	0	544	1	944	2	1344	3	1744	4
160	0	560	1	960	2	1360	3	1760	
176	0	576	1	976	2	1376	3	1776	4
192	0	592	1	992	2	1392	3	1792	4
208	0	608	1	1008	2	1408	3	1808	4
224	0	624	1	1024	2	1424	3	1824	4
240	0	640	1	1040	2	1440	3	1840	4
256	1	656	1	1056	2	1456	3	1856	4
272	1	672	1	1072	2	1472	3	1872	4
288	1	688	1	1088	2	1488	3	1888	4
304	1	704	1	1104	2	1504	3	1904	4
320	1	720	1	1120	2	1520	3	1920	4
336	1	736	2	1136	2	1536	3	1936	4
352	1	752	2	1152	2	1552	3	1952	4
368	1	768	2	1168	2	1568	3	1968	4
384	1	784	2	1184	3	1584	3	1984	4

1korretionstabell for korning horisontellt sid 2

nteta dif

2000		2400		2800		3200		0			
	4		6		7		8		0		
2016		2416		2816		3216		0			
	5		6		7		8		0		
2032		2432		2832		3232		0			
	5		6		7		8		0		
2048		2448		2848		3248		0			
	5		6		7		8		0		
2064		2464		2864		3264		0			
	5		6		7		8		0		
2080		2480		2880		3280		0			
	5		6		7		8		0		
2096		2496		2896		3296		0			
	5		6		7		8		0		
2112		2512		2912		3312		0			
	5		6		7		8		0		
2128		2528		2928		3328		0			
	5		6		7		8		0		
2144		2544		2944		3344		0			
	5		6		7		9		0		
2160		2560		2960		3360		0			
	5		6		7		9		0		
2176		2576		2976		3376		0			
	5		6		7		9		0		
2192		2592		2992		3392		0			
	5		6		7		9		0		
2208		2608		3008		3408		0			
	5		6		7		9		0		
2224		2624		3024		3424		0			
	5		6		7		9		0		
2240		2640		3040		3440		0			
	5		6		7		9		0		
2256		2656		3056		3456		0			
	5		6		8		9		0		
2272		2672		3072		3472		0			
	5		6		8		0		0		
2288		2688		3088		0		0			
	5		6		8		0		0		
2304		2704		3104		0		0			
	5		6		8		0		0		
2320		2720		3120		0		0			
	5		6		8		0		0		
2336		2736		3136		0		0			
	5		7		8		0		0		
2352		2752		3152		0		0			
	5		7		8		0		0		
2368		2768		3168		0		0			
	5		7		8		0		0		
2384		2784		3184		0		0			
	6		7		8		0		0		

Iradiell avvikelse de'r i mm vid korning vertikalt med korrektion enligt den beräknade tabellen

radie= 0.

z=	279.63	delr= .00
	255.16	.03
	230.95	.05
	206.95	.09
	183.10	.12
	159.39	.09
	135.80	.07
	112.30	.10
	88.91	.07
	65.60	.00
	42.38	-.08
	19.23	.01

```
z=  267.85  delr=   .00
    244.93         -.10
    222.06         -.21
    199.19         -.28
    176.31         -.35
    153.43          .48
    130 54         -.59
    107.62         -.63
     84.68         -.72
     61.73         -.83
     38.75         -.95
     15.73         -.88
1



radie=  113.

z=  248.06  delr=   .00
    226.87         -.14
    205.47         - 30
    183.85         -.44
    162.03         -.57
    140.07         -.75
    117 93         - 92
     95.63        -1.00
     73.19        -1.13
     50.62        -1.27
     27.92        -1.41
      5.03        -1.35

radie=  170.

z=  219.03  delr=   .00
    199.84         -.06
    180.12         -.18
    159.92         -.29
    139.32         -.41
    118.38         -.60
     97.11         -.77
     75.49         -.86
     53.62        -1.00
     31.48         1.16
      9.07        -1.30
    -13.66        -1.24
1
```

radie= 226.

z= 178.45 delr= .00
161.68 .21
143.99 .29
125.49 .32
106.33 .30
86.61 .2?
66.35 .09
45.55 .04
24.33 -.07
2.69 -.21
-19.36 -.33
-41.92 -.27

1 vertikal avvikelse delz i mm vid korning horisontellt med korrektion enligt den beraknade tabellen

1

z= 283.

r= -62.77 delz= .00
-38.07 -.28

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

z= 186.

r= -24.35 delz= .00
-1.56 -.31
22.83 -.01
46.96 .23
70.82 .23
94.05 .83
116.68 1.47
138.59 2.08
159.51 2.87
179.12 3.91
196.94 5.59

nteta dif

z= 89.

r= -5.93 delz= .00
18.92 -.32
43.69 -.10
68.43 .00
93.11 -.18
117.53 .15
141.67 .41
165.41 .54
188.56 .69
210.93 .87
232.18 1.35
252.04 1.87

z= -8.

r= -.05 delz= .00

nteta dif

nteta dif

nteta dif

100.64 -.36
126 08 -.16
151.49 .05

176.75	-.12
201 73	-.23
226.26	-.38
250.10	-.35
273.01	-.42

1

z= -105.

:= -8 32 delz= .00

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

iantal inkrement nalfa och nteta som funtion
av resp vinkel

alfa	nalfa	teta	nteta
25	2265	40	3471
24	2187	39	3397
23	2107	38	3322
22	2025	37	3246
21	1943	36	3169
20	1859	35	3092
19	1773	34	3014
18	1687	33	2935
17	1599	32	2856
16	1510	31	2776
15	1420	30	2695

13	1238
12	1146
11	1053
10	960
9	865
8	771
7	676
6	580
5	484
4	388
3	291
2	194
1	97
0	0

28	2531
27	2448
26	2364
25	2280
24	2195
23	2110
22	2023
21	1937
20	1849
19	1761
18	1673
17	1584
16	1494
15	1404
14	1314
13	1222
12	1131
11	1039
10	946
9	853
8	760
7	666
6	572
5	477
4	382
3	287
2	192
1	96
0	0

nalfa=laget hos alfa-motorn fran alfa=0 (inkrement)
dif =erforderling korrektion hos teta-motorn
tabellen innehaller inalfa-varden

nalfa	dif							
0		400		800		1200		1600	
	0		1		2		4		5
16		416		816		1216		1616	
	0		1		2		4		5
32		432		832		1232		1632	
	0		1		2		4		5
48		448		848		1248		1648	
	0		1		3		4		5
64		464		864		1264		1664	
	0		1		3		4		5
80		480		880		1280		1680	
	0		1		3		4		5
96		496		896		1296		1696	
	0		1		3		4		5
112		512		912		1312		1712	
	0		2		3		4		6
128		528		928		1328		1728	
	0		2		3		4		6
144		544		944		1344		1744	
	0		2		3		4		6
160		560		960		1360		1760	
	0		2		3		4		6
176		576		976		1376		1776	
	1		2		3		4		6
192		592		992		1392		1792	
	1		2		3		4		6
208		608		1008		1408		1808	
	1		2		3		4		6
224		624		1024		1424		1824	
	1		2		3		4		6
240		640		1040		1440		1840	
	1		2		3		4		6
256		656		1056		1456		1856	
	1		2		3		5		6
272		672		1072		1472		1872	
	1		2		3		5		6
288		688		1088		1488		1888	
	1		2		3		5		6
304		704		1104		1504		1904	
	1		2		3		5		6
320		720		1120		1520		1920	
	1		2		3		5		6
336		736		1136		1536		1936	
	1		2		3		5		7
352		752		1152		1552		1952	
	1		2		3		5		7
368		768		1168		1568		1968	
	1		2		4		5		7
384		784		1184		1584		1984	
	1		2		4		5		7

nalfa	dif							
2000		0		0		0		0	
	7		0		0		0		0
2016		0		0		0		0	
	7		0		0		0		0
2032		0		0		0		0	
	7		0		0		0		0

nteta	dif	nteta	dif	nteta	dif	nteta	dif	nteta	dif
2048	7	0	0	0	0	0	0	0	0
2064	7	0	0	0	0	0	0	0	0
2080	7	0	0	0	0	0	0	0	0
2096	7	0	0	0	0	0	0	0	0
2112	7	0	0	0	0	0	0	0	0
2128	8	0	0	0	0	0	0	0	0
2144	8	0	0	0	0	0	0	0	0
2160	8	0	0	0	0	0	0	0	0
2176	8	0	0	0	0	0	0	0	0
2192	8	0	0	0	0	0	0	0	0
2208	8	0	0	0	0	0	0	0	0
2224	8	0	0	0	0	0	0	0	0
2240	8	0	0	0	0	0	0	0	0
2256	8	0	0	0	0	0	0	0	0
2272	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

1korretionstabell for korning horisontellt sid 1

ntfta=laget hos teta-motorn fran teta=0 (inkrement)
dif =erforderling korrektion hos alfa-motorn tabellen innehaller 218nteta-varden

nteta	dif	nteta	dif	nteta	dif	nteta	dif	nteta	dif
0	0	400	1	800	2	1200	4	1600	5
16	0	416	1	816	3	1216	4	1616	5
32	0	432	1	832	3	1232	4	1632	5
48	0	448	1	848	3	1248	4	1648	5
64	0	464	1	864	3	1264	4	1664	5
80	0	480	1	880	3	1280	4	1680	5
96	0	496	2	896	3	1296	4	1696	6
112	0	512	2	912	3	1312	4	1712	6
128	0	528	2	928	3	1328	4	1728	6
144	0	544	2	944	3	1344	4	1744	6
160	0	560	2	960	3	1360	4	1760	6
176	1	576	2	976	3	1376	4	1776	6
192	1	592	2	992	3	1392	4	1792	6
208	1	608	2	1008	3	1408	4	1808	6
224	1	624	2	1024	3	1424	5	1824	6
240	1	640	2	1040	3	1440	5	1840	6
256	1	656	2	1056	3	1456	5	1856	6
272	1	672	2	1072	3	1472	5	1872	6
288	1	688	2	1088	3	1488	5	1888	6
304	1	704	2	1104	3	1504	5	1904	6
320	[illegible]	720	[illegible]	1120	[illegible]	1520	[illegible]	1920	[illegible]

33		736		1136		1536		1936			
	1		2		4		5		6		
352		752		1152		1552		1952			
	1		2		4		5		6		
368		768		1168		1568		1968			
	1		2		4		5		7		
384		784		1184		1584		1984			
	1		2		4		5		7		

nteta dif

2000		2400		2800		3200					
	7		8		10		12		0		
2016		2416		2816		3216		0			
	7		8		10		12		0		
2032		2432		2832		3232					
	7		8		10		12		0		
2048		2448		2848		3248		0			
	7		8		10		12		0		
2064		2464		2864		3264		0			
	7		8		10		12		0		
2080		2480		2880		3280		0			
	7		9		10		12		0		
2096		2496		2896		3296		0			
	7		9		10		12		0		
2112		2512		2912		3312		0			
	7		9		10		12		0		
2128		2528		2928		3328		0			
	7		9		11		12		0		
2144		2544		2944		3344		0			
	7		9		11		12		0		
2160		2560		2960		3360		0			
	7		9		11		13		0		
2176		2576		2976		3376		0			
	7		9		11		13		0		
2192		2592		2992		3392		0			
	7		9		11		13		0		
2208		2608		3008		3408		0			
	7		9		11		13		0		
2224		2624		3024		3424		0			
	8		9		11		13		0		
2240		2640		3040		3440		0			
	8		9		11		13		0		
2256		2656		3056		3456		0			
	8		9		11		13		0		
2272		2672		3072		3472		0			
	8		9		11		0		0		
2288		2688		3088		0		0			
	8		9		11		0		0		
2304		2704		3104		0		0			
	8		10		11		0		0		
2320		2720		3120		0		0			
	8		10		11		0		0		
2336		2736		3136		0		0			
	8		10		11		0		0		
2352		2752		3152		0		0			
	8		10		12		0		0		
2368		2768		3168		0		0			
	8		10		12		0		0		
2384		2784		3184		0		0			
	8		10		12		0		0		

iradiell avvikelse delr i mm vid korning
vertikalt med korretion enl.gt den be-
raknade tabellen

radie= 0.

r=	281.11	delr= .00
	256.15	.05
	231.59	.06
	207.35	-.01
	183.34	.10
	159.52	.26
	135.87	.15
	[illegible]	.39

```
      88.92          .27
      65 61          .06
      42.38          .24
      19.23         -.03

radie=   92.

z=  265.88  delr=   .00
    242.58         -.11
    219.47         -.25
    196.47         -.46
    173.51         -.47
    150 57         -.42
    127.69         -.62
    104.77         - 62
     81.85         -.65
     58.95         -.91
     35.96         -.76
     13.00        -1.05
1


radie=  184.

z=  236.84  delr=   .00
    215.40         -.18
    193.87         -.39
    172.25         -.67
    150.44         -.75
    128.47         -.76
    106.43        -1.01
     84.19        -1.06
     61.81        -1.12
     39.35        -1.42
     16.62        -1 29
     -6 14        -1.60

radie=  276

z=  191.93  del =   .00
    172.63         -.1'
    152.94         -.28
    132.90          .53
    112.40          .59
     91.54         -.60
     70.47          .85
     49.00         -.90
```

```
      27.23        -.97
       5.27       -1.27
     -17.16       -1.14
     -39.69       -1.46
1
```

```
radie=  368.

z=  126.98  delr=   .00
    110.32          .18
     92.87          .24
     74.76          .16
     55.86          .24
     36.34          .34
     16.43          .18
     -4.12          .18
    -25.15          .17
    -46.50         -.09
    -68.58          .05
    -90.83         -.24
i vert.kal avvikelse delz i mm vid korning
horisontellt med korrektion enligt den be-
raknade tabellen
1
```

```
z=  283.

r=  -62.77  delz=   .00

nteta  dif

nteta  dif

nteta  dif

nteta  dif

nteta  dif

nteta  dif

nteta  dif

nteta  dif
```

nteta dif

nteta dif

nteta dif

z= 173.

r= -22.77 delz= .00
14.03 -.02
50.50 .12
86.56 .36
122.07 .76
156.87 1.26
190.67 2.04
223.17 3.04
253.93 4.38
282.29 6.34

nteta dif

nteta dif

z= 63.

r= -2.99 delz= 00
33.99 .06
71.03 .02
108.08 .03
145.02 .15
181.72 .23
217.97 .43
253.56 .64
288.18 .84
321.42 1.15
352.70 1.83
381.49 2 39

z= -47.

r= -1.63 delz= .00

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

264.01	-.34
301.68	-.54
338.57	-.77
374.25	-.87
408.26	-1.43

z= -157.

r= -18.59 delz= .00

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

lantal inkrement nalfa och nteta sum funtio
av resp vinkel

alfa	nalfa	teta	nteta
25	2265	40	3471
24	2187	39	3397
23	2107	38	3322
22	2025	37	3246
21	1943	36	3169
20	1859	35	3092
19	1773	34	3014
18	1687	33	2935
17	1599	32	2856
16	1510	31	2776
15	1420	30	2695
14	1330	29	2613
13	1238	28	2531
12	1146	27	2448
11	1053	26	2364
10	960	25	2280
9	865	24	2195
8	771	23	2110
7	676	22	2023
6	580	21	1937
5	484	20	1849
4	388	19	1761
3	291	18	1673
2	194	17	1584
1	97	16	1494
0	0	15	1404
		14	1314
		13	1222
		12	1131
		11	1039
		10	946
		9	853
		8	760
		7	666
		6	572
		5	477
		4	382
		3	287
		2	192
		1	96
		0	0

```
all,al2,al3,vnoll,stig a.p,ala,anvarv,asta t ,astopp,tstart,tstopp,rnoll,znoll,rmin, max,zmin,zmax
lkorrektiontabell for korning vertikalt                    sid 1


nalfa=laget hos alfa-motorn fran alfa=0 ;inkrement
dif  =erforderling korrection hos teta-motorn
tabellen innehaller  ;nalfa-varden


nalfa dif

-3744      -3344      -2944      -2544      -2144
     19         16         14         11          9
-3728      -3328      -2928      -2528      -2128
     18         16         13         11          9
-3712      -3312      -2912      -2512      -2112
     18         16         13         11          9
-3696      -3296      -2896      -2496      -2096
     18          6         13         11          9
-3680      -3280      -2880      -2480      -2080
     18         16         13         11          9
-3664      -3264      -2864      -2464      -2064
     18         15         13         11          9
-3648      -3248      -2848      -2448      -2048
     18         15         13         11          9
-3632      -3232      -2832      -2432      -2032
     18         15         13         11          9
-3616      -3216      -2816      -2416      -2016
     18         15         13         11          9
-3600      -3200      -2800      -2400      -2000
     18         15         13         11          9
-3584      -3184      -2784      -2384      -1984
     17         15         13         11          9
-3568      -3168      -2768      -2368      -1968
     17         15         13         10          9
-3552      -3152      -2752      -2352      -1952
     17         15         12         10          8
-3536      -3136      -2736      -2336      -1936
     17         15         12         10          8
-3520      -3120      -2720      -2320      -1920
     17         15         12         10          8
-3504      -3104      -2704      -2304      -1904
     17         14         12         10          8
-3488      -3088      -2688      -2288      -1888
     17         14         12         10          8
-3472      -3072      -2672      -2272      -1872
     17         14         12         10          8
-3456      -3056      -2656      -2256      -1856
     17         14         12         10          8
-3440      -3040      -2640      -2240      -1840
     17         14         12         10          8
-3424      -3024      -2624      -2224      -1824
     16         14         12         10          8
-3408      -3008      -2608      -2208      -1808
     16         14         12         10          8
-3392      -2992      -2592      -2192      -1792
     16         14         12         10          8
-3376      -2976      -2576      -2176      -1776
     16         14         12         10          8
-3360      -2960      -2560      -2160      -1760
     16         14         11          9          8
lkorrektiontabell for korning vertikalt                    sid 2


nalfa dif

-1744      -1344      -944       -544       -144
     7          6          4          2          1
-1728      -1328      -928       -528       -128
     7          6          4          2          1
-1712      -1312      -912       -512       -112
     7          6          4          2          0
-1696      -1296      -896       -496       -96
     7          5          4          2          0
-1680      -1280      -880       -480       -80
     7          5          4          2          0
-1664      -1264      -864       -464       -64
     7          5          4          2          0
-1648      -1248      -848       -448       -48
     7          5          4          2          0
-1632      -1232      -832       -432       -32
     7          5          3          2          0
-1616      -1216      -816       -416       -16
```

-1600		-1200		-800		-400		0							
	7		5		3		2		0						
-1584		-1184		-784		384		0							
	7		5		3		2		0						
-1568		-1168		-768		-368		0							
	7		5		3		2		0						
-1552		-1152		-752		-352		0							
	7		5		3		1		0						
-1536		-1136		-736		-336		0							
	7		5		3		1		0						
-1520		-1120		-720		-320		0							
	6		5		3		1		0						
-1504		-1104		-704		-304		0							
	6		5		3		1		0						
-1488		-1088		-688		-288		0							
	6		5		3		1		0						
-1472		-1072		-672		-272		0							
	6		4		3		1		0						
-1456		-1056		-656		256		0							
	6		4		3		1		0						
-1440		-1040		-640		-240		0							
	6		4		3		1		0						
-1424		-1024		-624		-224		0							
	6		4		3		1		0						
-1408		-1008		-608		-208		0							
	6		4		3		1		0						
-1392		-992		-592		-192		0							
	6		4		2		1		0						
-1376		-976		-576		-176		0							
	6		4		2		1		0						
-1360		-960		-560		-160		0							
	6		4		2		1		0						

ntfta=laget hos teta-motorn fran teta=0 (inkrement)
dif =erforderling korrektion hos alfa-motorn tabellen innehaller 218 teta-varden

nteta	dif														
0		400		800		1200		1600							
	0		-1		-2		-3		-3						
16		416		816		1216		1616							
	0		-1		-2		-3		-4						
32		432		832		1232		1632							
	0		-1		-2		-3		-4						
48		448		848		1248		1648							
	0		-1		-2		-3		-4						
64		464		864		1264		1664							
	0		-1		-2		-3		-4						
80		480		880		1280		1680							
	0		-1		-2		-3		-4						
96		496		896		1296		1696							
	0		-1		-2		-3		-4						
112		512		912		1312		1712							
	0		-1		-2		-3		-4						
128		528		928		1328		1728							
	0		-1		-2		-3		-4						
144		544		944		1344		1744							
	0		-1		-2		-3		-4						
160		560		960		1360		1760							
	0		-1		-2		-3		-4						
176		576		976		1376		1776							
	0		-1		-2		-3		-4						
192		592		992		1392		1792							
	0		-1		-2		-3		-4						
208		608		1008		1408		1808							
	0		-1		-2		-3		-4						
224		624		1024		1424		1824							
	0		-1		-2		-3		-4						
240		640		1040		1440		1840							
	0		-1		-2		-3		-4						
256		656		1056		1456		1856							
	-1		-1		-2		-3		-4						
272		672		1072		1472		1872							
	-1		-1		-2		-3		-4						
288		688		1088		1488		1888							
	-1		-1		-2		-3		-4						
304		704		1104		1504		1904							
	-1		-1		-2		-3		-4						
320		720		1120		1520		1920							
	-		-1		-2		-3		-4						
336		736		1136		1536		1936							
	-1		-2		-2		-3		-4						
352		752		1152		1552		1952							
	-1		-2		-2		-3		-4						
368		768		1168		1568		1968							
	-1		-2		-2		-3		-4						
384		784		1184		1584		1984							
	-1		-2		-3		-3		-4						

nteta dif

2000		2400		2800		3200	0
	-5		-6		-7	-8	0
2016		2416		2816		3216	0
	-5		-6		-7	-8	0
2032		2432		2832		3232	0
	-5		-6		-7	-8	0
2048		2448		2848		3248	0
	-5		-6		-7	-8	0
2064		2464		2864		3264	0
	-5		-6		-7	-8	0
2080		2480		2880		3280	0
	-5		-6		-7	-9	0
2096		2496		2896		3296	0
	-5		-6		-7	-9	0
2112		2512		2912		3312	0
	-5		-6		-7	-9	0
2128		2528		2928		3328	0
	-5		-6		-7	-9	0
2144		2544		2944		3344	0
	-5		-6		-7	-9	0
2160		2560		2960		3360	0
	-5		-6		-7	-9	0
2176		2576		2976		3376	0
	-5		-6		-7	-9	0
2192		2592		2992		3392	0
	-5		-6		-7	-9	0
2208		2608		3008		3408	0
	-5		-6		-8	-9	0
2224		2624		3024		3424	0
	-5		-6		-8	-9	0
2240		2640		3040		3440	0
	-5		-6		-8	-9	0
2256		2656		3056		3456	0
	-5		-6		-8	-9	0
2272		2672		3072		3472	0
	-5		-6		-8	0	0
2288		2688		3088		0	0
	-5		-6		-8	0	0
2304		2704		3104		0	0
	-5		-7		-8	0	0
2320		2720		3120		0	0
	-5		-7		-8	0	0
2336		2736		3136			0
	-5		-7		-8	0	0
2352		2752		3152		0	0
	-5		-7		-8	0	0
2368		2768		3168		0	0
	-6		-7		-8	0	0
2384		2784		3184		0	0
	-6		-7		-8	0	0

irad_ell avvikelse delr i mm vid korning
vertikalt med korrektion enligt den be-
raknade tabellen

radie= -157.

z= -28.18	delr= .00
-67.98	311.11
-106.61	303.62
-144.27	291.36
-181.01	274.14
-216.89	251.76
-252.11	224.16
-286.84	191.21
-321.27	152.5
-355.70	107.99
-390.45	57.26
-425.92	.01

```
z=  -42.02  delr=   .00
    -81.71       377.37
   -119.98       369.88
   -157.07       357.62
   -193.02       340.39
   -227.89       317.99
   -261.90       290.35
   -295.23       257.32
   -328.05       218.51
   -360.70       173.83
   -393.48       122.88
   -426.79        65.34
1



radie= -223.

z=  -59.14  delr=   .00
    -98.71       443.62
   -136.59       436.15
   -173.06       423.91
   -208.14       406.71
   -241.93       384.33
   -274.63       356.69
   -306.44       323.65
   -337.55       284.78
   -368.31       239 99
   -399.00       188.87
   -430.04       131.08

radie= -256.

z=  -80.00  delr=   .00
   -119.43       509.89
   -156.88       502.45
   -192.65       490.27
   -226 79       473.13
   -259.37       450 82
   -290.63       423.24
   -320.80       390.24
   -350.04       351.37
   -378.74       306.54
   -407.20       255.31
   -435.83       197.34
1
```

radie= -289.

z= -105.28 deir= .00

-144.56	576.16
-181.50	568.79
-216.49	556.70
-249.55	539.69
-280.77	517.50
-310.42	490.06
-338.75	457.17
-365 94	418.39
-392.3º	373.59
-418.41	322.33
-444.43	264.25

1 vertikal avvikelse delz i mm vid korning horisontellt med korrektion enligt den beraknade tabellen

1

z= -105.

r= -8.32 delz= .00

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

z= 29.

r= -.62 delz= .00
24.27 -58.46
49.25 -62.83
74.33 -69.97
99.47 -79.81
124.54 -93.26
149.48 -109.92
174.19 -130.00
198 53 -153.71
222.29 -181.43
245.24 -213.53
267.09 -250.42

z= 163.

r= -20.05 delz= .00
4.75 -326.43
29.28 -330.76
53.63 -337.83
77.79 -347.59
101.47 -360.92
124.71 -377.42
147.36 -397.30
169.25 -420.78
190.14 -448.20
209.73 -479.94
227.64 -516 38

z= 297.

r= -69.27 delz= .00
-44.54 -594 39
-20.52 -598.65
3.02 -605.61
26.10 615.21
48.24 -628.30
69.57 -644.51
89.91 -664.03
109 05 -687.05
126.68 -713.90
142.41 744.92

1

z= 431.

r= -156.75 delz= 00

-132.12 -862.34

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

antal inkrement nalfa och nteta som fu tion
av resp vinke'

alfa nalfa teta nteta

```
all,al2,al3,vnoll,stig,alp,ala,anvarv,astart ,astopp,tstart,tstopp, noll,znoll, min, max,zmin,zma.
korrektionstabell for korning vertikal                    sid 1


nalfa=laget hos alfa-motorn fran alfa=0 (inkrement)
dif  =erforderlig korrektion hos teta-motorn
tabellen innehaller   lnalfa-varden


nalfa dif

-3744       -3344       -2944       -2544       -2144
      12          11          9           8           6
-3728       -3328       -2928       -2528       -2128
      12          10          9           8           6
-3712       -3312       -2912       -2512       -2112
      12          10          9           7           6
-3696       -3296       -2896       -2496       -2096
      12          10          9           7           6
-3680       -3280       -2880       -2480       -2080
      12          10          9           7           6
-3664       -3264       -2864       -2464       -2064
      12          10          9           7           6
-3648       -3248       -2848       -2448       -2048
      12          10          9           7           6
-3632       -3232       -2832       -2432       -2032
      12          10          9           7           6
-3616       -3216       -2816       -2416       -2016
      12          10          9           7           6
-3600       -3200       -2800       -2400       -2000
      12          10          8           7           6
-3584       -3184       -2784       -2384       -1984
      11          10          8           7           6
-3568       -3168       -2768       -2368       -1968
      11          10          8           7           6
-3552       -3152       -2752       -2352       -1952
      11          10          8           7           6
-3536       -3136       -2736       -2336       -1936
      11          10          8           7           6
-3520       -3120       -2720       -2320       -1920
      11          10          8           7           6
-3504       -3104       -2704       -2304       -1904
      11          10          8           7           5
-3488       -3088       -2688       -2288       -1888
      11          10          8           7           5
-3472       -3072       -2672       -2272       -1872
      11           9          8           7           5
-3456       -3056       -2656       -2256       -1856
      11           9          8           7           5
-3440       -3040       -2640       -2240       -1840
      11           9          8           7           5
-3424       -3024       -2624       -2224       -1824
      11           9          8           7           5
-3408       -3008       -2608       -2208       -1808
      11           9          8           6           5
-3392       -2992       -2592       -2192       -1792
      11           9          8           6           5
-3376       -2976       -2576       -2176       -1776
      11           9          8           6           5
-3360       -2960       -2560       -2160       -1760
      11           9          8           6           5
korrektionstabell for korning vertikalt                   sid 2


nalfa dif

-1744       -1344       -944        -544        -144
       5           4          3           2           0
-1728       -1328       -928        -528        -128
       5           4          3           1           0
-1712       -1312       -912        -512        -112
       5           4          3           1           0
-1696        -296       -896        -496         -96
       5           4          2           1           0
-1680       -1280       -880        -480         -80
       5           4          2           1           0
-1664       -1264       -864        -464         -64
       5           4          2           1           0
-1648       -1248       -848        -448         -48
       5           4          2           1           0
-1632       -1232       -832        -432         -32
       5           3          2           1           0
-1616       -1216       -816         416         -16
```

-1600		-1200		-800		-400	
	5		3		2		1
-1584		-1184		-784		-384	
	5		3		2		1
-1568		-1168		-768		-368	
	4		3		2		1
1552		-1152		-752		-352	
	4		3		2		1
-1536		-1136		-736		-336	
	4		3		2		1
-1520		-1120		-720		-320	
	4		3		2		1
1504		-1104		-704		-304	
	4		3		2		1
-1488		1088		-688		-288	
	4		3		2		1
-1472		-1072		-672		-272	
	4		3		2		1
-1456		-1056		-656		-256	
	4		3		2		1
-1440		-1040		-640		-240	
	4		3		2		1
-1424		-1024		-624		-224	
	4		3		2		1
-1408		-1008		-608		-208	
	4		3		2		1
-1392		-992		-592		-192	
	4		3		2		1
-1376		-976		-576		-176	
	4		3		2		0
-1360		-960		-560		-160	
	4		3		2		0

ntfta=laget hos teta-motorn fran teta=0 (inkrement)
dif =erforderling korrektion hos alfa-motorn tabellen innehaller 218nteta-varden

nteta	dif							
0		400		800		1200		1600	
	0		-1		-2		-4		-5
16		416		816		1216		1616	
	0		-1		-3		-4		-5
32		432		832		1232		1632	
	0		-1		-3		-4		-5
48		448		848		1248		1648	
	0		-1		-3		-4		-5
64		464		864		1264		1664	
	0		-1		-3		-4		-5
80		480		880		1280		1680	
	0		-1		-3		-4		-6
96		496		896		1296		1696	
	0		-2		-3		-4		-6
112		512		912		1312		1712	
	0		-2		-3		-4		-6
128		528		928		1328		1728	
	0		-2		-3		-4		-6
144		544		944		1344		1744	
	0		-2		-3		-4		-6
160		560		960		1360		1760	
	0		-2		-3		-4		-6
176		576		976		1376		1776	
	-1		-2		-3		-4		-6
192		592		992		1392		1792	
	-1		-2		-3		-4		-6
208		608		1008		1408		1808	
	-1		-2		-3		-5		-6
224		624		1024		1424		1824	
	-1		-2		-3		-5		-6
240		640		1040		1440		1840	
	-1		-2		-3		-5		-6
256		656		1056		1456		1856	
	-1		-2		-3		-5		-6
272		672		1072		1472		1872	
	-1		-2		-3		-5		-6
288		688		1088		1488		1888	
	-1		-2		-3		-5		-6
304		704		1104		1504		1904	
	-1		-2		-3		-5		-6
320		720		1120		1520		1920	
	-1		-2		-4		-5		-6
336		736		1136		1536		1936	
	-1		-2		-4		-5		-6
352		752		1152		1552		1952	
	-1		-2		-4		-5		-7
368		768		1168		1568		1968	
	-1		-2		-4		-5		-7
384		784		1184		1584		1984	
	-1		-2		-4		-5		-7

nteta dif

2000		2400		2800		3200	
	-7		-8		-10		-12
2016		2416		2816		3216	
	-7		-8		-10		-12
2032		2432		2832		3232	
	-7		-9		-10		-12
2048		2448		2848		3248	
	-7		-9		-10		-13
2064		2464		2864		3264	
	-7		-9		-11		-13
2080		2480		2880		3280	
	-7		-9		-11		-13
2096		2496		2896		3296	
	-7		-9		-11		-13
2112		2512		2912		3312	
	-7		-9		-11		-13
2128		2528		2928		3328	
	-7		-9		-11		-13
2144		2544		2944		3344	
	-7		-9		-11		-13
2160		2560		2960		3360	
	-7		-9		-11		-13
2176		2576		2976		3376	
	-7		-9		-11		-13
2192		2592		2992		3392	
	-8		-9		-11		-13
2208		2608		3008		3408	
	-8		-9		-11		-14
2224		2624		3024		3424	
	-8		-9		-11		-14
2240		2640		3040		3440	
	-8		-9		-11		-14
2256		2656		3056		3456	
	-8		-10		-12		-14
2272		2672		3072		3472	
	-8		-10		-12	0	
2288		2688		3088		0	
	-8		-10		-12	0	
2304		2704		3104		0	
	-8		-10		-12	0	
2320		2720		3120		0	
	-8		-10		-12	0	
2336		2736		3136		0	
	-8		-10		-12	0	
2352		2752		3152		0	
	-8		-10		-12	0	
2368		2768		3168		0	
	-8		-10		-12	0	
2384		2784		3184		0	
	-8		-10		-12	0	

iradiell avvikelse delr i cm vid korning
vertikalt med korrektion enligt den be-
raknade tabellen

radie= -157.

z= -18.59	delr= .00
-58.53	311.04
-97.69	303.68
-136.11	291.42
-173.85	274.24
-210 96	251.97
-247.52	224.57
-283.59	191.73
-319.31	153.38
-354.83	109.31
-390.28	59.06
-425.91	2.30

```
z=  -38.99  delr=   .00
    -78.78       448.00
   -117.50       440.62
   -155.19       428.32
   -191.93       411.08
   -227.74       388.74
   -262.73       361.23
   -296.95       328.25
   -330.54       289.71
   -363.67       245.40
   -396.44       194.84
   -429.09       137.68
1



radie= -294.

z=  -67.81  delr=   .00
   -107.43       584.96
   -145.66       577.58
   -182.55       565.29
   -218.17       548.05
   -252.56       525.69
   -285.83       498.15
   -318.02       465.11
   -349.31       426.47
   -379.85       382.01
   -409.74       331.24
   -439.21       273.79

radie= -362

z= -106.33  delr=   .00
   -145.77       721.93
   -183.45       714.59
   -219.42       702.35
   -253.78       685.17
   -286.56       662.69
   -317.89       635.42
   -347.81       602.42
   -376.52       563.80
   -404.19       519.31
   -430.91       468.46
   -456.91       410.85
1
```

radie= -431.

z= -156.75 delr= .00

-195.97 858.91

-232.99 851.65

-267.88 839.54

-300.75 822.53

-331.64 800.44

-360 71 773.17

-388.00 740.38

-413.74 701.94

-438.12 657 61

-461.24 606.84

-483.32 549.25

i vertikal avvikelse delz i mm vid korning
horisontellt med korrektion enligt den be-
raknade tabellen

i

z= -157.

r= -18.59 delz= .00

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

z= -10.

r= -.07 delz= .00

nteta dif

nteta dif

nteta dif

149.81 -14.11
187.61 -33.95
225.27 -58.77
262.57 -88.69
299 26 -124.11
334.94 -165.80
369.24 -213.40
401.55 -268.60

z= 137

r= -14.15 delz= .00
22.72 -275.89
59.42 -282.07
95.89 -292.55
132.01 -307.50
167.61 -327.16
202.51 -351.74
236.49 -381.36
269.21 -416 40
300.13 -457.61
328.95 -504.81
354.79 -559.03

z= 284.

r= -63.08 delz= .00
-26.44 -569 57
9.51 -575.65
44 71 -585.96
78.99 -600.66
112.17 -619.97
143.99 -644.09

```
     174.23      -673.13
     202.45       707.42
     227.93      -747.64
     250.38      -793.59
     268.60      -846.16
1
```

z= 431.

r= -156.75 delz= .00

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

nteta dif

antal inkrement nalfa och nteta som funtion
av reep vinkel

alfa   nalfa   teta   nteta