Type K lubricating greases

Classification, requirements and testing

DIN 51825

ICS 75.100

Supersedes August 1990 edition.

Schmierstoffe – Schmierfette K – Einteilung und Anforderungen

In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.

Contents

Foreword

This standard has been prepared by Technical Committee *Anforderungen an Schmierfette* of the *Fachausschuss Mineralöl- und Brennstoffnormung* of the *Normenausschuss Materialprüfung* (Materials Testing Standards Committee).

When using this standard, the following should be noted.

a) The aim has been to include in this standard those properties which will enable the user to make a proper choice among type K lubricating greases for the given application.

b) Type K lubricating greases are to be selected as a function of the type, design and size of rolling bearing, and of the service conditions.

c) The assessment of whether a lubricating grease is suitable for use in heavily loaded rolling bearings is rather difficult, since compliance of such grease with the minimum requirements when tested as specified in table 4 of DIN 51350-5 does not necessarily guarantee its suitability for such applications. Numerous tests have shown that test results obtained when using test models cannot entirely be assumed to apply for rolling bearings under actual service conditions.

d) When using lubricating greases containing solid additives, due consideration shall be given to the tribochemical or tribophysical behaviour of the rubbing surfaces.

e) Information on the application of lubricating greases is provided in *GfT-Arbeitsblatt* 3 (Gft Code of practice)*).

*) Issued by the *Gesellschaft für Tribologie e.V.* (German Society for Tribology), Ernststr. 15, 47443 Moers, Germany.

Document comprises 7 pages.

Translation by DIN-Sprachendienst.

In case of doubt, the German-language original should be consulted as the authoritative text.

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Amendments

This standard differs from the August 1990 edition, as follows:

a) NLGI grade 0 has been deleted.

b) Reference is made to a method specified in IP 186/93 (low-temperature torque) and a method of determining the biodegradability as in DIN 51828-2.

c) A reference to ISO 11007 has been included in addition to that made to DIN 51802.

d) Requirements for the oxidation stability as in DIN 51808 and compatibility with standard reference elastomer (SRE) and acrylonitrile-butadien rubber (NBR) as in DIN 53521 and DIN 53538-1 are no longer included.

e) The method specified in DIN 51820-1 has been substituted for that specified in DIN 51814.

f) The standard has been editorially revised and references have been updated.

Previous editions

DIN 51825: 1960-11, 1965-4, 1990-08; DIN 51825-1: 1975-01, 1981-06; DIN 51825-2: 1979-12; DIN 51825-3: 1981-06.

1 Scope

This standard specifies requirements and methods of test for type K lubricating greases of NLGI grades 1 to 4 (see DIN 51818) for use in rolling bearings and plain bearings and on slideways, establishes a system of designating such lubricants and provides information on their application.

2 Normative references

This standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the titles of the publications are listed below. For dated references, subsequent amendments to or revisions of any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

DIN 51350-5	Determination of wear characteristics of consistent lubricants by the Shell four-ball tester
DIN 51502	Designation of lubricants and marking of lubricant containers, lubricating equipment and lubrication points
DIN 51562-1	Viscometry – Determination of kinematic viscosity using the Ubbelohde viscometer – Apparatus and measurement procedure
DIN 51777-2	Testing of mineral oil hydrocarbons and solvents – Determination of water content according to Karl Fischer – Indirect method
DIN 51802	Testing lubricating greases for their corrosion-inhibiting properties by the SKF Emcor method
DIN 51805	Determination of flow pressure of lubricating greases (Kersternich method)
DIN 51807-1	Determination of the behaviour of lubricating greases in the presence of water (static method)
DIN 51811	Testing the corrosive effects of lubricating greases on copper by the copper strip test
DIN 51813	Determination of the solid matter content of lubricating greases (particle sizes above 25 µm)
DIN 51817	Determination of oil separation from lubricating grease under static conditions
DIN 51818	Consistency classification of lubricating greases – NLGI grades
DIN 51820-1	Analysis of lubricating greases by infrared spectrometry – Evaluation of infrared spectra
DIN 51821-1	Testing lubricating grease using the FAG-FE 9 roller bearing wear testing machine – Principles
DIN 51821-2	Testing lubricating grease using the FE 9 type FAG roller bearing wear testing machine – Method A/1500/6000
DIN 51828-1	Determining the biodegradability of lubricants and related products – General
DIN 51828-2	Determining the biodegradability of lubricants and related products by infrared spectrometry
DIN EN ISO 4259	Petroleum products – Determination and application of precision data in relation to methods of test (ISO 4259:1992 + Cor 1:1993)
ISO 2137:1985	Petroleum products – Lubricating grease and petrolatum – Determination of cone penetration

ISO 2176:1995 Petroleum products – Lubricating grease – Determination of dropping point

ISO 3733:1999 Petroleum products and bituminous materials – Determination of water – Distillation method

ISO 11007:1997 Petroleum products and lubricants – Determination of rust-prevention characteristics of lubricating greases

GfT-Arbeitsblatt 3 *Wälzlagerschmierung* (Lubrication of rolling bearings)*)

IP 186/93 Low-temperature torque of lubricating grease**)

3 Concept

Type K lubricating grease

Lubricant intended for use in rolling bearings and plain bearings and on slideways and consisting of a mixture of mineral or synthetic oil and a thickener. It may also contain liquid or solid additives.

4 Classification

Type K lubricating greases are classified as follows.

4.1 Type KP lubricating grease

Lubricating grease containing anti-friction and anti-wear additives for mixed-friction range operation or to increase the load-carrying capacity, and meeting the requirements specified in DIN 51350-5 (see table 4) is designated 'type KP lubricating grease'. Such greases are used, for example, in rolling bearings whose equivalent load[1]), P, exceeds the dynamic load rating, C, by 10 %.

4.2 Type KF lubricating grease

Lubricating grease containing solid additives is designated 'type KF lubricating grease'.

4.3 Type KPF lubricating grease

Lubricating grease containing anti-friction and anti-wear additives and solid additives is designated 'type KPF lubricating grease'.

4.4 Type K synthetic lubricating grease

To designate a synthetic lubricating grease, the relevant symbol given in table 1 of DIN 51502 shall be added.

5 Designation

Lubricating grease shall be designated as shown in the following examples.

EXAMPLE 1:

Designation of a type K lubricating grease of NLGI grade 1 (see table 1), intended for use at a maximum temperature of 100 °C (K; see table 2) and a lower operating temperature of –20 °C (–20; see table 3), conforming to this standard:

Lubricating grease DIN 51825 – K 1 G –20

EXAMPLE 2:

Designation of a type K lubricating grease of NLGI grade 2 (see table 1), intended for use at a maximum temperature of 120 °C as in table 2 (K), and a lower operating temperature of –30 °C, to be tested in accordance with method IP 186/93 (–30 L; see table 3), conforming to this standard:

Lubricating grease DIN 51825 – K 2 K –30 L

See page 1 for *).

**) Issued by the Institute of Petroleum; obtainable from *Beuth Verlag GmbH, AuslandsNormen-Service (ANS)*, 10772 Berlin, Germany.

1) Due consideration should be given to the information provided by the rolling bearing manufacturer.

6 Requirements

Type K lubricating greases shall comply with the requirements specified in table 4. They shall be homogeneous, largely free of air and resistant to worked penetration. When supplied in packaging drums and stored under normal conditions, they shall exhibit no significant bleeding.

Assessment whether a lubricating grease complies with the specifications of this standard is to be based on DIN EN ISO 4259, except for the worked penetration as in ISO 2137 and the minimum operating temperature as in IP 186/93.

Table 1: NLGI grades for lubricating greases

NLGI grade (as in DIN 51818)	Worked penetration measured as in ISO 2137, expressed in 0,1 mm units
1	310 to 340
2	265 to 295
3	220 to 250
4	175 to 205

Table 2: Code letters denoting the maximum operating temperature and the behaviour of lubricating greases in the presence of water

Code letter as in DIN 51502	Maximum operating temperature, in °C (see table 4)	Behaviour in the presence of water Rating*) as in DIN 51807-1
C	+60	0-40 or 1-40
D		2-40 or 3-40
E	+80	0-40 or 1-40
F		2-40 or 3-40
G	+100	0-90 or 1-90
H		2-90 or 3-90
K	+120	0-90 or 1-90
M		2-90 or 3-90
N	+140	To be agreed
P	+160	To be agreed
R	+180	To be agreed
S	+200	To be agreed
T	+220	To be agreed
U	Above +240	To be agreed

*) As the first digit
0 denotes no change
1 denotes a minor change
2 denotes a moderate change
3 denotes a major change

Table 3: Symbols denoting the minimum operating temperature of lubricating greases

Symbol (as in DIN 51502*))	Minimum operating temperature, in °C
–10	–10
–20	–20
–30	–30
–40	–40
–50	–50
–60	–60

*) When tested in accordance with IP 186/93, the code letter L is to be added to the symbol (see example 2 in clause 5).

Table 4: Requirements and testing

Property	Requirements														Testing as in
	C	D	E	F	G	H	K	M	N	P	R	S	T	U	
Behaviour in the presence of water Rating as in DIN 51807-1	0–40 1–40	2–40 3–40	0–40 1–40	2–40 3–40	0–90 1–90	2–90 3–90	0–90 1–90	2–90 3–90	To be agreed.						DIN 51807-1
Maximum operating temperature, in °C	60	60	80	80	100	100	120	120	140	160	180	200	220	≥ 240	
Dropping point, in °C	> 90	> 90	> 110	> 110	> 130	> 130									ISO 2176
Testing on FE 9 type FAG roller bearing grease testing machine, Method A/1500/6000 F_{50} for 100 h at test temperature, in °C	No requirement						120	120	140	160	180	200	220	To be agreed	DIN 51821-1 and DIN 51821-2
Minimum operating temperature[1]), in °C		–60		–50		–40		–30		–20		–10			
Flow pressure, in hPa	Up to 1400														DIN 51805
Low-temperature torque															IP 186/93
Starting torque, in mNm	Up to 1000														
Running torque, in mNm	Up to 100														
Rust-prevention characteristics (SKF-Emcor method) Degree of corrosion	Up to 1								To be agreed with the supplier.						ISO 11007 or 51802
Corrosive effect on copper Degree of corrosion	Up to 2 at 60 °C		Up to 2 at 80 °C		Up to 2 at 100 °C		To be agreed with the supplier.								DIN 51811
Solid foreign matter content (particle size above 25 µm), in mg/kg	Up to 20														DIN 51813[2])
Water content, as a percentage by mass	Up to 3,0				Up to 0,4										ISO 3733 DIN 51777-2[3])
Bleeding, as a percentage by mass	As declared by the supplier.														DIN 51817
Thickener	Type and quantity as declared by the supplier.														DIN 51820-1
Base oil	Type and viscosity at 40 °C and 100 °C as declared by the supplier.														DIN 51562-1

Table 4 (concluded)

Property	Requirements														Testing as in
	C	D	E	F	G	H	K	M	N	P	R	S	T	U	
Biodegradability, as a percentage by mass	80 or higher[4])														DIN 51828-1 and DIN 51828-2
Solid additives	Type and quantity as declared by the supplier.														Test method optional, and to be indicated.
Wear characteristics, in mm	Cap diameter: up to 1,8 mm														DIN 51350-5, method E[5])

[1]) Testing may be carried out in accordance with either IP 186/93 or DIN 51805, with the method used to be specified.

[2]) Applies to lubricating greases not containing any solid additive.

[3]) Testing may be carried out in accordance with either ISO 3733 or DIN 51777-2, with the method used to be specified.

[4]) Applies only to biodegradable greases.

[5]) Applies to type KP lubricating greases.