



Calculation of shaped couplings of shafts with hubs

- i Calculation: A = OK; B = Error; C = Error; D = Error
- ii Project information

1.0 Common input data

1.1 Calculation units	SI Units (N, mm, kW...)	1.16 Shaft material (min. tensile strength) [hardness]	
1.2 Transferred power	P 10.00 [kW]	1.17 C...Refined and Alloyed Steel (600) [HB 300-350 HRC 33-38]	<input checked="" type="checkbox"/>
1.3 Shaft speed	n 479.8 [/min]	1.18 Ultimate tensile strength	S_{Umin} 600 [MPa]
1.4 Torque	T 199.01 [Nm]	1.19 Permissible pressure	p_A 200 [MPa]
1.5 Loading conditions, operational parameters		1.20 Permitted stress in shear	τ_A 275 [MPa]
1.6 Power source	Light shock	1.21 Hub material (min. tensile strength) [hardness]	
1.7 Loading conditions	Light shock	1.22 G...Cast iron with spherical graphite (400)	<input checked="" type="checkbox"/>
1.8 Character of operation	Unidirectional	1.23 Ultimate tensile strength	S_{Umin} 400 [MPa]
1.9 Number of start-ups in thousands	100	1.24 Permissible pressure	p_A 135 [MPa]
1.10 Desired service life of the coupling	20000 [h]	1.25 Permitted stress in shear	τ_A 140 [MPa]
1.11 Coupling type, preliminary design of the shaft diameter		1.26 Operational coefficients	
1.12 Coupling design	Fixed connection	1.27 Coupling design factor	K_d 1.0
1.13 Hollow shaft inner diameter	d_h 0.000 [mm]	1.28 Application factor	K_a 1.3
1.14 Desired safety	S_f 1.50	1.29 Fatigue-life factor	K_f 0.5
1.15 Shaft minimum diameter	d_{min} 24.4 [mm]	1.30 Wear life factor	K_w 0.8

A Parallel side keys

2.0 Coupling parameters, key material, dimensional design

2.1 Coupling parameters		2.6 Key material (min. tensile strength) [hardness]	
2.2 Key type	B ... ISO R773	2.7 C...Refined and Alloyed Steel (600) [HB 300-350 HRC 33-38]	<input checked="" type="checkbox"/>
2.3 Number of keys	2	2.8 Ultimate tensile strength	S_{Umin} 600 [MPa]
2.4 Load distribution factor	K_L 0.75	2.9 Permissible pressure	p_A 200 [MPa]
2.5 Total service factor	K_S 2.60 <input checked="" type="checkbox"/>	2.10 Permitted stress in shear	τ_A 275 [MPa]
2.11 Design of coupling dimensions			
2.12 Keys for diameters	6 ~ 50 [mm]		
2.13 Min. shaft diameter	d_{1min} 24.4 [mm]		
2.14 Shaft diameter	d 60.000 [mm]		
2.15 Key	18 x 11 <input checked="" type="checkbox"/>		
2.16 Key width / height	b / h 18 / 11 [mm]		
2.17 Key radius / chamfer	R / s 9 / 0.6 [mm]		
2.18 Parameters of the key groove	t / d_1 7 / 46 [mm]		
2.19 Min. functional key length	L_{fmin} 23.9 [mm]		
2.20 Minimum key length	L_{min} 41.9 [mm]		
2.21 Permitted range of key lengths	50 ~ 200 [mm]		
2.22 Chosen key length	L 50.000 [mm] <input checked="" type="checkbox"/>		

3.0 Strength checks of the coupling

3.1 Check of shaft for torsion		3.5 Check of shaft key groove for deformation	
3.2 Permitted stress in shear	τ_A 275 [MPa]	3.6 Permissible pressure	p_A 200 [MPa]
3.3 Comparative stress	τ 27.1 [MPa]	3.7 Comparative pressure	p 73.5 [MPa]
3.4 Safety	10.16	3.8 Safety	2.72
3.9 Check of key for deformation		3.13 Check of hub key groove for deformation	
3.10 Permissible pressure	p_A 200 [MPa]	3.14 Permissible pressure	p_A 135 [MPa]
3.11 Comparative pressure	p 73.5 [MPa]	3.15 Comparative pressure	p 67.0 [MPa]
3.12 Safety	2.72	3.16 Safety	2.01

B Woodruff's keys

4.0 Coupling parameters, key material, dimensional design

5.0 Strength checks of the coupling

C Straight-sided splines

6.0 Coupling parameters, dimensional design

7.0 Strength checks of the coupling

D Involute splines

8.0 Coupling parameters, dimensional design

9.0 Strength checks of the coupling

Additions section

10.0 Comparative table