Volume 3

Rudolf Och

SPLINES
STANDARDS AND CALCULATION

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The author

Graduate Engineer (Dipl. Ing., FH) Rudolf Och was born in Bamberg, Germany in 1951. After graduating in mechanical engineering he founded FRENCO GmbH in Nuremberg, Germany in 1978. In the beginning, the company only engaged in the development and manufacture of spline gauges. Over the years, however, the business was extended to include the full spectrum of gear and spline metrology. This development is supported by numerous inventions.

The author was a member of the American Standards Institute for Splines ANSI and has been Chairman of the German standards committee AA 2.1 since 1993. During the chairmanship, the German term for spline (Passverzahnung) was officially introduced and all relevant German standards were revised. The international standard ISO 4156 was also completely revised under German leadership by the responsible standards committee ISO/TC 14.

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Splines

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Preface

Splines are a difficult technical “marginal area” within drive technology. They are neither addressed during vocational training nor in degree courses. Experts in the matter are accordingly few and far between. There is an undeniable diversity of official spline standards and internal company standards, some of which are incomplete and others plainly wrong. Some, however, do comply with the current state of technology. This book provides an overview of the standards, which is otherwise difficult to obtain.

This book is a compilation of individual documentations, which were compiled over a period of 30 years from the author’s experiences. It was revised as a whole before print and reflects the status quo of standardisation.

Commonly used formulae are described in a simple manner at the end of the book. These formulae only apply to spur gearing without helix angle.

No responsibility is accepted for the accuracy of the information in this book. It must be noted, however, that technical developments are a continuous process and knowledge, standards and rules are subject to constant changes.

June 2008, Rudolf Och

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1. List of Standards (formerly OFS 24)

National and International
Works standards
Modification of standards
Valid and invalid standards

1.1. Involute splines

Standard	Publisher	Content	Version	Note
ASA B 5.15	USA	Involute splines and serrations	1960	Predecessor of ANSI B 92.1
ANSI B 92.1	USA	Involute Splines	1996	
ANSI B 92.1b	USA	Involute Splines Addendum	1996	Amendment
ANSI B 92.2M	USA	Metric Module Involute Splines	1989	Similar to ISO 4156 - 1981
ASAE S 203.12	USA	Rear power Takeoff for agricultural tractors	1994	Similar to DIN 9611, but with different fits
SAE J498	USA	Involute splines		Similar to ANSI B 92.1
ANT 2020	Sulzer	Zoll-Vielkeilverbindungen mit Evolventenflanken	1968	
BS 3550	England	Involute Splines	1963	Similar to ANSI B92.1
BS 6186	England	Involute Splines: Metric module side fit	1981	= ISO 4156 - 1981
BS ISO 4156	England	Involute Splines: Metric module side shift	2006	English version of ISO 4156 - 2005
CSN 01 4952-54	Czech Republic	Involute splines	1981	Pressure angle 30°
DIN 5466-1	Germany	Tragfähigkeitsberechnung von Zahn- und Keilwellen-Verbindungen	2000	
DIN 5466-2	Germany	Tragfähigkeitsberechnung von Zahnwellen- und Keilwellen-Verbindungen nach DIN 5480	2002	Draft version
DIN 5480	Germany	Passverzahnungen mit Evolventenflanken	2006	
DIN 5482	Germany	Zahnnabenprofile- und Zahnwellen-Profile mit Evolventenflanken	1973	Withdrawn
DIN 9611	Germany	Heckzapfwelle	1992	Is ISO 500
01.30.4008	Renault	Cannelures Cylindriques Droites a Flancs en Développante	1984	Pressure angle 20°, with effective tolerances

Standard	Publisher	Content	Version	Note
E22-141	France	Cannelures Rectilignes a flancs en développant	1955	Pressure angle 20°, without effective tolerances
E22-142	France	Cannelures cylindriques droites a flancs en développant	1986	Gauges for E22-141
E22-144	France	Cannelures cylindriques droites a flancs an développant, généralités	1978	The equivalent of ISO 4156 - 1981
E22-145	France	Cannelures cylindriques droites a flancs an développante, vérification	1979	The equivalent of ISO 4156
NF ISO 4156	France	Cannelures cylindriques droites a flancs developpante	2006	French edition of ISO 4156
CTD-STD-1509	GKN-Cardantec	Involute splines	1989	Similar to DIN 5480, but with a 25° pressure angle
Fiat 63350-54	Fiat	Profillehren für Zahn- und Zahnwellenprofile mit Evolventen ASA	1964	
HES A1013-73	Honda	Involute splines	1976	Pressure angle 37.5°, reference to JIS D2001
ISO 500	International	Heckzapfwelle		Previously DIN 9611
ISO 4156	International	Straight cylindrical involute splines	2005	
ISO/DP 8399/2	International	Aéronautique et espace	1986	Excerpt from ISO 4156
JIS B 1602	Japan	Involute serrations	1961	Pressure angle 45°
JIS B 1603	Japan	Straight cylindrical involute splines	1995	= ISO 4156 - 1981 old + excerpts from D 2001
JIS D 2001	Japan	Involute Spline for Automobiles	1959	Withdrawn 1995, partly included in B1603
KHD 0099-40	KHD	Evolventische Vielkeilprofile	1969	
LaN 745	John Deere	Verzahnungsdaten	1990	
N06.030	Hydromatik	Keilwellen-Verbindungen mit Evolventenflanken nach ANSI B92.1a Sonderausführungen	1954	
NSE 506.04	D. Airbus		1968	Similar to E22-141
R18	Rolls-Royce	Tooth control for Involute Splines	1976	Based on B92.1
SMS 1830	Sweden	Bomförband med evolventprofil	1958	Similar to ASA B5.15
SMS 1833-36	Sweden	Bomförband med evolventprofil	1958	DP, pressure angle 30°
ST 2514	Turbomeca	Straight cylindrical involute splines	1980	Extract from E22-145

Standard	Publisher	Content	Version	Note
TGL 5482	East Germany	Zahnnabenprofile- und Zahnwellenprofile mit Evolventenflanken	1979	The equivalent of DIN 5482