



# Calculation Example Parallel Keys According to DIN 6892

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Constitution - GWJ-Technology - Parallel key	calculation DIN 6892 -	Mozilla Firefrox	Report parallel key calculation DIN 6892:1998-11 - Mozilla Firefox Datei Bearbeten Anscht Chronik Lossonichen a	Input of application factor K_A				· · · ·
input dialog for the required input data for the	te 🔊 Undo 🖙 R	edo 🛛 Repo	Date: Bearbeiten Ansicht Chronik Lesszeichen Eutras Hife O	Diameter of shaft (d)	60.0	Operation nominal torg	ue (T_nom) [Nm]	1950.0
Diameter of shaft (d)	and on method B		Input data	Application factor (K_A)	1.75	min. frictional torque (T	_Rmin) [Nm]	1250.0
Application factor (K_A)	60.0	Operation nom		Outer Ø hub (D2) [mm]	120.0	Max. load peak torque (	T_max) [Nm]	3900.0
0 🚮 Input data method B	11.75	min. frictional b	N	Calculation method B 🗾 Input d	iata method B	Load peaks (N_L)	ser defined input 💌 🗍	500.0
Kind of load: Alternating torque with a								
Changes of load direction (N_W)		2	30	Shaft		Hub		
max. reverse torque (T_maxRev) [Nm]	o o change 🔄	1000000.0	i ch	Material C60 hardened and temper	e 💌 1.0601 💌	Material 34	CrNiMo6 hardened and	te 🕶 1.6582 💌
Small outer diameter of stepped hub (D1)	for my l		W -	Supporting length (I_tr1) [mm]	91.0	Supporting length (I_tr	2) [mm]	91.0
Big outer diameter of stepped hub (D2) [m]		120.0		Parallel kev		Standard length (mm)	100	
P Width of hub with D2 internal I_tr (c) [mm]		45.5		Parallel key DIN 6885-1 AB 18 x 11 x 10	10	Supporting length (I_tr	3) (mm)	91.0
Axial distance between load in- and output	t position (a0) (mm)	96.0	<u>+ ( )</u>	Material 34CrNiMo6 hardened and		Number of parallel ke		
Chamfer of parallel key take over for ch	amfer of shaft/hub key	way edge?	<i>l</i> tr		11.0302	Humber of parallel Ke	s (_p)	
Chamfer or radius on the shaft keyway ed	ge (s_1) [mm]	1.0	Shaft diameter(d):	The parallel key is suitable for the given data.				
Chamfer or radius on the hub keyway edg	e (s_2) [mm]	1.0	Application factor(K <sub>A</sub> ):					
			Number of parallel keys(ip): Nominal torque(T <sub>nenn</sub> ):					
			Minimal frictional torque(T <sub>Rmin</sub> ):					
	Shaft		Maximum load peak torque(T <sub>max</sub> ): Number of load peaks(NL):	Result:	Shaft:	Hub:	Para	llel key:
Result: Pressure [N/mm <sup>2</sup> ] / Safety in T_nom:	420.00	1.26 384	Smaller outer diameter hub(D1):	Pressure [N/mm <sup>a</sup> ] / Safety in T_nom:	429.53 /	1.26 384.50 /	2.73 429.53	/ 2.10
Pressure [N/mm <sup>+</sup> ] / Safety in T_max	429.53 /	1.89 384	ti share hub(Da)'	Pressure [N/mm <sup>a</sup> ] / Safety in T_max	429.53 /	1.89 384.50 /	4.10 429.53	/ 3.14
			Bigger outer diameter http://www.and.output.position(a_): Axial distance between load in- and output position(a_): Hub width(c):					
Pressure (Nimm?) / Safety in T_max	420 54 1	1.89 384	Axial distance between load in- and output position(a <sub>0</sub> ): Hub width(c):	Pressure [Nimm] / Safety in T_max	429.53 /	1.89 384.50 /	4.10 429.53	V 3/14
Pressure (Nimm?) / Safety in T_nom, Pressure (Nimm?) / Safety in T_nom,	429.53 /	1.30		Pressure (Mmm <sup>*</sup> ) / Safety in T_nom:		1.26 384.60 /	2.73 429.53	
			Smaller outer diameter biology	Result:	Shaft			
Result:			Maximum load peak torqua(Tmax); Number of load peaks(NL); Smaller ordioad peaks(NL);					

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#### Calculation Example: Parallel Key According to DIN 6892 0.1

#### 0.1.1Start the Calculation Module

Please login with your username and your password. Select the module 'Parallel key' through the tree structure of the project manager by double-clicking on the module or clicking on the button 'New calculation'.

#### 0.1.2 **Calculation Example**

A strength calculation for the following shaft-hub-connection is required (see also DIN 6892, Example E.2). Enter the following values into the input fields:

Shaft diameter	= 60 mm
Application factor	= 1.75
Outer diameter hub $D_2$	= 120 mm
Calculation method	= B
Operation nominal torque $T_{nom}$	= 1.950 Nm
Min. frictional torque $T_{Rmin}$	= 1.250 Nm
Max. load peak torque $T_{max}$	= 3.900 Nm
Load peaks $N_L$	= 500
Material shaft	= C45 hardened and tempered
Material hub	= 34CrNiMo6 hardened and tempered
Parallel key	= DIN 6885.1 AB 18 x 11 x 100
Material parallel key	= 34CrNiMo6 hardened and tempered
Standard length parallel key	= 100 mm
Number of parallel keys	= 1
Inpute Mathad R.	

# Inputs Method B:

Kind of load	= Alternating torque with a slow torque increase
Changes of load direction	$= 10^{6}$
Max. reverse torque $T_{maxRev}$	= 3900 Nm
Small outer diameter $D_1$	= 120 mm
Large outer diameter $D_2$	= 120 mm
Width of hub within $l_{tr}$	= 91 mm
Axial distance $a_0$	= 45.5 mm
Chamfer/radius on shaft keyway edge $s_1$	= 1.0  mm
Chamfer/radius on shaft keyway edge $s_2$	= 1.0  mm

#### Start the Calculation 0.1.3

Please start to enter the values into the input field. All important calculation results will be calculated during every input and will be displayed in the result panel. A recalculation occurs after every data input. During the input of the values it can happen that the results will be marked in red. Nevertheless, please continue to input the data as usual. For the load peaks  $N_L$ , please select the entry 'User defined input' from the listbox. Enter the the value '500' into the adjacent input field.

🕗 eassistant - GWJ-Technology	- Parallel key calculation DIN 6892	- Mozilla Firefox	_ 🗆 ×
🗳 Open 😽 Save 🗖 Iocal	📓 Calculate 🛛 Undo 🗠 F	Redo 😡 Report 🙀 Options 🤣 Help	
Input of shaft diameter in mm			
Diameter of shaft (d)	60.0	Operation nominal torque (T_nom) [Nm]	1950.0
Application factor (K_A)	? 1.75	min. frictional torque (T_Rmin) [Nm]	1250.0
Outer Ø hub (D2) [mm]	120.0	Max. load peak torque (T_max) [Nm]	3900.0
Calculation method	<ul> <li>Input data method B</li> </ul>	Load peaks (N_L) User defined input 💌	500.0

Figure 1: Input of the values

# 0.1.4 Calculation Method B

The direction of the torque is reversed and a rough calculation according to Method C is not possible. It is recommended to use the calculation method B. Select the calculation method B from the listbox and click the button 'Input data method B'.

🗳 Open  🐼 Save 🔽 local	🖩 Calculate 🖍 Undo 🗠	Redo 😡 Report 🙀 Options 🤣 Help	
put dialog for the required input	data for the calculation method B		
Diameter of shaft (d)	60.0	Operation nominal torque (T_nom) [Nm]	1950.0
Application factor (K_A)	? 1.75	min. frictional torque (T_Rmin) [Nm]	1250.0
Duter Ø hub (D2) [mm]	120.0	Max. load peak torque (T_max) [Nm]	3900.0
Calculation method	Input data method B	Load peaks (N_L) User defined input 🔻	500.0

Figure 2: Calculation method B

Clicking this button opens the window 'Input data method B' and allows you to enter the other input values.

Input data method B     Kind of load: Alternating torque with a slow torque increase.	•	,N	
Changes of load direction (N_W) 10^6 Change	3900.0		
Small outer diameter of stepped hub (D1) [mm]	120.0	a <sub>0</sub>	
Big outer diameter of stepped hub (D2) [mm]	120.0	Willing w	
Width of hub with D2 internal I_tr (c) [mm] Axial distance between load in- and output position (a0) [mm]	91.0		\$0 <sup>2</sup>
Chamfer of parallel key take over for chamfer of shaft/hub keywa			
Chamfer or radius on the shaft keyway edge (s_1) [mm] Chamfer or radius on the hub keyway edge (s_2) [mm]	1.0	ltr	
	1	OK Cancel	

Figure 3: Calculation method B

**Hinweis:** If, at a later time, you need to change certain values, then click the button 'Input data method B' and the input mask will open again.

#### Input Values for Shaft and Hub

Specify the material for the shaft and the hub. The material for the shaft is 'C45 hardened and tempered'. The required material for the hub is '34CrNiMo6 hardened and tempered'. Both materials can be selected from the listbox.

Shaft		Hub
Material	C45 hardened and tempere 💌 1.0503 💌	Material 34CrNiMo6 hardened and tr 1.6582 💌
Supporting leng	th (I_tr1) [mm] 🗖 🗍 🗖 🗖 🗖	Supporting length (I_tr2) [mm]

Figure 4: Material selection for shaft and hub

Select the material either from the listbox or click the button 'Material' to open the material database. The database allows you to choose the material. You also get detailed information on the kind of material, hardness factor  $f_H$ , yield point as well as support factor  $f_S$ .

#### Input Values for Parallel Key

The parallel key selection according to DIN 6885 sheet 1 to 3 makes it easier to choose the required parallel key. You can also select the geometry and size of the parallel key. The database also provides the standard lengths of the parallel keys. The dimensions of the parallel key are as follows: DIN 6885.1 AB 18 x 11 x 100

#### Standard Length

In order to define the standard length of the parallel key, select the value '100' from the listbox.

rallel key		Standard length (mm)	100 💌
Parallel key	DIN 6885-1 A 18 x 11 x 100	Supporting length (I_tr3) [mm]	82.0
Material	17CrNiMo6 🔽 1.6587 💌	Number of parallel keys (i_p)	1

Figure 5: Standard length

#### Selection of the Parallel Key Geometry

Click on the button 'Parallel key' to select the shape of the parallel key.

arallel kev	Standard length [mm]	100 🔽
Parallel key DIN 6885-1 A 18 x 11 x 100	Supporting length (I_tr3) [mm]	82.0
Material 17CrNiMo6 🔹 1.6587 💌	Number of parallel keys (i_p)	1

Figure 6: Button 'Parallel key'

The geometry selection shows the suitable parallel key. Select the parallel key geometry 'DIN 6885 sheet 1-8/1968' as well the shape 'AB' from the listbox. Click the button 'OK' to confirm the values.

Selection	of the paral	lel key ge	ometry:	DI	N 6885 BI	att 1 -  8/	1968	Shape: AB 💌
d_min	d_max	b	h	t1	t2	r1		
58	65	18	11	7	4.4	0.6	-	🔲 Own input
65	75	20	12	7.5	4.9	0.8		current Ø d [mm]: 60.0
75	85	22	14	9	5.4	0.8		
85	95	25	14	9	5.4	0.8		For Ø d over [mm]: 58.0
95	110	28	16	10	6.4	0.8		En al dura la facada
110	130	32	18	11	7.4	0.8		For Ø d up to [mm]: 65.0
130	150	36	20	12	8.4	1.2		Width b [mm]: 18.0
150	170	40	22	13	9.4	1.2		rider o fring.
170	200	45	25	15	10.4	1.2		Height h [mm]: 11.0
200	230	50	28	17	11.4	1.2		
230	260	56	32	20	12.4	2		Depth shaft keyway t1 [mm]: 7.0
260	290	63	32	20	12.4	2		Depth hub keyway t2 [mm]: 4.4
290	330	70	36	22	14.4	2		
330	380	80	40	25	15.4	з	-	Chamfer / Radius r1 [mm]: 0.6
380	440	90	45	28	17.4	3	-	

Figure 7: Selection dialog for the parallel key

#### **Selection of Material**

Select the material '34CrNiMo6 hardened and tempered' from the listbox. If you need further information on the material, click the button 'Material' to open the material database.



Figure 8: Material for parallel key

#### Supporting Length and Number of Parallel Keys

The supporting length  $l_{tr}$  is determined automatically from the selected standard length. You can use the listbox to select the number of parallel keys. For our calculation example we specify one parallel key.

Parallel key	DIN 6885-1 AB 18 x 11 x 100	Supporting length (I_tr3) [mm]	91.0
Material	34CrNiMo6 hardened and te 💌 1.6582 💌	Number of parallel keys (i_p)	
laterial	34Chvimos hardened and te 11.6582	Number of parallel keys (I_p)	1

Figure 9: Supporting length and number of parallel key

#### 0.1.5 Calculation Results

All important calculation results, such as the safeties for the operation load or at the maximum load for all three components (shaft, hub and parallel key) or the equivalent pressure will be calculated during every input and will be displayed in the result panel. A recalculation occurs after every data input. Any changes that are made to the user interface take effect immediately. You will get the results for the equivalent pressure and for the pressure at load peak as well as the safety at operation load and the safety at peak load.

Result:	Shaft:		Hub:		Parallel key:	
Pressure [N/mm³] / Safety in T_nom:	432.92 /	0.32	387.54 /	0.86	432.92 /	0.42
Pressure [N/mm³] / Safety in T_max:	432.92 /	1.54	387.54 /	4.06	432.92 /	1.99

Figure 10: Calculation results

In our calculation example the safeties for the shaft, the hub and the parallel key are marked red. That means the minimum safeties are not fulfilled. In addition, you get also an appropriate message in the message window. The parallel key is not suitable for our calculation example.

Figure 11: Message window

#### Minimum Safety: Dimensioning of the Shaft Diameter

Use the automatic dimensioning function (calculator button) in order to determine the shaft diameter. With just one click, the program automatically determines the shaft diameter so that the required minimum safety of '1.2' will be fulfilled. In order to do so, please click the calculator button next to the input field of the shaft diameter.

🗳 Open 🛷 Save 🗖 local 🛛	🖩 Calculate 🖛 Undo 🖙 F	Redo 🔀 Report 🔐 Options 🤣 Help	
alculation of the shaft diameter on	minimum safety		
Diameter of shaft (d)	60.0	Operation nominal torque (T_nom) [Nm]	1950.0
Application factor (K_A)	? 1.75	min. frictional torque (T_Rmin) [Nm]	1250.0
Outer Ø hub (D2) [mm]	120.0	Max, load peak torque (T max) [Nm]	3900.0

Figure 12: Dimensioning button for the shaft diameter

Now the new shaft diameter is determined.

80 00 1-			
🗳 Open 🔊 Save 🗖 local	📓 Calculate 🖍 Undo 🗠	Redo 🕞 Report 🔐 Options 🔗 Help	
put of shaft diameter in mm			
Diameter of shaft (d)	111.88	Operation nominal torque (T_nom) [Nm]	1950.0
Application factor (K_A)	2 1.75	min. frictional torque (T_Rmin) [Nm]	1250.0
Duter Ø hub (D2) [mm]	120.0	Max. load peak torque (T max) [Nm]	3900.0

Figure 13: New shaft diameter

The shaft diameter is now d = 111.88 mm. With this diameter the minimum safety of '1.2' is achieved and the parallel key is suitable for this application. The safety can even be increased by selecting another material.

Result:	Shaft:		Hub	:	Parallel	key:
Pressure [N/mm³] / Safety in T_nom:	116.74 /	1.20	97.53 /	3.40	116.74 /	2.44
Pressure [N/mm²] / Safety in T_max:	116.74 /	5.70	97.53 /	16.15	116.74 /	11.56

Figure 14: Calculation result

Due to the new dimensioning, the shaft diameter is significantly larger now. A new size of the parallel key was determined automatically. Click the button 'Parallel key' and the larger parallel key is displayed automatically.

Selection of the parallel key geometry:		DIN 6885 Blatt 1 - 8/1968			1968	Shape: A	48 <b>-</b>		
d_min	d_max	b	h	t1	t2	r1			
75	85	22	14	9	5.4	0.8	-	🗖 Own input	
85	95	25	14	9	5.4	0.8		current Ø d (mm):	111.88
95	110	28	16	10	6.4	0.8		odnom o d fring.	
110	130	32	18	11	7.4	0.8		For Ø d over [mm]:	110.0
130	150	36	20	12	8.4	1.2		Can (i al un la Inana)	130.0
150	170	40	22	13	9.4	1.2		For Ø d up to [mm]:	130.0
170	200	45	25	15	10.4	1.2		Width b [mm]:	32.0
200	230	50	28	17	11.4	1.2		rinder to printly.	
230	260	56	32	20	12.4	2		Height h [mm]:	18.0
260	290	63	32	20	12.4	2			110
290	330	70	36	22	14.4	2		Depth shaft keyway t1 [mm]:	11.0
330	380	80	40	25	15.4	З		Depth hub keyway t2 [mm]:	7.4
380	440	90	45	28	17.4	3		boparnas nojmaj iz [mmj.	N STR
440	500	100	50	31	19.5	З	-	Chamfer / Radius r1 [mm]:	0.8

Figure 15: New parallel key

# 0.1.6 Documentation: Calculation Report

Use the button 'Report' to generate the calculation report very fast. This report contains the calculation method, all input values as well as the detailed results.



Figure 16: Button 'Report'

The calculation report contains a table of contents. You can navigate through the report via the table of contents that provides links to the input values, results and figures. The report is available in HTML and PDF format. Calculation reports, saved in HTML format, can be opened in a web browser or in Word for Windows.

Bearbeiten Ansicht Chroni	ik Lesezeichen Extras Hilfe	
Calculation resu	ults	
Jsed calculation method	: В	
Duter diameter hub(D):	120.0 mm	
Equivalent torque(T <sub>eq</sub> ):	3412.5 Nm	
quivalent circumference	e force(F <sub>ea</sub> ): 61002.86 N	
Circumference force at lo	ad peaks(F <sub>max</sub> ): 69717.555 N	
hanges of load direction	n factor(f <sub>w</sub> ): 0.316	
.oad distribution factor(k	( <sub>lambda</sub> ); 1.054	
riction factor(K <sub>R</sub> ):	0.744	
oad part factor equivale.	ent(K <sub>puen</sub> ): 1.0	
oad part factor load pea	ak(K <sub>numax</sub> ): 1.0	
Shaft		
Shaft Material name:	C45 hardened and tempered	
Material name: Material number:	C45 hardened and tempered 1.0503	
Material name:		
Material name: Material number:	1.0503 DIN 743, DIN EN 10084, Datenbank FORMAT, Datenbank Stahlwissen NaviMat 3.1, DIN EN 10083-2:1996-10, DIN	
Material name: Material number: Source of data:	1.0503 DIN 743, DIN EN 10084, Datenbank FORMAT, Datenbank Stahlwissen NaviMat 3.1, DIN EN 10083-2:1996-10, DIN 7190:2001-02	
Material name: Material number: Source of data: Kind of material:	1.0503 DIN 743, DIN EN 10084, Datenbank FORMAT, Datenbank Stahlwissen NaviMat 3.1, DIN EN 10083-2:1996-10, DIN 7190:2001-02 Ductil	
Material name: Material number: Source of data: Kind of material: Yield point(R <sub>e</sub> ):	1.0503 DIN 743, DIN EN 10084, Datenbank FORMAT, Datenbank Stahlwissen NaviMat 3.1, DIN EN 10083-2:1996-10, DIN 7190:2001-02 Ductil 370.0 N/mm²	
Material name: Material number: Source of data: Kind of material: Yield point(R <sub>e</sub> ): Support factor (f <sub>s</sub> ):	1.0503 DIN 743, DIN EN 10084, Datenbank FORMAT, Datenbank Stahlwissen NaviMat 3.1, DIN EN 10083-2:1996-10, DIN 7190:2001-02 Ductil 370.0 N/mm² 1.2 1.0	
Material name: Material number: Source of data: Kind of material: Yield point(R <sub>e</sub> ): Support factor (f <sub>s</sub> ): Hardness factor(f <sub>H</sub> ):	1.0503 DIN 743, DIN EN 10084, Datenbank FORMAT, Datenbank Stahlwissen NaviMat 3.1, DIN EN 10083-2:1996-10, DIN 7190:2001-02 Ductil 370.0 N/mm² 1.2 1.0	
Material name: Material number: Source of data: Kind of material: Yield point(R <sub>e</sub> ): Support factor (f <sub>g</sub> ): Hardness factor(f <sub>H</sub> ): Supporting length(l <sub>1tr</sub>	1.0503 DIN 743, DIN EN 10084, Datenbank FORMAT, Datenbank Stahlwissen NaviMat 3.1, DIN EN 10083-2:1996-10, DIN 7190:2001-02 Ductil 370.0 N/mm² 1.2 1.0 ): 84.0 mm 11.0 mm	

Figure 17: Calculation report

You may also print or save the calculation report:

- To save the report in the HTML format, please select 'File'  $\rightarrow$  'Save as' from your browser menu bar. Select the file type 'Webpage complete', then just click on the button 'Save'.
- If you click on the symbol 'Print', then you can print the report very easily.
- If you click on the symbol 'PDF', then the report appears in the PDF format. If you right-click on the PDF symbol, you should see the 'Save Target As' option. Click on that option and you will see the dialog box for saving the report.

# 0.1.7 How to Save the Calculation

When the calculation is finished, you can save it to your computer or to the eAssistant server. Click on the button 'Save'.



Figure 18: Button 'Save'

Before you can save the calculation to your computer, you need to activate the checkbox 'Enable save data local' in the project manager and the option 'Local' in the calculation module. A standard Windows dialog for saving files will appear. Now you will be able to save the calculation to your computer.

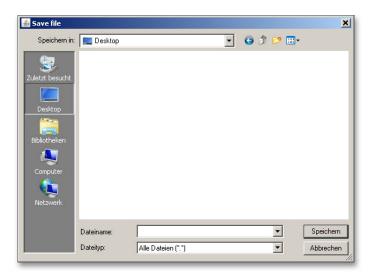


Figure 19: Windows dialog for saving the file

In case you do not activate the option in order to save your files locally, then a new window is opened and you can save the calculation to the eAssistant server. Please enter a name into the input field 'Filename' and click on the button 'Save'. Then click on the button 'Refresh' in the project manager. Your saved calculation file is displayed in the window 'Files'.

Projects	Files
Default	
Project 1	
Project 2	
	·
ilename	
	Save Cancel

Figure 20: Save the calculation

Our manual is improved continually. Of course we are always interested in your opinion, so we would like to know what you think. We appreciate your feedback and we are looking for ideas, suggestions or criticism. If you have anything to say or if you have any questions, please let us know by phone +49 (0) 531 129 399-0 or email eAssistant@gwj.de.