

# WN10

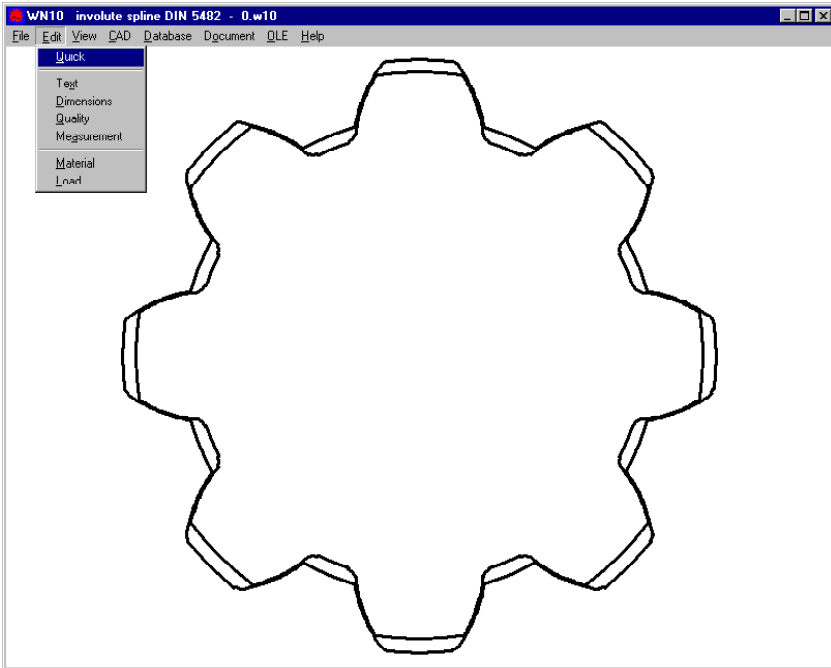


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## Involute Splines according to DIN 5482

for Windows



WN10 involute spline DIN 5482 - 0e.w10

| External involute spline 000000     |                | Internal involute spline 000000   |                |
|-------------------------------------|----------------|-----------------------------------|----------------|
| tip diameter d3                     | 14.5           | root diameter d1                  | 16             |
| root diameter d4                    | 11.5           | tip diameter d2                   | 12             |
| module m                            | 1.6            | module m                          | 1.6            |
| pressure angle alpha                | 30             | pressure angle alpha              | 30             |
| no. of teeth z                      | 8              | no. of teeth z                    | 8              |
| basic rack                          | 15x12 DIN 5482 | basic rack                        | 15x12 DIN 5482 |
| profile shift x'm                   | +0.500         | profile shift x'm                 | -0.500         |
| tooth depth h                       | 1.500          | tooth depth h                     | 1.500          |
| normal tooth thickn. s <sub>w</sub> | 3.091          | normal space width l <sub>w</sub> | 3.091          |
| tooth thickness tolerance field     | DIN 5480 - 8e  | gap width tolerance field         | DIN 5480 - 9H  |
| Meas. Dim. Mi (DM=4) nom            | 20.424         | Meas. Dim. Mi (DM=3) nom          | 9.085          |
| Meas. Dim. Mi (DM=4) max            | 20.389         | Meas. Dim. Mi (DM=3) min          | 9.135          |
| Meas. Dim. Mi (DM=4) min            | 20.336         | Meas. Dim. Mi (DM=3) max          | 9.218          |
| Complement. part                    | 000000         | Complement. part                  | 000000         |

Zahnwelle 000000  
Zahnraube 000000

tolerance tooth thickness / tooth gap  
A / B 15 x 12 DIN 5482 - 9H / 8e (DIN 5480)

| Load                         | 1        | 2   |      |
|------------------------------|----------|-----|------|
| rated torque                 | TN       | Nm  | 100  |
| maximum torque               | Tmax     | Nm  | 300  |
| application factor           | KA       |     | 1.75 |
| equival. torque              | Teq      | Nm  | 175  |
| load alternating factor      | KW       |     | 1.00 |
| load distrib. factor         | K lambda |     | 1.53 |
| equiv. eff. surface pressure | peq      | MPa | 318  |
| max. eff. surface pressure   | pmax     | MPa | 484  |

| STRENGTH                               | 1      | 2      |      |
|--|--------|--------|------|
| material                               | 1.7707 | 0.6020 |      |
| Yield Point                            | Re     | 600    | 150  |
| Supp. Factor                           | FS     | 1.20   | 2.00 |
| Hardness factor                        | FS     | 1.16   | 1.00 |
| Perm. surface pressure                 | psdm   | 828    | 300  |
| load peak frequency factor             | FL     | 1.37   | 1.16 |
| safety marg. H <sup>2</sup> /psdm/peq  | Sq2    | 2.60   | 0.04 |
| safety marg. H <sup>2</sup> /psdm/pmax | Smax   | 2.46   | 0.74 |

Hub

Shaft

TG2 = 0.063 mm  
Tav2 = 0.040 mm  
Tef2 = 0.023 mm  
Ae = 0 mm

TG1 = 0.046 mm  
Tav1 = 0.028 mm  
Tef1 = 0.017 mm  
Ae = 0.030 mm

emax = 3.154 mm  
emin = 3.09 mm  
e2 = s1 = 3.09 mm  
smax = 3.06 mm  
smin = 3.044 mm  
smin = 3.010 mm

jmmin = 0.030 mm  
jmmax = 0.138 mm  
jmmax = 0.070 mm

### Calculation of Involute Splines to DIN 5482

WN10 software calculates dimensions and strength of an involute spline joint according to DIN 5482 (Release 1950).

WN10 also calculates self-defined non-standard splines: you can enter tooth tip diameters and tooth root diameters of external and internal spline, and WN10 calculates tooth height coefficients.

WN10 calculates strength of the joint according to Niemann (2005).

WN10 provides generation of true-scale tooth profile drawings with CAD interfaces DXF and IGES.

### Dimensions

You can select DIN 5482 sizes from database, or input all dimension data.

### Profile Database

Database includes DIN 5482 standard dimensions of internal and external spline. Database may be extended and modified by the user.

Dimensions to DIN 5482 Toothed shaft joint to DIN 5482

| NOM   | D1 | D2 | D3   | D4   | D5   | Z  | M    | X | M | B1     |
|-------|----|----|------|------|------|----|------|---|---|--------|
| 15x12 | 15 | 12 | 14.5 | 11.5 | 12.8 | 8  | 1.6  |   |   | 0.5    |
| 17x14 | 17 | 14 | 16.5 | 13.5 | 14.4 | 9  | 1.6  |   |   | 0.7    |
| 18x15 | 18 | 15 | 17.5 | 14.5 | 16   | 10 | 1.6  |   |   | 0.4    |
| 20x17 | 20 | 17 | 19.5 | 16.5 | 19.2 | 12 | 1.6  |   |   | -0.2   |
| 22x19 | 22 | 19 | 21.5 | 18.5 | 20.8 | 13 | 1.6  |   |   | 0      |
| 25x22 | 25 | 22 | 24.5 | 21.2 | 22.4 | 14 | 1.6  |   |   | 0.55   |
| 28x25 | 28 | 25 | 27.5 | 24.5 | 26.2 | 15 | 1.75 |   |   | 0.302  |
| 30x27 | 30 | 27 | 29.5 | 26.3 | 28   | 16 | 1.75 |   |   | 0.327  |
| 32x28 | 32 | 28 | 31.5 | 27.6 | 29.8 | 17 | 1.75 |   |   | 0.102  |
| 35x31 | 35 | 31 | 34.5 | 30.5 | 31.5 | 18 | 1.75 |   |   | 0.676  |
| 38x34 | 38 | 34 | 37.5 | 33.5 | 36.1 | 19 | 1.9  |   |   | 0      |
| 40x36 | 40 | 36 | 39.5 | 35.5 | 38   | 20 | 1.9  |   |   | 0.049  |
| 42x38 | 42 | 38 | 41.5 | 37.5 | 39.9 | 21 | 1.9  |   |   | 0.099  |
| 45x41 | 45 | 41 | 44.5 | 40.6 | 44   | 22 | 2    |   |   | -0.181 |
| 48x44 | 48 | 44 | 47.5 | 43.2 | 46   | 23 | 2    |   |   | 0.119  |
| 50x45 | 50 | 45 | 49.5 | 44.6 | 48   | 24 | 2    |   |   | 0.181  |
| 52x47 | 52 | 47 | 51.5 | 46.5 | 50   | 25 | 2    |   |   | -0.231 |
| 55x50 | 55 | 50 | 54.5 | 49   | 52   | 26 | 2    |   |   | 0.019  |
| 58x53 | 58 | 53 | 57.5 | 52   | 54   | 27 | 2    |   |   | 0.518  |
| 60x55 | 60 | 55 | 59.5 | 54.5 | 56   | 28 | 2    |   |   | 0.768  |
| 62x57 | 62 | 57 | 61.5 | 56.5 | 60.9 | 29 | 2.1  |   |   | -0.434 |
| 65x60 | 65 | 60 | 64.3 | 59.5 | 63   | 30 | 2.1  |   |   | 0.015  |
| 68x62 | 68 | 62 | 67.3 | 61.5 | 65.1 | 31 | 2.1  |   |   | -0.034 |
| 70x64 | 70 | 64 | 69.3 | 63.5 | 67.2 | 32 | 2.1  |   |   | -0.084 |
| 72x66 | 72 | 66 | 71.3 | 65.5 | 69.3 | 33 | 2.1  |   |   | -0.134 |
| 75x69 | 75 | 69 | 74.3 | 68.5 | 71.4 | 34 | 2.1  |   |   | 0.315  |
| 78x72 | 78 | 72 | 77.3 | 71.5 | 73.5 | 35 | 2.1  |   |   | 0.765  |
| 80x74 | 80 | 74 | 79.3 | 73.5 | 75.6 | 36 | 2.1  |   |   | 0.715  |

Abmessungen nach DIN 5482 Passverzahnung nach DIN 5482

| NOM   | D1 | D2 | D3   | D4   | D5   | Z  | M    | X      | M    | R1   | R2  | K |
|-------|----|----|------|------|------|----|------|--------|------|------|-----|---|
| 15x12 | 15 | 12 | 14,5 | 11,5 | 12,8 | 8  | 1,6  | 0,5    | 0,15 | 0,25 | 0,3 |   |
| 17x14 | 17 | 14 | 16,5 | 13,5 | 14,4 | 9  | 1,6  | 0,7    | 0,15 | 0,25 | 0,3 |   |
| 18x15 | 18 | 15 | 17,5 | 14,5 | 16   | 10 | 1,6  | 0,4    | 0,15 | 0,25 | 0,3 |   |
| 20x17 | 20 | 17 | 19,5 | 16,5 | 19,2 | 12 | 1,6  | -0,2   | 0,15 | 0,25 | 0,3 |   |
| 22x19 | 22 | 19 | 21,5 | 18,5 | 20,8 | 13 | 1,6  | 0      | 0,15 | 0,25 | 0,3 |   |
| 25x22 | 25 | 22 | 24,5 | 21,2 | 22,4 | 14 | 1,6  | 0,55   | 0,15 | 0,25 | 0,3 |   |
| 28x25 | 28 | 25 | 27,5 | 24,5 | 26,2 | 15 | 1,75 | 0,302  | 0,15 | 0,25 | 0,3 |   |
| 30x27 | 30 | 27 | 29,5 | 26,3 | 28   | 16 | 1,75 | 0,327  | 0,15 | 0,25 | 0,3 |   |
| 32x28 | 32 | 28 | 31,5 | 27,6 | 29,8 | 17 | 1,75 | 0,102  | 0,15 | 0,25 | 0,3 |   |
| 35x31 | 35 | 31 | 34,5 | 30,5 | 31,5 | 18 | 1,75 | 0,676  | 0,15 | 0,25 | 0,3 |   |
| 38x34 | 38 | 34 | 37,5 | 33,5 | 36,1 | 19 | 1,9  | 0      | 0,15 | 0,25 | 0,3 |   |
| 40x36 | 40 | 36 | 39,5 | 35,5 | 38   | 20 | 1,9  | 0,049  | 0,15 | 0,25 | 0,3 |   |
| 42x38 | 42 | 38 | 41,5 | 37,5 | 39,9 | 21 | 1,9  | 0,099  | 0,15 | 0,25 | 0,3 |   |
| 45x41 | 45 | 41 | 44,5 | 40,6 | 44   | 22 | 2    | -0,181 | 0,25 | 0,35 | 0,4 |   |
| 48x44 | 48 | 44 | 47,5 | 43,2 | 46   | 23 | 2    | 0,119  | 0,25 | 0,35 | 0,4 |   |
| 50x45 | 50 | 45 | 49,5 | 44,6 | 48   | 24 | 2    | -0,181 | 0,25 | 0,35 | 0,4 |   |
| 52x47 | 52 | 47 | 51,5 | 46,5 | 50   | 25 | 2    | -0,231 | 0,25 | 0,35 | 0,4 |   |
| 55x50 | 55 | 50 | 54,5 | 49   | 52   | 26 | 2    | 0,019  | 0,25 | 0,35 | 0,4 |   |
| 58x53 | 58 | 53 | 57,5 | 52   | 54   | 27 | 2    | 0,518  | 0,25 | 0,35 | 0,4 |   |
| 60x55 | 60 | 55 | 59,5 | 54,5 | 56   | 28 | 2    | 0,768  | 0,25 | 0,35 | 0,4 |   |
| 62x57 | 62 | 57 | 61,5 | 56,5 | 60,9 | 29 | 2,1  | -0,434 | 0,35 | 0,45 | 0,5 |   |
| 65x60 | 65 | 60 | 64,3 | 59,5 | 63   | 30 | 2,1  | 0,015  | 0,35 | 0,45 | 0,5 |   |
| 68x62 | 68 | 62 | 67,3 | 61,5 | 65,1 | 31 | 2,1  | -0,034 | 0,35 | 0,45 | 0,5 |   |
| 70x64 | 70 | 64 | 69,3 | 63,5 | 67,2 | 32 | 2,1  | -0,084 | 0,35 | 0,45 | 0,5 |   |
| 72x66 | 72 | 66 | 71,3 | 65,5 | 69,3 | 33 | 2,1  | -0,134 | 0,35 | 0,45 | 0,5 |   |
| 75x69 | 75 | 69 | 74,3 | 68,5 | 71,4 | 34 | 2,1  | 0,315  | 0,35 | 0,45 | 0,5 |   |
| 78x72 | 78 | 72 | 77,3 | 71,5 | 73,5 | 35 | 2,1  | 0,765  | 0,35 | 0,45 | 0,5 |   |
| 80x74 | 80 | 74 | 79,3 | 73,5 | 75,6 | 36 | 2,1  | 0,715  | 0,35 | 0,45 | 0,5 |   |
| 82x76 | 82 | 76 | 81,3 | 75,5 | 83,2 | 37 | 2,25 | -2,425 | 0,35 | 0,45 | 0,5 |   |

## Tolerances

From tolerance series and tolerance zone, WN10 calculates measuring dimensions and backlash or interference.

You can configure tolerance system according to DIN 5482-3:1973, or according to DIN 5480-1:2006

## Measurement

The program calculates span width and dimension over/between pins (min, max & nom. values) for dimensions and selected tolerance fields. Whereby no. of teeth meas. and pin diameter can be altered.

## Material Database

Material properties can be selected from the integrated database (> 900 records)

## Strength Calculation

WN10 calculates transferable torque or safety against permissible flank pressure according to Niemann/Winter/Höhn (2005).

## Drawing Tables

Table drawings with dimensions may be printed or exported to CAD.

## Tooth Profile Drawings

True-scale drawings of tooth profile, tooth contact, reference profile may be exported to CAD or printed on screen.

## Production Drawing

WN10 generates production drawings of external spline and internal spline with ISO 7200 data field.

## CAD Interface

True-scale tooth drawings, production drawing and drawing tables can be generated as DXF or IGES file, and imported by any CAD software.

## User Interface

The dialogue windows of WN10 allow even the less experienced PC user to find his way around the program quickly. WN10 provides users with a help text wherever they are in the program. When the demo mode is selected, WN10 runs through a demo program in which an example calculation is performed.

## System Requirements

WN10 is available as 32-bit app or as 64-bit app for Windows 7, Windows 8, Windows 10.

## Scope of Delivery

WN10 Software with user manual (pdf), non-expiring license for unlimited time use with update rights.

## Software Maintenance

HEXAGON Software is continuously improved and updated. Registered users are regularly kept informed of updates and new editions.

## Guarantee

HEXAGON gives a 24 month guarantee on full functionality of the software.

WN10 Passverzahnung DIN 5482 - 15x12.w10

| ZAHNWELLE 000000        |                | ZAHNABE 000000            |                |
|-------------------------|----------------|---------------------------|----------------|
| Kopfkreisdurchmesser d3 | 14,5           | Fußkreisdurchmesser d1    | 15             |
| Fußkreisdurchmesser d4  | 11,5           | Kopfkreisdurchmesser d2   | 12             |
| Modul m                 | 1,6            | Modul m                   | 1,6            |
| Eingriffswinkel alpha   | 30             | Eingriffswinkel alpha     | 30             |
| Zähnezahl z             | 8              | Zähnezahl z               | 8              |
| Bezugsprofil            | 15x12 DIN 5482 | Bezugsprofil              | 15x12 DIN 5482 |
| Profilverchiebung x*m   | +0,500         | Profilverchiebung x*m     | -0,500         |
| Zahnhöhe h              | 1,500          | Zahnhöhe h                | 1,500          |
| Nurmalzahnradicke sw    | 3,091          | Nurmalzahnradicke sw      | 3,091          |
| Zahndicken-Toleranzfeld | DIN 5480 - 9h  | Lückenweiten-Toleranzfeld | DIN 5480 - 10H |
| Zahnweite (k=2) Wnom    | 7,626          | Prüfmaß Mi (DM=2,9) nom   | 9,424          |
| Zahnweite (k=2) Wmax    | 7,806          | Prüfmaß Mi (DM=2,9) min   | 9,491          |
| Zahnweite (k=2) Wmin    | 7,571          | Prüfmaß Mi (DM=2,9) max   | 9,598          |
| Gegenstück              | 000000         | Gegenstück                | 000000         |

| Last                        | FESTIGKEIT |          |
|-----------------------------|------------|----------|
| Nenn Drehmoment             | TN         | Nm 95,49 |
| Maximales Drehmoment        | Tmax       | Nm 286,5 |
| Anwendungsfaktor            | KA         | 1,00     |
| Äquivalentes Drehmoment     | Teq        | Nm 95,49 |
| Lastverteilungsfaktor       | fV         | 1,00     |
| KI lambda                   | 1,00       |          |
| äquiv.wirks.Flächenpressung | peq        | MPa 240  |
| max.wirks.Flächenpressung   | pmax       | MPa 601  |

| Werkstoff                    | 1    | 2         |
|------------------------------|------|-----------|
| Streckgrenze                 | Re   | 1050 230  |
| Stutzfaktor                  | rS   | 1,20 2,00 |
| Härteeinflussfaktor          | fH   | 1,00 1,00 |
| Zul.Flächenpressung          | pzul | 1260 460  |
| Lastspitzenhaftigkeitsfaktor | fL   | 1,00 1,00 |
| Sicherheit Seq               | Seq  | 5,25 1,91 |
| Sicherheit fL*pzul/pmax      | Smax | 2,10 0,77 |

WN10 Passverzahnung DIN 5482 - 0.w10

| ZAHNWELLE 000000        |                | ZAHNABE 000000            |                |
|-------------------------|----------------|---------------------------|----------------|
| Kopfkreisdurchmesser d3 | 14,5           | Fußkreisdurchmesser d1    | 15             |
| Fußkreisdurchmesser d4  | 11,5           | Kopfkreisdurchmesser d2   | 12             |
| Modul m                 | 1,6            | Modul m                   | 1,6            |
| Eingriffswinkel alpha   | 30             | Eingriffswinkel alpha     | 30             |
| Zähnezahl z             | 8              | Zähnezahl z               | 8              |
| Bezugsprofil            | 15x12 DIN 5482 | Bezugsprofil              | 15x12 DIN 5482 |
| Profilverchiebung x*m   | +0,500         | Profilverchiebung x*m     | -0,500         |
| Zahnhöhe h              | 1,500          | Zahnhöhe h                | 1,500          |
| Nurmalzahnradicke sw    | 3,091          | Nurmalzahnradicke sw      | 3,091          |
| Zahndicken-Toleranzfeld | DIN 5480 - 9h  | Lückenweiten-Toleranzfeld | DIN 5480 - 10H |
| Zahnweite (k=2) Wnom    | 7,626          | Prüfmaß Mi (DM=2,9) nom   | 9,424          |
| Zahnweite (k=2) Wmax    | 7,806          | Prüfmaß Mi (DM=2,9) min   | 9,491          |
| Zahnweite (k=2) Wmin    | 7,571          | Prüfmaß Mi (DM=2,9) max   | 9,598          |
| Gegenstück              | 000000         | Gegenstück                | 000000         |