

Foreword

The formulation of this National Standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) under the project entitled "Enhancing the Implementation of the AFMA Through Improved Agricultural Engineering Standards" which was funded by the Bureau of Agricultural Research (BAR) of the Department of Agriculture (DA).

This standard has been technically prepared in accordance with PNS 01-4:1998 (ISO/IEC Directives Part 3:1997) – Rules for the Structure and Drafting of International Standards. It provides specifications and proper application of drives using helical gears.

The word “shall” is used to indicate requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted.

The word “should” is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that certain course of action is preferred but not necessarily required.

In the preparation of this standard, the following references were considered:

Browning power transmission equipment. 1975. Catalog number 8.

Baumeister, Theodore (ed.) 1997. Mark’s handbook for mechanical engineers. 10th Edition. Mc Graw Hill Book Company, USA.

Dodge design manual

Faires, V. M. 1969. Design of Machine Elements. Macmillan Company, New York USA.

Horton, H. L. (Ed.) 1984. Machinery’s handbook. 23rd Edition. Industrial Press Inc, New York.

PNS 375:1991, Helical gears for general engineering – Shapes and dimensions.

Shigley, Joseph, E. 1977. Mechanical engineering design. 3rd Edition. Mc Graw Hill Book Company, USA.

**Engineering Materials – Helical Gears for Agricultural Machines
– Specifications and Applications**

1 Scope

This standard establishes specifications and provides sufficient technical data for the proper application of helical gears for agricultural machinery.

2 Reference

The following normative reference contains provisions, which, through reference in this text, constitute provisions of this standard:

PAES 304: 2000, Engineering Materials – Keys and Keyways for Agricultural Machines – Specifications and Applications

3 Application

Helical gears can be used in transmitting motion and power between two shafts in the same or in opposite directions. They can also be used in transmitting linear motion. Helical gears are used for higher speed application due to more quiet operation. For the purpose of this standard, only transmission of power between shafts of opposite directions shall be discussed.

4 Definitions**4.1****helical gear**

cylindrical gear whose tooth traces are helices, it transmits rotational motion and power between two parallel axes (Fig. 1)

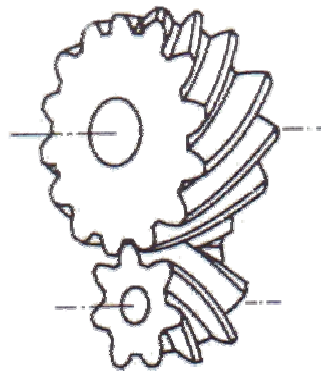


Figure 1 – Helical gear

4.2

gear tooth

each of the projecting parts of a gear which is intended to ensure, by contact with the teeth of another gear, that one gear turns the other

4.3

module

quotient of the circular pitch, expressed in millimeters, to the number π (or the quotient of the diametral pitch, expressed in millimeters, to the number of teeth)

4.4

normal module

quotient of the normal circular pitch (expressed in millimeters) and the number π , where the normal circular pitch is the product of the circular pitch and the cosine of the helix angle

4.5

pitch circle

line of intersection of the pitch cylinder by a plane perpendicular to the axis of the gear (see Fig. 2)

4.6

addendum

radial distance between the addendum circle and the pitch circle (see Fig. 2)

4.7

addendum circle

circle that bounds the outer ends of the teeth (see Fig. 2)

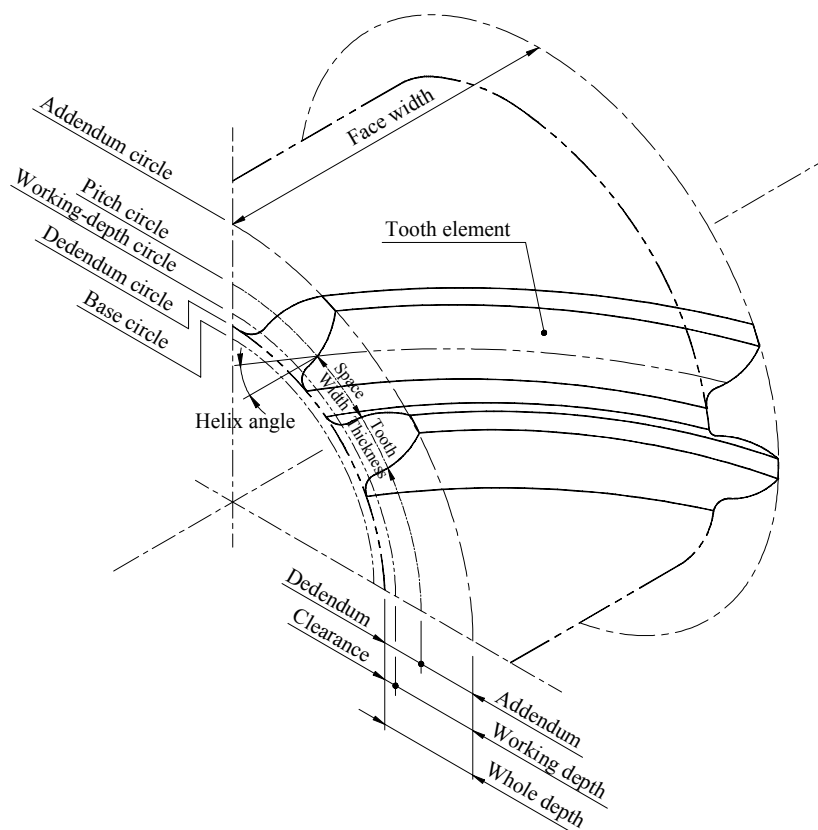


Figure 2 – Nomenclature of helical gears

4.8

dedendum

radial distance between the dedendum circle and the pitch circle (see Fig. 2)

4.9

dedendum circle

line of intersection of the dedendum cylinder by a plane perpendicular to the axis of the gear (see Fig.2)

4.10

clearance

amount by which the dedendum in a given gear exceeds the addendum of its meshing gear (Fig. 2)

4.11

pitch diameter

diameter of the pitch circle

4.12

addendum diameter

diameter of the addendum circle

4.13

dedendum diameter

diameter of the of the dedendum circle

4.14

tooth depth

radial distance between the addendum circle and the dedendum circle

4.15

circular pitch

length of the arc of the pitch circle between two consecutive corresponding points of adjacent teeth

4.16

normal circular pitch

length of the arc, lying between the tooth traces of two consecutive corresponding flanks of a cylindrical normal helix

4.17

tooth thickness

width of the tooth measured along the circular pitch (Fig.2)

4.18**tooth space**

space between teeth measured along the pitch circle (Fig.2)

4.19**backlash**

difference between the tooth space and the tooth thickness

4.20**face width**

width over the toothed part of a gear, measured along a straight line generator of the reference cylinder (see Fig. 2)

4.21**tooth flank**

portion of the surface of a tooth lying between the tip surface and the root surface (Fig. 2)

4.22**pressure angle**

pressure angle at the point where the profile cuts the pitch circle (see Fig. 3)

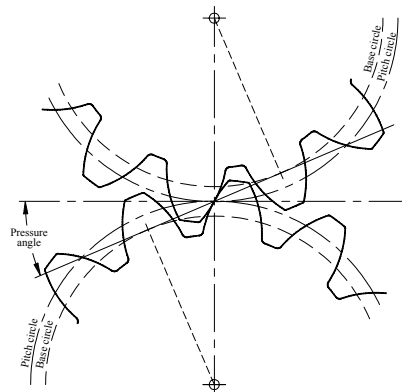


Figure 3 – Pressure angle and base circle

4.23**normal pressure angle**

pressure angle at a point on a tooth trace

4.24**helix**

curve whose tangents are inclined at a constant angle to the axis of the cylinder

4.25

normal helix

in a cylinder on which helix is considered, a helix which is perpendicular to that helix

4.26

helix angle

acute angle between the tooth trace and the generator of any imaginary cylinder or cone coaxial with a gear whose tooth trace is under consideration

4.27

base circle

of an involute cylindrical gear, the "base circle" of the involutes forming the tooth profiles (see Fig. 3)

4.28

tooth profile

the line of intersection of a tooth flank with any defined surface cutting the reference surface

4.29

tooth trace

the line of intersection of a flank with the reference surface

4.30

involute cylindrical gear

a cylindrical gear of which every usable tooth profile is an arc of an involute to a circle (See Fig. 4)

4.31

involute to a circle

a plane curve described by a point on a straight line (the "generating line"), which rolls out without slip on the base circle (Fig. 4)

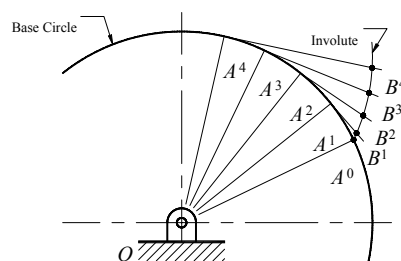


Figure 4 – Construction of an involute curve

5 Classification

Helical gears shall be classified according to its shape into 6 types: A1, B1, C1, A2, B2, and C2 (see Figure 5). A1, B1, and C1 are available as cold-rolled steel while A2, B2, and C2 are available as cast steel.

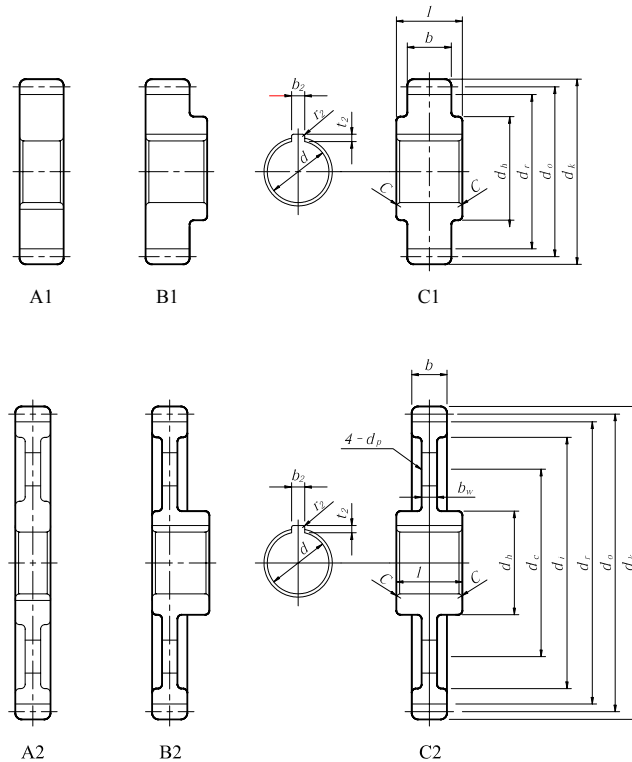


Figure 5 – Helical gear types

6 Materials

Helical gear materials discussed in this standard are of AISI designation C1045 and 4140 (as hot-rolled), its mechanical properties are in accordance with Table 1.

Table 1 – Mechanical Properties of helical gear materials

AISI No.	Ultimate tensile strength, MPa	Brinell hardness number
C1045	586-724	175-215
4140	621-689	185-210

7 Recommended design practices

7.1 Calculation of gear dimensions

Table 2 specifies the formulas for calculating the different dimensions of standard helical gears.

Table 2 – Helical gear calculations

To obtain	Method	Formula
Pitch diameter	Divide the number of teeth by the product of the normal diametral pitch and the cosine of the helix angle	$PD = \frac{T}{NP \times \cos a}$
Outside diameter	Add twice the addendum to the pitch diameter	$OD = PD + 2Add$
Center distance	Divide the sum of the pitch diameters by two	$CD = \frac{PD_1 + PD_2}{2}$
Addendum	Divide 1 by the normal diametral pitch	$Add = \frac{1}{NP}$
Whole depth of tooth	Multiply 2.157 by the normal module	$W = 2.175 \times \text{Normal module}$
Normal tooth thickness at pitch line	Multiply 1.157 by the normal module	$TP = 1.157 \times \text{Normal module}$
Module	Divide the circular pitch by π	$\frac{\text{Circular pitch}}{\pi}$
	Divide the pitch diameter by the number of teeth	$\frac{\text{Pitch diameter}}{\text{Number of teeth}}$
Normal module	Divide the number of teeth by the product of the pitch diameter and the cosine of the helix angle	$\text{Normal Module} = \frac{PD \times \cos a}{T}$

7.2 Power ratings

7.2.1 Power ratings presented in this standard are based on module facewidth, and pressure angle shown in Table 3. For the purpose of this standard, only power ratings of helical gears made of AISI steel designation C1045 shall be presented.

Table 3 – Standard modules and face width

Module, mm/tooth	1.25	1.5	2.0	2.50	3.0	4.0	5.0	6.0	8.0
Face width, mm	16	19	25	32	38	50	63	75	100
Pressure angle, °	20	20	20	20	20	20	20	20	20

7.2.2. Tables 4 to 12 present power ratings for helical gears with 30° helix angle. Helical gears with 30° helix angle have a higher power rating as compared to helical gears with 45° helix angle.

7.2.3 Tables 13 to 21 present power ratings of helical gears with 45° helix angle. This type of helical gear is used for parallel gears and can operate at 90°, however its power is limited and is used for transmission of motion only.

Table 4 – Power ratings* for 30° helix angle, 1.25 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	89	132	174	215	408	740	1,015	1,246	1,444	1,615	1,764	1,787	2,011	2,115	2,208	2,292	2,368	2,438
12	100	148	195	241	455	817	1,114	1,360	1,568	1,747	1,901	1,916	2,155	2,261	2,356	2,441	2,518	2,588
13	111	164	216	267	501	894	1,210	1,470	1,688	1,873	2,032	2,037	2,292	2,399	2,494	2,580	2,657	2,727
14	119	176	232	286	535	947	1,274	1,541	1,762	1,948	2,107	2,101	2,364	2,470	2,563	2,647	2,722	2,790
15	131	193	253	312	582	1,026	1,375	1,657	1,890	2,085	2,251	2,238	2,518	2,627	2,724	2,810	2,887	2,957
16	141	209	274	337	626	1,095	1,460	1,751	1,989	2,188	2,356	2,333	2,625	2,734	2,830	2,915	2,992	3,061
17	152	225	295	362	669	1,163	1,541	1,841	2,084	2,286	2,455	2,421	2,724	2,833	2,928	3,013	3,088	3,156
18	163	241	315	387	712	1,229	1,621	1,928	2,175	2,379	2,549	2,505	2,818	2,926	3,021	3,105	3,179	3,246
19	174	256	335	411	754	1,292	1,695	2,009	2,259	2,464	2,635	2,580	2,903	3,010	3,104	3,187	3,260	3,326
20	185	272	356	436	796	1,354	1,768	2,087	2,340	2,546	2,717	2,653	2,984	3,090	3,183	3,265	3,337	3,402
21	193	283	370	454	826	1,400	1,822	2,145	2,401	2,608	2,779	2,708	3,046	3,152	3,244	3,326	3,398	3,462
22	204	299	390	477	865	1,458	1,888	2,216	2,473	2,681	2,851	2,770	3,116	3,221	3,312	3,392	3,463	3,526
24	225	329	429	524	943	1,569	2,015	2,349	2,609	2,816	2,985	2,885	3,246	3,348	3,436	3,514	3,582	3,643
25	236	345	449	548	982	1,624	2,077	2,414	2,674	2,881	3,049	2,940	3,307	3,408	3,495	3,572	3,639	3,698
27	254	371	482	588	1,046	1,714	2,178	2,518	2,779	2,985	3,153	3,028	3,407	3,506	3,591	3,665	3,731	3,788
28	264	386	501	610	1,081	1,762	2,231	2,572	2,833	3,038	3,204	3,071	3,455	3,552	3,636	3,709	3,773	3,830
30	285	415	538	654	1,151	1,856	2,332	2,675	2,934	3,137	3,300	3,151	3,545	3,639	3,721	3,791	3,853	3,908
32	306	444	575	698	1,219	1,946	2,428	2,772	3,030	3,230	3,389	3,226	3,629	3,721	3,799	3,868	3,927	3,980
33	313	455	588	713	1,243	1,977	2,462	2,807	3,064	3,263	3,422	3,253	3,660	3,751	3,829	3,897	3,956	4,008
35	334	484	625	756	1,309	2,063	2,553	2,897	3,152	3,349	3,505	3,322	3,737	3,826	3,902	3,967	4,024	4,074
36	344	498	642	777	1,341	2,103	2,595	2,939	3,193	3,387	3,542	3,352	3,771	3,859	3,933	3,998	4,054	4,103
40	381	549	706	852	1,452	2,241	2,737	3,077	3,325	3,514	3,662	3,450	3,881	3,964	4,035	4,095	4,148	4,195

* Based on AISI designation C1045, 20° pressure angle and 16 mm average face width.

Table 5 – Power ratings* for 30° helix angle, 1.5 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	152	224	295	364	684	1,220	1,650	2,005	2,301	2,552	2,768	2,774	3,121	3,266	3,396	3,512	3,616	3,711
12	170	251	330	407	760	1,343	1,805	2,179	2,489	2,750	2,972	2,961	3,331	3,478	3,608	3,725	3,829	3,923
13	189	279	366	450	837	1,465	1,955	2,348	2,669	2,937	3,165	3,136	3,528	3,676	3,807	3,923	4,027	4,120
14	203	299	392	482	891	1,548	2,053	2,452	2,776	3,044	3,269	3,224	3,627	3,772	3,899	4,012	4,113	4,203
15	222	327	428	526	969	1,674	2,210	2,631	2,971	3,250	3,485	3,427	3,855	4,004	4,135	4,251	4,354	4,446
16	240	354	463	568	1,041	1,783	2,340	2,772	3,118	3,401	3,636	3,561	4,006	4,154	4,284	4,398	4,499	4,590
17	259	380	497	609	1,111	1,889	2,464	2,906	3,257	3,542	3,778	3,686	4,147	4,293	4,421	4,534	4,634	4,723
18	277	407	531	651	1,181	1,992	2,584	3,035	3,389	3,676	3,912	3,803	4,279	4,424	4,550	4,661	4,759	4,847
19	295	433	565	691	1,248	2,090	2,696	3,154	3,511	3,798	4,034	3,909	4,398	4,541	4,665	4,774	4,871	4,956
20	314	460	599	731	1,314	2,186	2,805	3,269	3,628	3,916	4,150	4,010	4,511	4,652	4,775	4,882	4,976	5,060
21	327	479	623	761	1,363	2,256	2,886	3,354	3,716	4,004	4,239	4,087	4,598	4,739	4,861	4,967	5,060	5,143
22	345	504	656	800	1,426	2,344	2,985	3,457	3,820	4,107	4,340	4,174	4,695	4,834	4,953	5,058	5,149	5,231
24	381	556	721	877	1,550	2,514	3,172	3,650	4,013	4,297	4,526	4,331	4,873	5,007	5,123	5,223	5,311	5,389
25	399	581	753	916	1,611	2,597	3,263	3,743	4,105	4,388	4,615	4,407	4,958	5,090	5,203	5,302	5,388	5,464
27	430	625	808	981	1,713	2,733	3,411	3,893	4,254	4,535	4,759	4,528	5,094	5,223	5,333	5,429	5,513	5,586
28	447	649	839	1,017	1,769	2,806	3,487	3,970	4,329	4,607	4,828	4,586	5,159	5,285	5,394	5,488	5,569	5,642
30	481	698	899	1,088	1,877	2,945	3,634	4,115	4,470	4,743	4,959	4,693	5,280	5,402	5,507	5,597	5,676	5,745
32	516	746	960	1,159	1,984	3,079	3,772	4,252	4,602	4,870	5,081	4,794	5,393	5,512	5,612	5,699	5,775	5,841
33	528	763	981	1,184	2,021	3,125	3,821	4,300	4,650	4,916	5,126	4,831	5,435	5,553	5,652	5,738	5,813	5,879
35	563	811	1,041	1,254	2,124	3,252	3,951	4,427	4,772	5,034	5,239	4,924	5,539	5,653	5,749	5,832	5,904	5,968
36	580	835	1,070	1,288	2,173	3,311	4,011	4,485	4,827	5,086	5,288	4,964	5,585	5,697	5,791	5,873	5,944	6,006
40	641	919	1,174	1,408	2,344	3,512	4,210	4,675	5,007	5,256	5,449	5,094	5,731	5,836	5,925	6,001	6,068	6,126

* Based on AISI steel designation C1045, 20° pressure angle and 19 mm average face width.

Table 6 – Power ratings* for 30° helix angle, 2.0 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	351	518	678	834	1,537	2,661	3,517	4,191	4,736	5,186	5,563	5,476	6,161	6,401	6,613	6,800	6,967	7,116
12	394	579	758	930	1,703	2,916	3,824	4,528	5,091	5,551	5,933	5,808	6,534	6,774	6,984	7,170	7,334	7,482
13	437	642	838	1,027	1,869	3,166	4,119	4,849	5,426	5,894	6,280	6,117	6,882	7,121	7,329	7,512	7,674	7,818
14	469	688	898	1,098	1,985	3,330	4,301	5,036	5,611	6,073	6,452	6,257	7,039	7,270	7,471	7,647	7,803	7,942
15	513	751	979	1,197	2,154	3,590	4,616	5,386	5,984	6,463	6,855	6,629	7,457	7,694	7,899	8,079	8,237	8,378
16	555	812	1,056	1,289	2,306	3,808	4,863	5,646	6,250	6,729	7,119	6,858	7,716	7,949	8,150	8,326	8,481	8,618
17	597	872	1,133	1,381	2,455	4,017	5,098	5,892	6,498	6,977	7,365	7,070	7,954	8,183	8,381	8,553	8,704	8,838
18	639	932	1,209	1,472	2,601	4,219	5,324	6,125	6,734	7,211	7,596	7,269	8,177	8,402	8,596	8,764	8,912	9,043
19	681	991	1,284	1,560	2,741	4,410	5,533	6,340	6,948	7,422	7,803	7,445	8,376	8,597	8,786	8,951	9,095	9,222
20	722	1,050	1,358	1,649	2,880	4,596	5,735	6,546	7,153	7,624	8,001	7,613	8,565	8,781	8,967	9,128	9,268	9,392
21	753	1,093	1,413	1,713	2,981	4,732	5,885	6,700	7,308	7,779	8,154	7,746	8,714	8,928	9,112	9,271	9,410	9,532
22	793	1,151	1,485	1,798	3,112	4,902	6,065	6,882	7,487	7,953	8,323	7,887	8,873	9,083	9,263	9,418	9,553	9,672
24	874	1,264	1,627	1,965	3,364	5,224	6,404	7,219	7,816	8,272	8,632	8,145	9,163	9,365	9,536	9,684	9,813	9,927
25	915	1,321	1,698	2,049	3,489	5,380	6,566	7,380	7,973	8,424	8,779	8,268	9,301	9,499	9,667	9,812	9,938	10,048
27	984	1,417	1,818	2,188	3,695	5,635	6,830	7,641	8,227	8,670	9,016	8,466	9,524	9,716	9,879	10,018	10,140	10,246
28	1,023	1,471	1,884	2,265	3,806	5,768	6,965	7,770	8,350	8,787	9,129	8,558	9,627	9,815	9,974	10,110	10,229	10,333
30	1,100	1,578	2,015	2,418	4,023	6,023	7,219	8,015	8,583	9,008	9,339	8,728	9,819	9,999	10,152	10,282	10,395	10,494
32	1,178	1,684	2,145	2,568	4,233	6,265	7,459	8,244	8,800	9,214	9,535	8,888	9,999	10,172	10,318	10,443	10,551	10,646
33	1,205	1,721	2,191	2,620	4,307	6,351	7,544	8,327	8,879	9,290	9,608	8,949	10,067	10,238	10,383	10,506	10,613	10,706
35	1,282	1,827	2,319	2,767	4,509	6,579	7,767	8,539	9,080	9,480	9,788	9,095	10,232	10,397	10,536	10,655	10,757	10,847
36	1,320	1,878	2,381	2,838	4,604	6,684	7,868	8,633	9,168	9,563	9,867	9,158	10,303	10,465	10,602	10,718	10,818	10,906
40	1,454	2,059	2,600	3,087	4,933	7,036	8,202	8,943	9,456	9,832	10,119	9,359	10,529	10,680	10,807	10,916	11,009	11,090

* Based on AISI steel designation C1045, 20° pressure angle and 25 mm average face width.

Table 7 – Power ratings* for 30° helix angle, 2.5 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	696	1,022	1,334	1,633	2,960	4,985	6,458	7,578	8,458	9,168	9,753	9,474	10,659	11,017	11,328	11,602	11,844	12,059
12	780	1,142	1,488	1,818	3,269	5,441	6,987	8,145	9,044	9,763	10,350	10,002	11,253	11,607	11,914	12,182	12,419	12,629
13	864	1,264	1,643	2,004	3,576	5,882	7,493	8,682	9,595	10,319	10,907	10,491	11,803	12,152	12,454	12,717	12,949	13,154
14	928	1,354	1,757	2,139	3,788	6,163	7,791	8,977	9,879	10,588	11,161	10,692	12,028	12,364	12,653	12,905	13,126	13,322
15	1,014	1,477	1,915	2,329	4,103	6,628	8,339	9,574	10,509	11,240	11,828	11,301	12,714	13,057	13,351	13,607	13,831	14,029
16	1,096	1,594	2,063	2,504	4,381	7,005	8,752	9,999	10,934	11,661	12,243	11,657	13,114	13,449	13,737	13,986	14,203	14,396
17	1,178	1,710	2,209	2,678	4,651	7,364	9,142	10,397	11,330	12,052	12,626	11,984	13,482	13,809	14,090	14,332	14,544	14,730
18	1,260	1,826	2,355	2,850	4,916	7,711	9,514	10,774	11,704	12,418	12,984	12,289	13,825	14,145	14,418	14,655	14,860	15,042
19	1,341	1,940	2,497	3,016	5,168	8,034	9,856	11,116	12,040	12,746	13,304	12,558	14,127	14,440	14,707	14,937	15,137	15,312
20	1,422	2,053	2,638	3,182	5,417	8,348	10,185	11,444	12,362	13,059	13,608	12,813	14,415	14,721	14,981	15,204	15,399	15,570
21	1,481	2,135	2,741	3,303	5,598	8,580	10,431	11,693	12,608	13,302	13,847	13,019	14,646	14,948	15,205	15,425	15,617	15,785
22	1,560	2,245	2,877	3,461	5,830	8,863	10,722	11,979	12,885	13,569	14,103	13,232	14,886	15,180	15,430	15,645	15,831	15,995
24	1,717	2,462	3,144	3,772	6,277	9,397	11,263	12,505	13,391	14,055	14,571	13,618	15,321	15,602	15,839	16,043	16,219	16,374
25	1,796	2,571	3,278	3,926	6,496	9,655	11,523	12,757	13,633	14,287	14,794	13,803	15,528	15,803	16,035	16,234	16,406	16,556
27	1,928	2,753	3,501	4,183	6,856	10,074	11,942	13,162	14,022	14,661	15,154	14,102	15,865	16,130	16,353	16,544	16,709	16,854
28	2,003	2,854	3,625	4,325	7,049	10,289	12,151	13,360	14,208	14,836	15,320	14,236	16,016	16,275	16,493	16,679	16,840	16,980
30	2,151	3,055	3,868	4,603	7,423	10,700	12,547	13,732	14,557	15,165	15,631	14,487	16,298	16,545	16,753	16,931	17,084	17,217
32	2,299	3,254	4,108	4,875	7,783	11,089	12,919	14,080	14,883	15,471	15,920	14,721	16,562	16,798	16,997	17,167	17,313	17,440
33	2,351	3,324	4,192	4,971	7,909	11,227	13,052	14,207	15,004	15,586	16,031	14,813	16,665	16,899	17,095	17,262	17,406	17,531
35	2,498	3,521	4,428	5,237	8,253	11,590	13,396	14,527	15,303	15,868	16,298	15,029	16,908	17,133	17,321	17,481	17,619	17,739
36	2,570	3,616	4,541	5,364	8,414	11,756	13,550	14,669	15,434	15,990	16,413	15,121	17,012	17,232	17,416	17,573	17,708	17,825
40	2,825	3,953	4,939	5,809	8,965	12,308	14,056	15,130	15,857	16,381	16,778	15,411	17,338	17,543	17,714	17,859	17,984	18,092

* Based on AISI steel designation C1045, 20° pressure angle and 32 mm average face width.

Table 8 – Power ratings* for 30° helix angle, 3.0 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	1,180	1,725	2,243	2,736	3,252	8,018	10,209	11,824	13,065	14,047	14,844	14,275	16,059	16,533	16,941	17,298	17,611	17,889
12	1,321	1,926	2,499	3,041	3,582	8,718	10,999	12,655	13,912	14,898	15,693	15,017	16,895	17,360	17,760	18,108	18,413	18,683
13	1,463	2,128	2,755	3,346	3,908	9,391	11,750	13,437	14,704	15,691	16,480	15,703	17,666	18,122	18,513	18,852	19,149	19,411
14	1,569	2,278	2,942	3,566	4,129	9,807	12,175	13,846	15,089	16,049	16,813	15,959	17,953	18,390	18,763	19,086	19,368	19,616
15	1,713	2,483	3,203	3,877	4,465	10,525	13,001	14,735	16,017	17,003	17,784	16,841	18,946	19,389	19,768	20,095	20,380	20,631
16	1,851	2,677	3,446	4,163	4,755	11,089	13,603	15,342	16,617	17,592	18,361	17,331	19,498	19,930	20,297	20,614	20,891	21,133
17	1,988	2,869	3,686	4,444	5,037	11,624	14,168	15,908	17,174	18,135	18,891	17,780	20,003	20,423	20,781	21,088	21,356	21,591
18	2,125	3,060	3,924	4,723	5,312	12,138	14,704	16,441	17,696	18,644	19,386	18,198	20,473	20,883	21,230	21,529	21,788	22,016
19	2,260	3,247	4,154	4,991	5,573	12,615	15,193	16,923	18,164	19,097	19,825	18,565	20,886	21,285	21,622	21,912	22,163	22,383
20	2,394	3,433	4,384	5,258	5,828	13,075	15,663	17,383	18,609	19,528	20,241	18,914	21,278	21,666	21,995	22,276	22,520	22,733
21	2,492	3,568	4,551	5,452	6,015	13,417	16,017	17,736	18,956	19,867	20,574	19,198	21,598	21,981	22,305	22,582	22,821	23,031
22	2,623	3,748	4,771	5,705	6,252	13,829	16,428	18,132	19,335	20,230	20,922	19,486	21,922	22,294	22,609	22,878	23,111	23,314
24	2,883	4,102	5,202	6,200	6,705	14,601	17,188	18,860	20,028	20,891	21,555	20,007	22,508	22,861	23,159	23,413	23,633	23,824
25	3,013	4,279	5,417	6,445	6,926	14,972	17,552	19,207	20,359	21,206	21,857	20,256	22,788	23,133	23,423	23,671	23,884	24,070
27	3,232	4,574	5,774	6,852	7,289	15,573	18,139	19,767	20,892	21,716	22,345	20,661	23,244	23,576	23,854	24,092	24,296	24,474
28	3,354	4,739	5,971	7,074	7,482	15,879	18,428	20,035	21,142	21,950	22,567	20,839	23,444	23,768	24,039	24,270	24,469	24,642
30	3,598	5,063	6,358	7,510	7,853	16,459	18,971	20,539	21,610	22,388	22,980	21,172	23,818	24,126	24,385	24,604	24,793	24,957
32	3,840	5,383	6,738	7,936	8,210	17,006	19,480	21,008	22,046	22,797	23,365	21,483	24,168	24,463	24,709	24,918	25,098	25,254
33	3,924	5,495	6,871	8,084	8,334	17,201	19,665	21,182	22,210	22,953	23,515	21,607	24,308	24,598	24,841	25,047	25,224	25,378
35	4,165	5,811	7,242	8,498	8,672	17,709	20,135	21,615	22,612	23,329	23,871	21,895	24,632	24,911	25,143	25,340	25,509	25,656
36	4,281	5,962	7,419	8,694	8,830	17,940	20,344	21,805	22,786	23,491	24,022	22,017	24,769	25,041	25,269	25,461	25,627	25,770
40	4,696	6,498	8,041	9,378	9,364	18,702	21,024	22,416	23,344	24,006	24,502	22,397	25,197	25,449	25,660	25,838	25,990	26,122

* Based on AISI steel designation C1045, 20° pressure angle and 38 mm average face width.

Table 9 – Power ratings* for 30° helix angle, 4.0 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	2,713	3,935	5,078	6,150	10,642	16,766	20,744	23,537	25,606	27,199	28,465	26,975	30,347	31,066	31,680	32,211	32,674	33,082
12	3,032	4,383	5,641	6,814	11,665	18,112	22,202	25,028	27,098	28,679	29,926	28,238	31,768	32,467	33,063	33,576	34,023	34,416
13	3,353	4,833	6,203	7,474	12,663	19,396	23,574	26,420	28,483	30,047	31,274	29,399	33,074	33,754	34,332	34,828	35,260	35,638
14	3,590	5,161	6,606	7,940	13,320	20,143	24,291	27,079	29,082	30,590	31,767	29,764	33,484	34,130	34,677	35,147	35,554	35,911
15	3,916	5,619	7,180	8,616	14,361	21,542	25,851	28,724	30,776	32,315	33,512	31,337	35,254	35,907	36,459	36,933	37,343	37,702
16	4,225	6,045	7,705	9,224	15,231	22,584	26,916	29,772	31,795	33,304	34,473	32,147	36,166	36,798	37,332	37,789	38,184	38,530
17	4,532	6,466	8,220	9,819	16,067	23,567	27,909	30,740	32,733	34,212	35,352	32,886	36,997	37,609	38,126	38,567	38,948	39,281
18	4,837	6,883	8,730	10,404	16,878	24,501	28,844	31,649	33,610	35,058	36,171	33,573	37,770	38,364	38,864	39,290	39,658	39,979
19	5,135	7,288	9,221	10,965	17,640	25,359	29,690	32,461	34,387	35,803	36,889	34,171	38,442	39,017	39,501	39,913	40,268	40,578
20	5,434	7,691	9,707	11,520	18,383	26,183	30,497	33,234	35,126	36,511	37,570	34,738	39,080	39,638	40,107	40,506	40,849	41,149
21	5,651	7,984	10,062	11,924	18,929	26,801	31,115	33,838	35,713	37,084	38,128	35,215	39,617	40,165	40,626	41,018	41,355	41,649
22	5,939	8,370	10,524	12,446	19,608	27,528	31,810	34,494	36,333	37,671	38,690	35,677	40,137	40,669	41,115	41,494	41,821	42,105
24	6,508	9,126	11,424	13,458	20,896	28,876	33,087	35,690	37,458	38,738	39,706	36,512	41,076	41,578	41,998	42,354	42,661	42,927
25	6,793	9,503	11,870	13,956	21,521	29,521	33,696	36,260	37,995	39,247	40,193	36,914	41,528	42,016	42,424	42,770	43,068	43,326
27	7,270	10,129	12,609	14,779	22,539	30,563	34,678	37,181	38,864	40,074	40,985	37,570	42,266	42,733	43,124	43,454	43,738	43,984
28	7,536	10,475	13,012	15,225	23,072	31,082	35,149	37,610	39,260	40,442	41,331	37,848	42,579	43,034	43,413	43,734	44,010	44,249
30	8,062	11,154	13,801	16,092	24,091	32,060	36,033	38,413	39,998	41,129	41,978	38,369	43,165	43,596	43,956	44,260	44,520	44,746
32	8,582	11,820	14,570	16,932	25,061	32,976	36,857	39,161	40,687	41,772	42,583	38,858	43,716	44,126	44,468	44,757	45,004	45,218
33	8,764	12,054	14,838	17,226	25,403	33,307	37,162	39,444	40,953	42,025	42,826	39,060	43,942	44,347	44,683	44,968	45,211	45,422
35	9,278	12,705	15,583	18,035	26,315	34,154	37,920	40,133	41,589	42,620	43,388	39,516	44,456	44,842	45,164	45,435	45,667	45,868
36	9,525	13,016	15,937	18,416	26,735	34,534	38,254	40,431	41,861	42,871	43,624	39,706	44,669	45,047	45,360	45,625	45,852	46,048
40	10,402	14,108	17,165	19,731	28,146	35,774	39,327	41,382	42,721	43,663	44,362	40,292	45,329	45,678	45,967	46,211	46,419	46,599

* Based on AISI steel designation C1045, 20° pressure angle and 50 mm average face width.

Table 10 – Power ratings* for 30° helix angle, 5.0 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	5,252	7,559	9,686	11,654	19,629	29,840	36,099	40,329	43,379	45,682	47,483	44,548	50,117	51,109	34,634	52,673	53,301	53,851
12	5,859	8,402	10,732	12,873	21,422	32,071	38,441	42,679	45,703	47,968	49,729	46,478	52,288	53,247	36,038	54,753	55,355	55,882
13	6,470	9,246	11,772	14,079	23,160	34,184	40,631	44,861	47,850	50,074	51,793	48,248	54,279	55,206	37,326	56,658	57,237	57,742
14	6,918	9,853	12,506	14,916	24,267	35,347	41,692	45,803	48,684	50,814	52,454	48,722	54,812	55,688	37,617	57,056	57,600	58,075
15	7,539	10,713	13,570	16,155	26,098	37,699	44,257	48,473	51,411	53,576	55,238	51,218	57,620	58,504	39,498	59,880	60,427	60,904
16	8,122	11,503	14,528	17,249	27,580	39,372	45,916	50,078	52,957	55,069	56,683	52,434	58,988	59,840	40,370	61,165	61,690	62,147
17	8,698	12,280	15,464	18,313	28,997	40,939	47,453	51,555	54,375	56,433	58,001	53,539	60,232	61,054	41,162	62,330	62,835	63,275
18	9,272	13,049	16,386	19,356	30,361	42,422	48,896	52,935	55,696	57,702	59,226	54,567	61,388	62,182	41,898	63,413	63,899	64,322
19	9,830	13,791	17,270	20,350	31,635	43,771	50,189	54,160	56,859	58,813	60,293	55,454	62,386	63,153	42,530	64,340	64,809	65,216
20	10,387	14,528	18,143	21,329	32,870	45,063	51,420	55,323	57,963	59,867	61,305	56,297	63,335	64,077	43,132	65,224	65,676	66,068
21	10,792	15,064	18,780	22,043	33,782	46,042	52,378	56,249	58,858	60,737	62,154	57,021	64,149	64,878	43,658	66,003	66,446	66,831
22	11,328	15,764	19,603	22,957	34,898	47,166	53,426	57,224	59,773	61,603	62,980	57,702	64,914	65,620	44,139	66,707	67,135	67,506
24	12,381	17,131	21,196	24,715	37,001	49,240	55,342	58,997	61,432	63,170	64,472	58,929	66,295	66,958	45,007	67,977	68,377	68,724
25	12,907	17,808	21,981	25,577	38,016	50,230	56,254	59,843	62,225	63,921	65,190	59,522	66,963	67,606	45,428	68,595	68,983	69,319
27	13,785	18,932	23,277	26,995	39,665	51,827	57,727	61,212	63,512	65,144	66,361	60,496	68,058	68,672	46,122	69,615	69,985	70,305
28	14,272	19,547	23,979	27,755	40,515	52,607	58,418	61,834	64,082	65,674	66,860	60,898	68,510	69,107	46,402	70,022	70,381	70,691
30	15,230	20,751	25,345	29,227	42,133	54,072	59,711	62,997	65,148	66,665	67,793	61,651	69,357	69,922	46,927	70,787	71,125	71,417
32	16,175	21,927	26,669	30,644	43,663	55,440	60,917	64,082	66,144	67,594	68,670	62,362	70,158	70,694	47,426	71,514	71,834	72,111
33	16,506	22,338	27,132	31,141	44,206	55,940	61,371	64,502	66,538	67,969	69,029	62,662	70,495	71,023	47,641	71,830	72,145	72,418
35	17,434	23,480	28,405	32,495	45,636	57,202	62,480	65,502	67,460	68,832	69,846	63,330	71,246	71,749	48,111	72,518	72,818	73,077
36	17,880	24,023	29,006	33,129	46,289	57,761	62,962	65,931	67,850	69,193	70,185	63,603	71,554	72,045	48,302	72,795	73,088	73,341
40	19,448	25,912	31,077	35,298	48,463	59,573	64,502	67,285	69,074	70,320	71,238	64,444	72,500	72,952	48,884	73,641	73,910	74,141

* Based on AISI steel designation C1045, 20° pressure angle and 63 mm average face width.

Table 11 – Power ratings* for 30° helix angle, 6.0 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	8,854	12,650	16,103	19,256	31,652	46,675	55,448	61,199	65,260	68,281	70,616	65,768	73,989	75,248	76,309	77,217	78,002	78,688
12	9,862	14,034	17,798	21,212	34,412	49,955	58,809	64,527	68,526	71,478	73,748	68,452	77,008	78,218	79,237	80,107	80,858	81,512
13	10,875	15,413	19,477	23,137	37,071	53,042	61,937	67,606	71,534	74,416	76,622	70,910	79,774	80,940	81,919	82,753	83,472	84,099
14	11,613	16,395	20,645	24,449	38,712	54,654	63,351	68,827	72,592	75,339	77,432	71,477	80,411	81,509	82,429	83,212	83,886	84,473
15	12,643	17,804	22,369	26,436	41,545	58,165	67,115	72,709	76,537	79,321	81,436	75,057	84,439	85,543	86,468	87,255	87,931	88,520
16	13,601	19,081	23,895	28,157	43,770	60,562	69,441	74,935	78,669	81,373	83,420	76,726	86,316	87,378	88,266	89,020	89,669	90,232
17	14,548	20,334	25,382	29,825	45,886	62,794	71,587	76,976	80,618	83,243	85,226	78,241	88,021	89,043	89,897	90,621	91,243	91,783
18	15,487	21,570	26,840	31,451	47,914	64,899	73,595	78,880	82,432	84,983	86,904	79,648	89,604	90,590	91,412	92,109	92,707	93,226
19	16,398	22,758	28,233	32,995	49,795	66,801	75,383	80,558	84,018	86,495	88,355	80,857	90,964	91,914	92,706	93,377	93,952	94,450
20	17,305	23,933	29,603	34,509	51,613	68,617	77,083	82,150	85,524	87,931	89,735	82,008	92,259	93,176	93,941	94,587	95,141	95,621
21	17,964	24,790	30,604	35,615	52,961	70,009	78,424	83,438	86,767	89,138	90,912	83,014	93,390	94,290	95,039	95,673	96,215	96,685
22	18,833	25,902	31,886	37,017	54,588	71,573	79,856	84,761	88,004	90,307	92,028	83,935	94,426	95,296	96,019	96,630	97,154	97,607
24	20,534	28,060	34,357	39,701	57,634	74,447	82,466	87,160	90,242	92,421	94,043	85,596	96,296	97,110	97,787	98,358	98,846	99,269
25	21,381	29,127	35,569	41,012	59,098	75,816	83,710	88,306	91,315	93,438	95,015	86,403	97,203	97,993	98,648	99,202	99,675	100,084
27	22,791	30,890	37,564	43,160	61,473	78,026	85,720	90,166	93,062	95,098	96,608	87,731	98,698	99,450	100,075	100,601	101,051	101,440
28	23,568	31,849	38,636	44,301	62,681	79,086	86,645	90,994	93,820	95,803	97,271	88,267	99,301	100,031	100,637	101,148	101,584	101,960
30	25,096	33,719	40,713	46,500	64,971	81,074	88,375	92,541	95,235	97,120	98,513	89,274	100,434	101,123	101,695	102,176	102,587	102,942
32	26,596	35,536	42,716	48,609	67,129	82,928	89,987	93,987	96,563	98,360	99,685	90,230	101,508	102,162	102,704	103,159	103,548	103,883
33	27,120	36,172	43,418	49,349	67,899	83,614	90,604	94,557	97,098	98,870	100,175	90,641	101,971	102,614	103,147	103,595	103,977	104,307
35	28,586	37,927	45,333	51,350	69,905	85,321	92,090	95,894	98,331	100,026	101,272	91,541	102,984	103,597	104,103	104,530	104,893	105,206
36	29,287	38,757	46,232	52,282	70,815	86,070	92,729	96,461	98,847	100,505	101,724	91,907	103,395	103,993	104,488	104,903	105,258	105,563
40	31,742	41,630	49,309	55,446	73,822	88,485	94,759	98,242	100,457	101,990	103,114	93,024	104,652	105,202	105,655	106,036	106,361	106,641

* Based on AISI steel designation C1045, 20° pressure angle and 75 mm average face width.

Table 12 – Power ratings* for 30° helix angle, 8.0 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	20,608	29,033	36,491	43,142	67,884	95,177	109,906	119,124	125,436	130,029	133,521	123,094	138,480	140,304	141,833	143,132	144,250	145,223
12	22,891	32,086	40,150	47,280	73,322	101,188	115,867	124,928	131,078	135,527	138,893	127,690	143,651	145,395	146,853	148,090	149,154	150,078
13	25,170	35,109	43,745	51,320	78,509	106,799	121,378	130,270	136,259	140,567	143,815	131,899	148,387	150,056	151,451	152,632	153,647	154,527
14	26,804	37,211	46,174	53,975	81,520	109,447	123,556	132,069	137,764	141,841	144,905	132,624	149,202	150,766	152,071	153,176	154,123	154,945
15	29,130	40,315	49,893	58,188	87,173	116,087	130,516	139,166	144,928	149,042	152,127	139,062	156,445	158,014	159,322	160,428	161,377	162,199
16	31,256	43,061	53,086	61,705	91,379	120,306	134,498	142,929	148,515	152,487	155,458	141,869	159,603	161,106	162,358	163,415	164,321	165,106
17	33,345	45,737	56,175	65,088	95,341	124,207	138,150	146,365	151,780	155,618	158,481	144,414	162,466	163,909	165,108	166,121	166,988	167,738
18	35,409	48,360	59,183	68,364	99,111	127,866	141,556	149,562	154,815	158,528	161,291	146,780	165,127	166,514	167,666	168,638	169,469	170,188
19	37,398	50,864	62,032	71,445	102,570	131,136	144,555	152,350	157,444	161,034	163,700	148,795	167,395	168,728	169,834	170,768	171,565	172,255
20	39,370	53,329	64,820	74,445	105,893	134,247	147,403	154,998	159,943	163,419	165,995	150,719	169,559	170,843	171,908	172,806	173,573	174,236
21	40,806	55,128	66,861	76,650	108,385	136,680	149,707	157,199	162,065	165,480	168,008	152,447	171,503	172,760	173,803	174,681	175,432	176,080
22	42,678	57,433	69,436	79,392	111,312	139,318	152,072	159,367	164,089	167,396	169,841	153,969	173,215	174,427	175,432	176,278	177,001	177,625
24	46,322	61,874	74,354	84,593	116,743	144,132	156,360	163,286	167,745	170,855	173,148	156,714	176,303	177,435	178,371	179,159	179,832	180,412
25	48,126	64,052	76,752	87,115	119,342	146,426	158,409	165,168	169,508	172,529	174,755	158,056	177,812	178,908	179,815	180,577	181,228	181,789
27	51,116	67,637	80,675	91,227	123,541	150,131	161,734	168,235	172,393	175,281	177,404	160,281	180,316	181,358	182,219	182,943	183,560	184,093
28	52,748	69,563	82,753	93,375	125,629	151,855	163,213	169,554	173,600	176,407	178,468	161,149	181,292	182,302	183,136	183,838	184,435	184,951
30	55,938	73,292	86,748	97,487	129,566	155,081	165,976	172,019	175,860	178,518	180,466	162,783	183,131	184,082	184,868	185,528	186,090	186,574
32	59,048	76,889	90,571	101,398	133,254	158,088	168,560	174,333	177,991	180,516	182,364	164,345	184,888	185,788	186,531	187,154	187,685	188,142
33	60,136	78,148	91,914	102,776	134,586	159,228	169,577	175,273	178,878	181,365	183,185	165,038	185,668	186,553	187,283	187,896	188,418	188,868
35	63,149	81,587	95,534	106,452	137,996	161,996	171,966	177,426	180,871	183,243	184,976	166,523	187,338	188,180	188,873	189,455	189,951	190,377
36	64,578	83,199	97,215	108,145	139,521	163,195	172,978	178,323	181,692	184,010	185,701	167,117	188,006	188,826	189,503	190,070	190,553	190,969
40	69,543	88,720	102,909	113,832	144,509	167,013	176,158	181,116	184,227	186,362	187,917	168,916	190,031	190,782	191,401	191,920	192,361	192,741

* Based on AISI steel designation C1045, 20° pressure angle and 100 mm average face width.

Table 13 – Power ratings* for 45° helix angle, 1.25 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	60	89	117	145	277	511	710	882	1,032	1,164	1,281	1,314	1,479	1,563	1,640	1,710	1,774	1,833
12	67	99	131	162	309	566	782	966	1,126	1,265	1,387	1,415	1,592	1,679	1,758	1,829	1,895	1,954
13	74	110	145	180	342	621	853	1,049	1,216	1,362	1,489	1,511	1,700	1,789	1,869	1,942	2,007	2,068
14	80	119	156	193	365	659	901	1,103	1,274	1,422	1,550	1,565	1,761	1,849	1,929	2,000	2,065	2,123
15	88	130	171	211	398	715	974	1,189	1,370	1,525	1,660	1,671	1,880	1,972	2,054	2,128	2,195	2,255
16	95	140	185	228	429	765	1,037	1,260	1,447	1,606	1,743	1,748	1,967	2,059	2,141	2,215	2,281	2,342
17	102	151	199	245	459	814	1,098	1,329	1,521	1,683	1,822	1,820	2,048	2,140	2,222	2,296	2,362	2,422
18	110	162	213	262	489	863	1,157	1,396	1,592	1,757	1,898	1,888	2,124	2,217	2,299	2,372	2,438	2,497
19	117	173	227	279	519	909	1,214	1,458	1,659	1,826	1,967	1,951	2,194	2,287	2,368	2,441	2,506	2,564
20	124	183	240	296	548	955	1,269	1,519	1,723	1,892	2,034	2,010	2,262	2,354	2,435	2,507	2,571	2,629
21	130	191	251	308	569	988	1,310	1,564	1,770	1,941	2,084	2,056	2,312	2,404	2,485	2,557	2,621	2,679
22	137	202	264	324	597	1,031	1,361	1,620	1,828	2,000	2,144	2,108	2,371	2,463	2,543	2,614	2,677	2,734
24	151	223	291	357	653	1,115	1,459	1,725	1,938	2,111	2,255	2,204	2,480	2,570	2,648	2,718	2,779	2,834
25	159	233	305	373	680	1,156	1,507	1,777	1,990	2,164	2,308	2,251	2,532	2,621	2,699	2,767	2,828	2,882
27	171	251	327	401	727	1,224	1,585	1,860	2,076	2,250	2,393	2,325	2,616	2,704	2,780	2,847	2,906	2,959
28	178	261	340	416	752	1,260	1,627	1,904	2,120	2,294	2,436	2,362	2,657	2,744	2,819	2,885	2,944	2,996
30	192	281	366	447	802	1,332	1,707	1,987	2,204	2,377	2,518	2,431	2,734	2,819	2,893	2,957	3,013	3,064
32	206	301	392	478	852	1,401	1,784	2,066	2,283	2,455	2,594	2,495	2,807	2,890	2,961	3,024	3,079	3,127
33	211	308	401	489	869	1,425	1,811	2,094	2,311	2,483	2,622	2,518	2,833	2,916	2,987	3,048	3,103	3,151
35	225	329	426	519	918	1,492	1,884	2,169	2,385	2,555	2,693	2,578	2,900	2,981	3,050	3,110	3,163	3,210
36	232	338	439	534	941	1,523	1,917	2,203	2,419	2,588	2,724	2,604	2,930	3,009	3,078	3,137	3,189	3,235
40	257	374	484	587	1,024	1,631	2,033	2,318	2,531	2,697	2,829	2,690	3,027	3,103	3,168	3,224	3,273	3,317

* Based on AISI steel designation C1045, 20° pressure angle and 16 mm average face width.

Table 14 – Power ratings* for 45° helix angle, 1.5 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	102	151	199	246	466	847	1,163	1,430	1,658	1,856	2,029	2,059	2,316	2,437	2,546	2,644	2,733	2,815
12	114	169	222	275	519	936	1,277	1,561	1,802	2,009	2,188	2,208	2,484	2,607	2,717	2,817	2,907	2,988
13	127	187	247	304	573	1,024	1,388	1,688	1,941	2,155	2,340	2,348	2,642	2,767	2,878	2,978	3,069	3,150
14	136	201	265	326	611	1,085	1,462	1,770	2,026	2,242	2,427	2,424	2,727	2,850	2,959	3,057	3,145	3,225
15	149	220	289	356	665	1,175	1,578	1,904	2,173	2,400	2,593	2,582	2,905	3,032	3,145	3,246	3,337	3,418
16	161	238	313	385	716	1,255	1,675	2,013	2,289	2,520	2,715	2,692	3,029	3,156	3,269	3,369	3,459	3,539
17	174	256	336	414	766	1,333	1,770	2,117	2,399	2,633	2,830	2,795	3,144	3,272	3,383	3,483	3,571	3,651
18	186	275	360	442	815	1,409	1,861	2,217	2,504	2,741	2,940	2,892	3,254	3,380	3,491	3,590	3,677	3,756
19	199	292	383	470	863	1,482	1,947	2,311	2,602	2,840	3,039	2,980	3,353	3,478	3,588	3,685	3,772	3,849
20	211	310	406	498	910	1,553	2,032	2,401	2,696	2,936	3,135	3,065	3,448	3,572	3,681	3,777	3,862	3,938
21	220	323	423	518	945	1,605	2,093	2,468	2,766	3,007	3,208	3,129	3,520	3,644	3,752	3,848	3,932	4,007
22	232	341	445	545	990	1,672	2,171	2,551	2,850	3,092	3,292	3,202	3,602	3,725	3,831	3,925	4,008	4,082
24	257	376	490	599	1,079	1,801	2,318	2,706	3,008	3,250	3,448	3,336	3,753	3,873	3,977	4,067	4,148	4,219
25	269	394	513	626	1,124	1,864	2,389	2,780	3,084	3,325	3,522	3,400	3,825	3,943	4,046	4,135	4,214	4,284
27	290	424	551	672	1,198	1,968	2,506	2,902	3,206	3,447	3,643	3,503	3,941	4,057	4,157	4,245	4,321	4,390
28	302	440	572	697	1,238	2,024	2,567	2,965	3,269	3,508	3,702	3,553	3,997	4,111	4,210	4,296	4,371	4,438
30	325	474	614	747	1,318	2,132	2,685	3,084	3,387	3,624	3,815	3,646	4,102	4,214	4,309	4,392	4,465	4,529
32	349	507	657	798	1,397	2,236	2,797	3,198	3,498	3,732	3,920	3,734	4,201	4,309	4,402	4,482	4,552	4,614
33	357	519	672	815	1,424	2,273	2,836	3,238	3,538	3,771	3,958	3,766	4,237	4,344	4,436	4,516	4,585	4,647
35	381	553	714	865	1,501	2,372	2,942	3,343	3,641	3,872	4,055	3,847	4,327	4,432	4,521	4,598	4,665	4,725
36	393	569	734	889	1,537	2,419	2,991	3,392	3,688	3,917	4,098	3,882	4,367	4,470	4,558	4,634	4,700	4,759
40	434	628	807	975	1,665	2,579	3,155	3,553	3,843	4,065	4,239	3,997	4,497	4,594	4,677	4,749	4,811	4,866

* Based on AISI steel designation C1045, 20° pressure angle and 19 mm average face width.

Table 15 – Power ratings* for 45° helix angle, 2.0 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	236	348	458	565	1,055	1,866	2,509	3,030	3,463	3,826	4,137	4,123	4,638	4,844	5,026	5,189	5,335	5,467
12	264	390	512	631	1,172	2,053	2,739	3,289	3,739	4,114	4,432	4,392	4,942	5,149	5,331	5,494	5,639	5,770
13	293	433	567	697	1,288	2,236	2,962	3,537	4,002	4,387	4,711	4,645	5,225	5,433	5,615	5,777	5,921	6,051
14	315	464	608	747	1,372	2,360	3,105	3,687	4,155	4,538	4,859	4,768	5,364	5,566	5,744	5,900	6,040	6,165
15	345	507	664	814	1,491	2,549	3,340	3,953	4,442	4,842	5,174	5,062	5,695	5,903	6,085	6,245	6,388	6,515
16	373	549	717	878	1,599	2,712	3,531	4,159	4,655	5,058	5,391	5,254	5,910	6,116	6,296	6,454	6,594	6,719
17	402	590	770	942	1,706	2,869	3,713	4,354	4,856	5,261	5,594	5,431	6,110	6,314	6,491	6,646	6,783	6,906
18	431	631	823	1,006	1,811	3,022	3,889	4,540	5,047	5,453	5,786	5,598	6,297	6,499	6,673	6,826	6,960	7,080
19	459	672	874	1,067	1,913	3,167	4,054	4,713	5,223	5,628	5,959	5,747	6,466	6,664	6,835	6,985	7,117	7,234
20	487	712	926	1,129	2,014	3,309	4,213	4,879	5,391	5,796	6,125	5,889	6,626	6,821	6,990	7,136	7,266	7,380
21	508	742	964	1,174	2,087	3,413	4,331	5,003	5,517	5,923	6,251	6,000	6,750	6,944	7,111	7,257	7,385	7,498
22	536	781	1,014	1,234	2,182	3,544	4,475	5,151	5,665	6,069	6,394	6,121	6,886	7,077	7,241	7,384	7,509	7,620
24	591	860	1,113	1,352	2,368	3,794	4,747	5,428	5,940	6,338	6,657	6,343	7,136	7,320	7,478	7,615	7,735	7,841
25	619	900	1,163	1,411	2,460	3,916	4,878	5,561	6,071	6,467	6,783	6,449	7,255	7,436	7,591	7,725	7,843	7,946
27	666	966	1,247	1,510	2,612	4,115	5,091	5,776	6,284	6,675	6,985	6,619	7,447	7,623	7,774	7,904	8,017	8,117
28	693	1,004	1,294	1,565	2,696	4,221	5,201	5,885	6,389	6,776	7,083	6,699	7,537	7,710	7,858	7,985	8,096	8,194
30	746	1,078	1,386	1,674	2,858	4,423	5,411	6,091	6,588	6,967	7,266	6,849	7,706	7,872	8,015	8,137	8,243	8,337
32	799	1,152	1,479	1,781	3,017	4,617	5,610	6,285	6,775	7,145	7,436	6,989	7,863	8,024	8,161	8,279	8,381	8,470
33	818	1,178	1,511	1,819	3,072	4,685	5,680	6,354	6,842	7,211	7,499	7,042	7,922	8,082	8,217	8,333	8,434	8,523
35	871	1,252	1,602	1,925	3,225	4,869	5,866	6,534	7,014	7,375	7,656	7,171	8,067	8,221	8,352	8,464	8,561	8,646
36	898	1,288	1,647	1,976	3,298	4,954	5,950	6,615	7,091	7,448	7,726	7,227	8,130	8,282	8,410	8,520	8,615	8,699
40	991	1,417	1,804	2,158	3,550	5,243	6,233	6,883	7,343	7,684	7,949	7,405	8,331	8,474	8,594	8,697	8,786	8,864

* Based on AISI steel designation C1045, 20° pressure angle and 25 mm average face width.

Table 16 – Power ratings* for 45° helix angle, 2.5 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	466	686	899	1,105	1,357	3,514	4,638	5,520	6,232	6,818	7,309	7,187	8,085	8,397	8,671	8,913	9,129	9,322
12	522	768	1,005	1,232	1,503	3,850	5,040	5,961	6,695	7,294	7,792	7,619	8,572	8,883	9,155	9,395	9,607	9,798
13	579	851	1,111	1,361	1,648	4,179	5,428	6,381	7,134	7,742	8,244	8,022	9,025	9,334	9,603	9,840	10,049	10,236
14	622	912	1,189	1,455	1,750	4,394	5,666	6,625	7,374	7,974	8,467	8,202	9,228	9,527	9,787	10,015	10,216	10,395
15	680	996	1,297	1,585	1,899	4,736	6,079	7,083	7,863	8,485	8,993	8,688	9,774	10,081	10,346	10,578	10,782	10,964
16	736	1,076	1,399	1,707	2,033	5,022	6,403	7,424	8,209	8,832	9,338	8,987	10,110	10,412	10,672	10,899	11,099	11,276
17	792	1,156	1,501	1,828	2,163	5,296	6,711	7,744	8,533	9,155	9,658	9,262	10,420	10,716	10,972	11,194	11,389	11,562
18	848	1,235	1,602	1,949	2,292	5,562	7,005	8,049	8,840	9,459	9,958	9,520	10,710	11,001	11,251	11,468	11,659	11,827
19	902	1,313	1,701	2,066	2,415	5,812	7,278	8,329	9,119	9,734	10,227	9,750	10,968	11,253	11,498	11,710	11,896	12,060
20	958	1,392	1,799	2,183	2,537	6,055	7,542	8,598	9,386	9,997	10,484	9,967	11,213	11,493	11,733	11,940	12,121	12,281
21	998	1,448	1,871	2,268	2,625	6,234	7,738	8,799	9,588	10,198	10,683	10,140	11,407	11,684	11,921	12,126	12,305	12,462
22	1,052	1,524	1,966	2,380	2,740	6,456	7,974	9,036	9,821	10,424	10,903	10,323	11,614	11,885	12,116	12,316	12,491	12,644
24	1,159	1,675	2,154	2,601	2,961	6,877	8,415	9,474	10,248	10,839	11,304	10,658	11,990	12,250	12,471	12,662	12,828	12,974
25	1,213	1,750	2,248	2,711	3,071	7,082	8,627	9,684	10,453	11,036	11,495	10,817	12,169	12,424	12,641	12,827	12,989	13,132
27	1,304	1,877	2,406	2,895	3,251	7,415	8,971	10,023	10,782	11,355	11,803	11,074	12,459	12,706	12,915	13,095	13,251	13,388
28	1,356	1,948	2,493	2,996	3,348	7,589	9,146	10,192	10,943	11,508	11,949	11,193	12,592	12,834	13,038	13,214	13,367	13,500
30	1,458	2,089	2,667	3,197	3,538	7,921	9,477	10,510	11,244	11,794	12,221	11,414	12,841	13,073	13,269	13,437	13,582	13,709
32	1,560	2,230	2,838	3,395	3,722	8,238	9,789	10,807	11,526	12,061	12,475	11,620	13,073	13,296	13,484	13,645	13,784	13,905
33	1,596	2,279	2,898	3,464	3,786	8,349	9,900	10,915	11,629	12,160	12,570	11,699	13,161	13,382	13,568	13,727	13,864	13,984
35	1,698	2,418	3,068	3,658	3,963	8,646	10,190	11,190	11,889	12,406	12,804	11,889	13,375	13,588	13,766	13,919	14,051	14,166
36	1,748	2,485	3,149	3,751	4,046	8,783	10,322	11,313	12,004	12,514	12,905	11,971	13,467	13,676	13,851	14,000	14,130	14,242
40	1,926	2,725	3,438	4,079	4,333	9,243	10,756	11,714	12,376	12,861	13,231	12,230	13,759	13,954	14,117	14,256	14,376	14,481

* Based on AISI steel designation C1045, 20° pressure angle and 32 mm average face width.

Table 17 – Power ratings* for 45° helix angle, 3.0 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	795	1,167	1,523	1,865	3,387	5,720	7,424	8,724	9,748	10,576	11,258	7,300	12,319	12,739	13,104	13,425	13,709	13,963
12	890	1,304	1,699	2,077	3,742	6,245	8,035	9,381	10,428	11,267	11,953	7,710	13,011	13,426	13,787	14,102	14,381	14,628
13	986	1,443	1,877	2,290	4,094	6,754	8,621	10,003	11,068	11,913	12,601	8,090	13,652	14,062	14,417	14,726	14,998	15,240
14	1,059	1,546	2,007	2,445	4,339	7,079	8,967	10,347	11,400	12,229	12,900	8,247	13,917	14,312	14,652	14,948	15,208	15,438
15	1,157	1,687	2,188	2,662	4,700	7,615	9,600	11,039	12,129	12,984	13,673	8,719	14,713	15,116	15,462	15,763	16,027	16,260
16	1,251	1,821	2,357	2,863	5,019	8,050	10,079	11,533	12,625	13,476	14,157	8,996	15,181	15,575	15,913	16,206	16,462	16,689
17	1,345	1,954	2,525	3,062	5,330	8,467	10,532	11,995	13,086	13,931	14,604	9,250	15,610	15,995	16,325	16,611	16,860	17,080
18	1,439	2,086	2,692	3,259	5,635	8,868	10,964	12,434	13,521	14,358	15,022	9,488	16,010	16,387	16,709	16,988	17,230	17,444
19	1,531	2,216	2,854	3,450	5,926	9,242	11,361	12,833	13,914	14,741	15,396	9,697	16,364	16,733	17,047	17,317	17,553	17,761
20	1,624	2,346	3,016	3,641	6,213	9,606	11,744	13,215	14,288	15,107	15,751	9,897	16,700	17,060	17,367	17,631	17,860	18,062
21	1,691	2,440	3,134	3,779	6,422	9,874	12,030	13,504	14,576	15,390	16,030	10,056	16,970	17,326	17,628	17,888	18,115	18,313
22	1,781	2,566	3,290	3,961	6,689	10,203	12,368	13,837	14,898	15,701	16,330	10,223	17,251	17,598	17,893	18,146	18,366	18,559
24	1,961	2,814	3,597	4,318	7,204	10,823	12,999	14,452	15,490	16,270	16,877	10,524	17,760	18,091	18,372	18,612	18,820	19,003
25	2,051	2,939	3,750	4,495	7,457	11,122	13,301	14,745	15,772	16,541	17,137	10,668	18,003	18,327	18,601	18,835	19,038	19,216
27	2,203	3,147	4,006	4,790	7,873	11,608	13,789	15,218	16,228	16,978	17,559	10,902	18,397	18,709	18,973	19,199	19,394	19,564
28	2,288	3,264	4,148	4,953	8,096	11,859	14,034	15,450	16,446	17,184	17,753	11,007	18,574	18,879	19,137	19,357	19,547	19,713
30	2,458	3,494	4,428	5,273	8,529	12,338	14,496	15,885	16,854	17,569	18,117	11,203	18,905	19,197	19,442	19,652	19,833	19,990
32	2,627	3,723	4,703	5,586	8,945	12,790	14,929	16,292	17,235	17,928	18,457	11,386	19,214	19,493	19,728	19,929	20,101	20,252
33	2,686	3,803	4,800	5,696	9,091	12,950	15,085	16,440	17,376	18,062	18,586	11,457	19,334	19,611	19,842	20,040	20,210	20,358
35	2,855	4,029	5,071	6,003	9,489	13,374	15,487	16,815	17,727	18,393	18,899	11,626	19,620	19,885	20,108	20,297	20,460	20,602
36	2,937	4,138	5,201	6,149	9,676	13,567	15,667	16,981	17,881	18,536	19,034	11,698	19,741	20,001	20,219	20,405	20,564	20,703
40	3,230	4,525	5,659	6,662	10,315	14,211	16,259	17,521	18,377	18,995	19,463	11,925	20,124	20,366	20,569	20,741	20,888	21,016

* Based on AISI steel designation C1045, 20° pressure angle and 38 mm average face width.

Table 18 – Power ratings* for 45° helix angle, 4.0 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	1,832	2,672	3,467	4,220	7,464	12,122	15,305	17,619	19,376	20,757	21,870	20,936	23,553	24,205	24,767	25,254	25,682	26,061
12	2,049	2,981	3,859	4,687	8,211	13,154	16,457	18,820	20,594	21,975	23,081	21,992	24,741	25,379	25,927	26,402	26,817	27,184
13	2,269	3,293	4,252	5,153	8,944	14,146	17,549	19,948	21,731	23,107	24,203	22,964	25,835	26,460	26,994	27,455	27,859	28,214
14	2,432	3,522	4,537	5,487	9,439	14,749	18,153	20,522	22,265	23,601	24,658	23,311	26,224	26,821	27,329	27,768	28,150	28,486
15	2,655	3,838	4,938	5,963	10,198	15,812	19,366	21,818	23,612	24,981	26,061	24,582	27,654	28,259	28,774	29,217	29,603	29,943
16	2,868	4,135	5,308	6,397	10,848	16,635	20,233	22,686	24,466	25,816	26,876	25,272	28,431	29,019	29,519	29,948	30,322	30,649
17	3,079	4,429	5,674	6,824	11,477	17,415	21,044	23,492	25,255	26,584	27,623	25,904	29,142	29,713	30,198	30,614	30,975	31,292
18	3,290	4,722	6,036	7,245	12,090	18,162	21,813	24,251	25,994	27,303	28,321	26,491	29,803	30,359	30,829	31,233	31,583	31,889
19	3,497	5,007	6,387	7,652	12,670	18,852	22,513	24,935	26,655	27,940	28,937	27,006	30,381	30,922	31,378	31,769	32,108	32,404
20	3,704	5,292	6,735	8,054	13,237	19,517	23,184	25,587	27,284	28,546	29,522	27,494	30,931	31,456	31,900	32,279	32,607	32,894
21	3,854	5,498	6,989	8,347	13,653	20,013	23,691	26,089	27,776	29,027	29,992	27,896	31,383	31,901	32,338	32,711	33,033	33,315
22	4,055	5,772	7,322	8,729	14,176	20,606	24,275	26,648	28,309	29,536	30,479	28,298	31,835	32,339	32,763	33,124	33,437	33,710
24	4,453	6,310	7,974	9,473	15,176	21,713	25,354	27,673	29,281	30,460	31,363	29,024	32,653	33,129	33,530	33,871	34,166	34,422
25	4,652	6,579	8,298	9,841	15,664	22,245	25,868	28,162	29,744	30,901	31,785	29,373	33,044	33,509	33,899	34,231	34,517	34,767
27	4,987	7,028	8,837	10,450	16,461	23,106	26,699	28,950	30,492	31,615	32,469	29,939	33,682	34,128	34,502	34,820	35,094	35,332
28	5,174	7,277	9,133	10,783	16,883	23,541	27,105	29,324	30,840	31,940	32,775	30,186	33,959	34,394	34,758	35,067	35,334	35,565
30	5,546	7,768	9,714	11,433	17,694	24,366	27,868	30,027	31,490	32,547	33,347	30,646	34,477	34,891	35,237	35,530	35,782	36,002
32	5,914	8,252	10,283	12,066	18,470	25,141	28,582	30,682	32,096	33,114	33,882	31,078	34,963	35,357	35,687	35,966	36,206	36,414
33	6,044	8,421	10,483	12,288	18,742	25,418	28,842	30,925	32,326	33,333	34,091	31,251	35,158	35,547	35,872	36,147	36,384	36,589
35	6,409	8,896	11,038	12,901	19,476	26,137	29,500	31,528	32,885	33,856	34,585	31,652	35,608	35,981	36,292	36,555	36,780	36,976
36	6,586	9,125	11,303	13,192	19,817	26,462	29,792	31,792	33,126	34,080	34,795	31,820	35,797	36,162	36,466	36,723	36,943	37,134
40	7,215	9,929	12,228	14,202	20,971	27,532	30,738	32,638	33,895	34,789	35,456	32,344	36,387	36,724	37,005	37,243	37,446	37,622

* Based on AISI steel designation C1045, 20° pressure angle and 50 mm average face width.

Table 19 – Power ratings* for 45° helix angle, 5.0 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	3,556	5,154	6,647	8,046	13,891	21,814	26,935	30,518	33,164	35,199	36,813	34,853	39,209	40,123	40,904	41,577	42,165	42,682
12	3,973	5,740	7,382	8,912	15,219	23,554	28,814	32,436	35,082	37,099	38,688	36,473	41,032	41,920	42,677	43,328	43,895	44,393
13	4,393	6,328	8,116	9,773	16,516	25,214	30,582	34,226	36,861	38,855	40,417	37,961	42,706	43,570	44,303	44,933	45,480	45,960
14	4,704	6,757	8,642	10,381	17,367	26,175	31,500	35,067	37,623	39,545	41,043	38,422	43,225	44,045	44,739	45,334	45,851	46,303
15	5,131	7,355	9,392	11,262	18,720	27,985	33,515	37,189	39,807	41,768	43,291	40,447	45,503	46,331	47,032	47,632	48,152	48,607
16	5,534	7,912	10,076	12,054	19,847	29,329	34,884	38,533	41,114	43,035	44,521	41,485	46,670	47,472	48,149	48,728	49,229	49,667
17	5,935	8,461	10,748	12,828	20,931	30,595	36,159	39,776	42,316	44,197	45,647	42,431	47,735	48,511	49,165	49,724	50,207	50,629
18	6,335	9,006	11,412	13,590	21,981	31,798	37,360	40,941	43,439	45,281	46,695	43,310	48,724	49,476	50,110	50,650	51,116	51,522
19	6,724	9,534	12,051	14,320	22,968	32,902	38,445	41,982	44,434	46,235	47,613	44,074	49,584	50,312	50,925	51,447	51,897	52,289
20	7,114	10,059	12,685	15,041	23,928	33,962	39,481	42,972	45,380	47,141	48,484	44,800	50,400	51,107	51,700	52,205	52,640	53,019
21	7,398	10,442	13,147	15,567	24,634	34,758	40,275	43,747	46,133	47,874	49,200	45,411	51,087	51,782	52,365	52,861	53,288	53,660
22	7,774	10,945	13,748	16,245	25,512	35,691	41,166	44,586	46,925	48,626	49,918	46,001	51,752	52,426	52,990	53,470	53,883	54,242
24	8,517	11,930	14,919	17,559	27,175	37,422	42,802	46,117	48,364	49,988	51,217	47,068	52,952	53,587	54,119	54,570	54,957	55,293
25	8,889	12,421	15,499	18,206	27,981	38,250	43,582	46,846	49,051	50,640	51,839	47,582	53,530	54,148	54,664	55,102	55,478	55,804
27	9,512	13,236	16,459	19,274	29,296	39,588	44,840	48,025	50,162	51,697	52,851	48,421	54,474	55,065	55,559	55,977	56,336	56,647
28	9,859	13,686	16,983	19,852	29,982	40,253	45,442	48,572	50,667	52,166	53,293	48,776	54,873	55,448	55,928	56,334	56,683	56,985
30	10,544	14,569	18,006	20,975	31,295	41,506	46,571	49,597	51,609	53,043	54,118	49,440	55,620	56,166	56,620	57,005	57,334	57,620
32	11,222	15,436	19,004	22,064	32,544	42,679	47,624	50,552	52,488	53,863	54,891	50,065	56,323	56,842	57,274	57,639	57,952	58,223
33	11,460	15,739	19,353	22,445	32,984	43,104	48,014	50,914	52,829	54,187	55,201	50,323	56,613	57,125	57,550	57,910	58,217	58,484
35	12,129	16,586	20,319	23,491	34,157	44,188	48,983	51,793	53,640	54,945	55,918	50,906	57,269	57,758	58,164	58,506	58,799	59,053
36	12,452	16,991	20,777	23,985	34,697	44,673	49,408	52,174	53,986	55,267	56,219	51,147	57,541	58,018	58,415	58,750	59,036	59,283
40	13,593	18,407	22,368	25,684	36,510	46,258	50,777	53,385	55,082	56,275	57,159	51,895	58,382	58,823	59,188	59,496	59,759	59,987

* Based on AISI steel designation C1045, 20° pressure angle and 63 mm average face width.

Table 20 – Power ratings* for 45° helix angle, 6.0 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	6,012	8,660	11,105	8,913	22,577	34,437	41,746	46,703	50,285	52,995	55,116	51,755	58,224	59,396	60,391	61,246	61,989	62,639
12	6,708	9,628	12,307	9,848	24,650	37,029	44,474	49,445	52,999	55,666	57,742	54,012	60,764	61,897	62,857	63,679	64,392	65,016
13	7,409	10,597	13,502	10,774	26,660	39,486	47,027	51,992	55,508	58,129	60,157	56,083	63,093	64,190	65,116	65,908	66,594	67,193
14	7,923	11,295	14,348	11,417	27,944	40,845	48,273	53,102	56,493	59,005	60,940	56,646	63,727	64,764	65,637	66,383	67,028	67,591
15	8,635	12,283	15,572	12,368	30,060	43,574	51,254	56,208	59,668	62,222	64,184	59,556	67,001	68,046	68,926	69,677	70,325	70,890
16	9,304	13,191	16,674	13,209	31,778	45,523	53,193	58,086	61,479	63,970	65,877	60,981	68,604	69,612	70,459	71,181	71,804	72,346
17	9,966	14,085	17,753	14,027	33,421	47,350	54,989	59,815	63,139	65,568	67,421	62,277	70,061	71,035	71,852	72,547	73,146	73,667
18	10,625	14,969	18,815	14,830	35,004	49,080	56,677	61,431	64,687	67,056	68,858	63,481	71,416	72,357	73,145	73,816	74,392	74,894
19	11,266	15,823	19,835	15,595	36,483	50,655	58,190	62,866	66,050	68,358	70,108	64,521	72,586	73,495	74,256	74,902	75,458	75,941
20	11,906	16,671	20,842	16,349	37,918	52,163	59,631	64,229	67,344	69,594	71,296	65,510	73,699	74,578	75,314	75,938	76,474	76,940
21	12,371	17,288	21,576	16,899	38,976	53,306	60,750	65,311	68,392	70,612	72,289	66,357	74,652	75,516	76,238	76,850	77,376	77,832
22	12,987	18,095	22,526	17,603	40,274	54,620	61,978	66,455	69,466	71,629	73,258	67,155	75,550	76,386	77,084	77,676	78,184	78,624
24	14,198	19,671	24,366	18,959	42,721	57,045	64,224	68,535	71,412	73,468	75,011	68,596	77,171	77,957	78,612	79,166	79,641	80,053
25	14,803	20,452	25,273	19,624	43,902	58,203	65,293	69,528	72,343	74,350	75,853	69,292	77,954	78,717	79,353	79,890	80,351	80,750
27	15,813	21,748	26,771	20,719	45,822	60,072	67,020	71,133	73,853	75,784	77,227	70,434	79,238	79,967	80,574	81,086	81,525	81,905
28	16,373	22,458	27,583	21,306	46,813	60,986	67,831	71,865	74,523	76,408	77,813	70,906	79,770	80,478	81,067	81,564	81,990	82,358
30	17,477	23,848	29,163	22,444	48,701	62,704	69,350	73,232	75,776	77,573	78,910	71,791	80,765	81,435	81,992	82,462	82,864	83,211
32	18,566	25,207	30,696	23,540	50,488	64,309	70,766	74,507	76,948	78,666	79,940	72,627	81,706	82,342	82,870	83,316	83,696	84,025
33	18,947	25,682	31,232	23,924	51,120	64,895	71,299	74,999	77,410	79,105	80,362	72,979	82,101	82,728	83,248	83,686	84,061	84,384
35	20,017	27,002	32,708	24,972	52,790	66,375	72,602	76,176	78,494	80,119	81,322	73,763	82,983	83,580	84,076	84,493	84,849	85,157
36	20,530	27,629	33,404	25,463	53,554	67,031	73,169	76,680	78,952	80,544	81,721	74,084	83,344	83,928	84,412	84,819	85,167	85,467
40	22,340	29,816	35,807	27,144	56,097	69,161	74,981	78,274	80,393	81,871	82,960	75,073	84,457	84,995	85,439	85,813	86,132	86,408

* Based on AISI steel designation C1045, 20° pressure angle and 75 mm average face width.

Table 21 – Power ratings* for 45° helix angle, 8.0 module helical gears, watts

Number of teeth (Driver)	rpm of driver gear																	
	40	60	80	100	200	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800
11	13,869	19,741	25,044	29,855	48,486	70,475	83,027	91,143	96,821	101,017	104,244	96,784	108,882	110,604	112,054	113,292	114,361	115,293
12	15,437	21,879	27,647	32,842	52,617	75,281	87,902	95,944	101,517	105,607	108,735	100,629	113,207	114,861	116,250	117,433	118,454	119,343
13	17,009	24,004	30,218	35,775	56,585	79,793	92,430	100,378	105,838	109,821	112,855	104,151	117,170	118,759	120,092	121,226	122,202	123,052
14	18,150	25,508	31,994	37,754	58,995	82,087	94,404	102,061	107,282	111,070	113,944	104,902	118,015	119,509	120,760	121,823	122,737	123,532
15	19,751	27,683	34,640	40,790	63,248	87,273	99,926	107,735	113,036	116,869	119,770	110,107	123,870	125,372	126,628	127,695	128,611	129,407
16	21,233	29,643	36,963	43,392	66,540	90,743	103,264	110,916	116,077	119,793	122,596	112,484	126,544	127,987	129,192	130,214	131,091	131,853
17	22,695	31,561	39,223	45,909	69,661	93,969	106,337	113,829	118,853	122,456	125,166	114,642	128,972	130,359	131,517	132,497	133,338	134,068
18	24,144	33,449	41,434	48,360	72,646	97,005	109,211	116,543	121,435	124,931	127,554	116,647	131,228	132,564	133,677	134,620	135,428	136,128
19	25,547	35,262	43,540	50,679	75,407	99,740	111,761	118,928	123,687	127,077	129,615	118,364	133,160	134,447	135,519	136,425	137,201	137,874
20	26,942	37,052	45,611	52,949	78,069	102,348	114,184	121,192	125,825	129,116	131,574	120,001	135,001	136,243	137,276	138,149	138,897	139,544
21	27,957	38,358	47,123	54,611	80,050	104,357	116,109	123,036	127,605	130,843	133,259	121,442	136,623	137,840	138,853	139,708	140,440	141,073
22	29,289	40,046	49,053	56,706	82,423	106,594	118,142	124,909	129,354	132,498	134,838	122,747	138,091	139,266	140,243	141,068	141,773	142,384
24	31,897	43,317	52,763	60,705	86,853	110,693	121,841	128,301	132,517	135,485	137,688	125,101	140,739	141,839	142,752	143,522	144,180	144,748
25	33,192	44,930	54,580	62,654	88,980	112,646	123,605	129,924	134,036	136,925	139,066	126,246	142,027	143,093	143,978	144,723	145,360	145,910
27	35,346	47,593	57,565	65,843	92,424	115,798	126,459	132,560	136,512	139,281	141,328	128,136	144,153	145,169	146,010	146,719	147,324	147,847
28	36,531	49,037	59,163	67,530	94,166	117,298	127,759	133,722	137,575	140,270	142,260	128,891	145,003	145,988	146,804	147,491	148,077	148,584
30	38,856	51,846	62,252	70,775	97,462	120,107	130,190	135,894	139,563	142,121	144,006	130,310	146,599	147,529	148,298	148,945	149,498	149,974
32	41,134	54,571	65,224	73,878	100,562	122,726	132,457	137,925	141,429	143,865	145,657	131,659	148,117	148,997	149,726	150,338	150,860	151,311
33	41,930	55,524	66,266	74,968	101,671	123,702	133,332	138,732	142,188	144,589	146,354	132,245	148,775	149,642	150,359	150,961	151,475	151,918
35	44,151	58,148	69,101	77,905	104,548	126,112	135,423	140,614	143,924	146,218	147,903	133,520	150,210	151,034	151,716	152,288	152,776	153,197
36	45,210	59,386	70,426	79,268	105,847	127,167	136,319	141,408	144,647	146,891	148,537	134,035	150,789	151,594	152,258	152,817	153,292	153,703
40	48,914	63,657	74,953	83,884	110,129	130,552	139,154	143,895	146,897	148,970	150,486	135,606	152,557	153,295	153,904	154,416	154,851	155,226

* Based on AISI steel designation C1045, 20° pressure angle and 100 mm average face width.

7.3 Service factors

Selection of gears is based on type of load and the method of lubrication. Service factors for type of load and type of lubrication are given in Tables 22 and 23 respectively. The service factor is computed as follows:

$$\text{Service factor} = \text{service factor for load} + \text{service factor for lubrication} \dots \dots \dots [\text{Eq. 1}]$$

Table 22 – Service factors for type of load

Hours of operation per day	Uniform load	Light shock	Heavy shock
8-10	1.0	1.2	1.4
11-16	1.1	1.3	1.5
17-24	1.2	1.4	1.6

Table 23 – Service factors for type of lubrication

Type of lubrication	Service factor
Intermittent	0.7
Grease	0.4
Oil, drip	0.2
Oil, bath	-

7.4 Minimum number of teeth

The minimum number of teeth to mesh with another gear is shown on Figure 6.

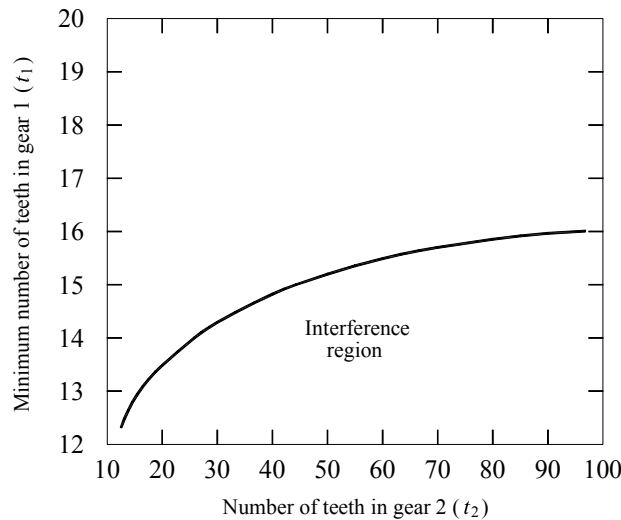


Figure 6 – Minimum number of teeth for 20° full-depth

7.5 Gear ratio

7.5.1 Gear ratio is the ratio between the number of teeth of the driven and the driver gear (see Equation 2).

$$\text{Gear ratio} = \frac{t_2}{t_1} \dots \dots \dots [\text{Eq.2}]$$

Where: t_2 = number of teeth of the driven gear
 t_1 = number of teeth of the driving gear

7.5.2 Hunting tooth gear ratio

7.5.2.1 When using a hunting tooth gear ratio, a particular tooth in the pinion must mesh once with every tooth on the meshing gear when the pinion has completed as many revolutions as the number of teeth in the meshing gear. This is done in order to distribute the wear more evenly.

7.5.2.2 In a hunting tooth gear ratio, the teeth in a pair of meshing gears are such that they do not have a common divisor. Hunting tooth gear ratios are obtained by having the sum of the teeth in each pair equal to a prime number.

7.6 Design power

The required power is computed as follows:

$$\text{Design power} = \text{Power to be transmitted} \times \text{service factor} \dots\dots\dots[\text{Eq. 3}]$$

7.7 Center distance

Desired center distance given the module and speed ratio can be computed using the following equation:

$$\text{Center distance} = \frac{\text{module}(t_1 + t_2)}{2} \dots\dots\dots[\text{Eq. 4}]$$

8 Markings

The following information shall be marked on the gear and /or its packaging:

- a) Type
- b) Module
- c) Number of teeth
- d) Helix angle
- e) Manufacturer's name and/or its trademark and address

9 Safety

9.1 Enclosing the drive with a cover is recommended for safety and to avoid foreign materials from getting in contact with the drive.

9.2 Make drive inspection on a periodic basis. Inspect gears for wear and tear, for quality of lubricant, and for its alignment. Tightness of keys and setscrews should also be inspected periodically.

9.3 Use gears with proper markings.

9.4 Use proper keys as specified in PAES 304:2000 Keys and Keyways for Agricultural Machines.

Annex A
(informative)

Example of helical gear drive selection

A.1 Given parameters

A drive is desired for 1200 W, 200 rpm driver shaft and a 100 rpm driven shaft to operate for 8 to 10 h/day and at a center distance of approximately 100 mm, with heavy shock load and with grease lubrication.

A.2 Speed ratio

The speed ratio is computed as

$$\text{Speed ratio} = \frac{n_1}{n_2}$$

where:

n_1 = rpm of driver gear

n_2 = rpm of driven gear

$$\text{Speed ratio} = \frac{n_1}{n_2} = \frac{200}{100} = 2.0$$

A.3 Service factor

From Tables 22 and 23, the service factor for load and lubrication are 1.4 and 0.4 respectively. Thus, the service factor is computed as:

$$\text{Service factor} = 1.4 + 0.4 = 1.8$$

A.4 Design power

The design power is computed as:

$$\text{Design power} = 1200 \text{ W} \times 1.8 = 2160 \text{ W}$$

A.5 Module and number of teeth of driving gear

A.5.1 Selection of the module and number of teeth shall be based on the design power of the drive, the gear with the next higher power rating to the design power can be considered suitable for the drive (assuming an allowable 10% deviation of the design power to the power rating).

A.5.2 Given a driving gear rpm of 200 and the design power, a gear with a power rating that surpasses the design power can be selected by scanning through Tables 4-12 for helical gears with 30° helix angle. Table A.1 presents the gears that are suitable for the drive based on power

Table A.1 – Summary of gear selection data

	Number of teeth		Module	Power rating, watts	Center distance, mm
	Driver	Driven			
1	36	72	1.5	2,173	81.00
2	40	80	1.5	2,344	90.00
3	16	32	2.0	2,306	48.00

A.6 Number of teeth of driven gear

The number of teeth of the driven gear is computed using the following equation (see Table A.1 for computed values):

$$\text{Gear ratio} = \frac{t_2}{t_1}$$

where: t_2 = number of teeth of the driven gear

t_1 = number of teeth of the driver gear

Gear ratio = speed ratio

A.7 Center distance

The center distance can be computed as follows (see Table A.1 for computed values):

$$\text{Center distance} = \frac{\text{module}(t_1 + t_2)}{2}$$

A.8 Gear selection

Since the requirement for center distance is approximately 100 mm, the most suitable for the drive is a gear of module 1.5 and 40 teeth (driving gear) since it conforms to both the design power and the requirement for the center distance.