DO-01-04-09/2.ID.DE.EN

Warnung

Gewindewerkzeuge können durch technisches Versagen oder durch Fahrlässigkeit brechen oder zersplittern und die Gesundheit des Mitarbeitenden gefährden. Befolgen Sie daher die gesetzlichen Sicherheits- und Gesundheitsvorschriften. Zudem ist das Tragen der Schutzbrille unerlässlich.
Das Schleifen von Gewindewerkzeugen verursacht gefährlichen Staub und darf nur unter gewissenhaftesten Sicherheitsrichtlinien verrichtet werden.

Warning

Thread tools can break or shatter either through technical failure or negligence, and can endanger the health of the operator. Always obey the safety and health regulations, also the wearing of safety glasses is compulsory.
The grinding of threading tools causes hazardous particles, and must be performed only under most rigorous safety standards.

Eventuelle Druckfehler technischer Daten oder zwischenzeitlich eintretende Änderungen jeder Art berechtigen nicht zu Ansprüchen.

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DC SWISS GmbH
Graseggerstraße 125
DE-50737 Köln
Tel. +49 221 995 532-0
Fax +49 221 995 532-10
E-Mail: info@dcswiss.de

DC SWISS s.r.l.
Via Canova 10
IT-20017 Rho
Tel. +39 02 669 40 41
Fax +39 02 669 78 50
E-mail: info@dcswiss.it

DC SWISS UK Ltd
Khepera Business Centre
Dore House Industrial Estate
9, Orgreave Road
Sheffield S13 9LQ
Tel. +44 114 2939013

GEWINDEFORMEN – THREAD FORMING

DC SWISS SA
CH-2735 Malleray
Tel. +41 32 491 63 63
Fax +41 32 491 64 64
E-mail: info@dcswiss.ch

DC® THREADING TECHNOLOGY

www.dcswiss.com

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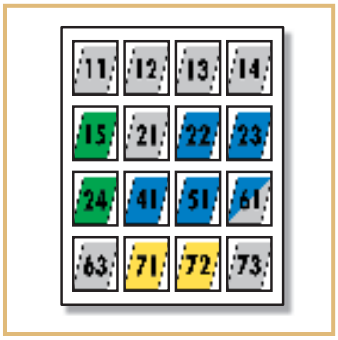
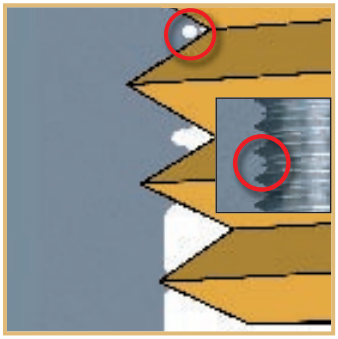


ANWENDUNGSBEREICH
Für sämtliche kaltverformbaren Werkstoffe mit einer Bruchdehnung von mindestens 10% und einer Zugfestigkeit von bis zu 1'150 N/mm², z.B. Stähle, rostfreie Stähle, Reintitan, Aluminium, Kupfer, langspanendes Messing.

RANGE OF APPLICATION
All materials with a minimum of 10% elongation and a tensile strength of up to 1'150 N/mm², e.g. steels, stainless steels, pure titanium, aluminium, copper, long chipping brass, etc.



FORMPROZESS
Die Zahnspitzen und -flanken des Gewindeformers dringen in den verformbaren Werkstoff ein und verdrängen das Material in die Freiräume des Werkzeugprofils. Dadurch entsteht das Gewindeprofil mit der typischen Furche in der Spitze.

FORMING PROCESS
The polished points and flats of the thread former's teeth pierce the ductile material and force the material into the space in the tool profile. This creates the thread profile with its typical groove in the crest.

VORTEILE
- *Höhere Prozesssicherheit, da keine Späne entstehen.*
- *Ein einziges Werkzeug für Durchgangs- und Sacklöcher.*
- *Ideal für tiefe Gewinde.*
- *Gewinde mit höherer Ausreissfestigkeit bei statischer und dynamischer Belastung.*

ADVANTAGES
- Higher process security due to the lack of shavings.
- Only one tool for both, through and blind holes.
- Optimal for deep threads.
- Thread with higher resistance of stripping by static and dynamic load.

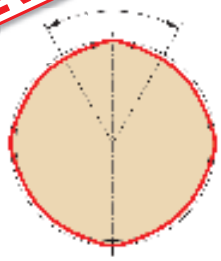
EINSATZEINSCHRÄNKUNG
Das Gewindeformen in dünnwandige Werkstücke ist aus physikalischer Sicht mit der notwendigen Sorgfalt anzuwenden.

APPLICATION RESTRICTION
For physical reasons, thread forming in thin-walled work pieces should be carried out with due care.

AUSREICHEND SCHMIEREN
Beim Verformen von Werkstoffen entstehen erhebliche Reibkräfte. Deshalb muss das Werkzeug stets durch einen Schmierfilm geschützt werden. Ein Riss des Schmierfilms verursacht Kaltverschweissungen, die zum Werkzeugbruch führen können.

ADEQUATE LUBRICATION
The thread forming process generates considerable friction. Therefore the tool must be protected by a film of lubricant. If the supply of lubricant is interrupted, then cold welding will quickly occur, resulting in tool failure.

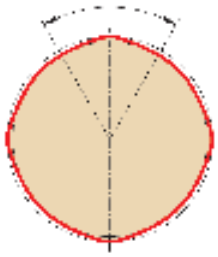
NEW



FS380DL-5 M1 4HX

GEWINDEFORMER FS-DL
Universalgewindeformer mit 4 Druckstollen für kleine Gewinde im Abmessungsbereich Ø ≥ 1 - < 3 mm in alle kaltverformbaren Werkstoffe. Mit «DL»-Verschleiss-schutzschicht mit ausserordentlichen Gleit- und Schmiereigenschaften. Für rostfreie Stähle, Reinkupfer, usw.

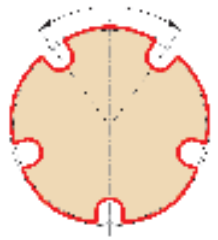
THREAD FORMER FS-DL
Universal thread former with 4 forming lobes for small thread sizes Ø ≥ 1 - < 3 mm, in all cold forming materials. With DC «DL» wear-protective coating with excellent lubrication and sliding properties. For stainless steels, pure copper, etc.



FS380VS-5 M1 4HX

GEWINDEFORMER FS-VS
Universalgewindeformer mit 4 Druckstollen für kleine Gewinde im Abmessungsbereich Ø ≥ 1 - < 3 mm in alle kaltverformbaren Werkstoffe. Mit DC-«VS»-Gleit- und Verschleissschutzschicht.

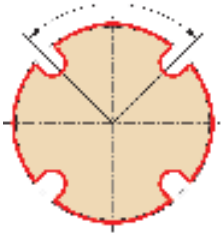
THREAD FORMER FS-VS
Universal thread former with 4 forming lobes for small thread sizes Ø ≥ 1 - < 3 mm, in all cold forming materials. With DC «VS» tool wear protective coating with high sliding properties.



FPS381CN-3 M8 6HX

GEWINDEFORMER FPS-CN
Für Ø ≥ 3 mm, mit breiten Druckstollen, die bei abrasiven Werkstoffen ein progressives Fliessen verursachen. Mit CrN-Beschichtung für besseres Gleiten und höhere Standzeiten in langspanendem Messing und Aluminium.

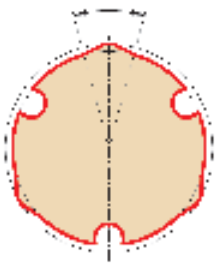
THREAD FORMER FPS-CN
For Ø ≥ 3 mm, with large forming lobes designed for a progressive flow of abrasive materials. With CrN coating for better gliding and high tool life in long chipping brass and Aluminium.



FPS381VS-3 M3 6HX

GEWINDEFORMER FPS-VS
Für Ø ≥ 3 mm, mit breiten Druckstollen, für ein progressives Fliessen von Werkstoffen mit geringer Bruchdehnung. Mit «VS»-Verschleiss-schutzschicht mit thermischer und chemischer Beständigkeit bei hohen Temperaturen. Für Baustähle, Kohlenstoffstähle, legierte Stähle, usw.

THREAD FORMER FPS-VS
For Ø ≥ 3 mm, with large forming lobes designed for a progressive flow of materials with low elongation coefficient. With DC «VS» wear-protective coating with thermal and chemical properties. For structural steels, carbon steels, alloy steels, etc.



FAS381VS-3 M4 6HX

GEWINDEFORMER FAS-VS
Für Ø ≥ 3 mm, mit spitzen Druckstollen, für ein schnelles Fliessen von zähen Werkstoffen mit hoher Bruchdehnung. Mit «VS»-Verschleissschutzschicht mit ausserordentlichen Gleit- und Schmiereigenschaften. Für rostfreie Stähle, Reinkupfer, usw.

THREAD FORMER FAS-VS
For Ø ≥ 3 mm, with pointed forming lobes designed for a fast flow of tough materials with high elongation coefficient. With DC «VS» wear-protective coating with excellent lubrication and sliding properties. For stainless steels, pure copper, etc.

SCHMIERNUTEN AB Ø 3 MM
Dank dieser Nuten wird der Schmierstoff besser zur Werkzeugoberfläche geführt, die mit dem Werkstoff in direktem Kontakt ist.

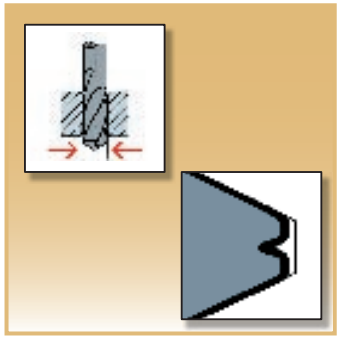
LUBRICATION GROOVES FROM Ø 3 MM
Lubricant will be guided to the surface of the tool which is directly in contact with the material.

OHNE SCHMIERNUTEN
Besonders geeignet für die Bearbeitung von weichen Werkstoffen und für Durchgangslöcher in dünne Bleche.

WITHOUT LUBRICATION GROOVES
Especially recommended for forming soft materials and for through holes in thin parts (e.g. sheet metal work).

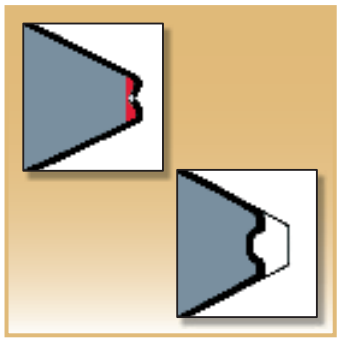
MIT INNENKÜHLUNG
Speziell empfohlen für tiefere Gewinde und für die Horizontalbearbeitung.

WITH INTERNAL COOLANT SUPPLY
Highly recommended for deeper threads and for horizontal working.



KORREKTES GEWINDEPROFIL
Für das Verformen ist eine genaue, saubere Vorbohrung erforderlich, damit ein normgerechtes Gewinde entsteht. Bei Werkstoffen mit sehr hoher Bruchdehnung oder bei Gewindetiefen von > 2 x D empfehlen wir, den Vorbohrungs-Ø um 0.02 bis 0.05 mm zu vergrössern.

CORRECT THREAD PROFILE
Accurate core hole is required in order to form a thread according to the norm. For materials with a very high elongation coefficient and threading depth > 2 x D, we recommend increasing the core hole Ø by 0.02 to 0.05 mm.



UNKORREKTES GEWINDEPROFIL
Profil zu gross *zufolge eines zu kleinen Vorbohrungsdurchmessers; verursacht ein zu hohes Drehmoment.*
Profil ungenügend *- Folge eines zu grossen Vorbohrungsdurchmessers.*

INCORRECT THREAD PROFILE
Too big profile due to the too small core hole diameter. The required torque is higher.
Incomplete profile caused by the core hole diameter being too big.

ANWENDUNGSGRUPPEN – APPLICATION GROUPS

Referenz: DIN

11 Automatenstahl

1.0711	9 S 20
1.0715	9 SMn 28
1.0718	9 SMnPb 28
1.0726	35 S 20
1.0737	9 SMnPb 36

12 Baustahl, Einsatzstahl

1.0037	St 37-2 (S235JR)
1.0050	St 50-2 (E295)
1.0060	St 60-2 (E335)
1.5919	15 CrNi6
1.7131	16 MnCr5

13 Kohlenstoffstahl

1.0503	C 45
1.0535	C 55
1.0601	C 60
1.1545	C 105 W1
1.2067	100 Cr 6

14 Stahl legiert < 850 N/mm²

1.2363	X100CrMoV5-1
1.3551	80MoCrV42-16
1.4922	X20CrMoV12-1
1.7218	25CrMo4
1.7220	34CrMo4

15 Stahl legiert / vergütet > 850 - < 1150 N/mm²

1.3553	X82WMoCrV6-5-4
1.6580	30CrNiMo8
1.7220	34CrMo4
1.7225	42CrMo4
1.8507	34CrAlMo5

21 Rostfreier Stahl, geschwefelt

1.4005	X12CrS13
1.4006	X12Cr13
1.4016	X6Cr17
1.4104	X12CrMoS17
1.4305	X10CrNiS18 9

22 Austenitisch

1.4301	X5CrNi18 10
1.4406	X2CrNiMoN17 12 2
1.4435	X2CrNiMo18 14 3
1.4541	X6CrNiTi18 10
1.4571	X6CrNiMoTi17 12 2

23 Ferritisch, martensitisch < 850 N/mm²

1.4112	X90CrMoV18
1.4582	X4CrNiMoNb25 7
1.4762	X10CrAl24
1.4821	X20 CrNiSi25 4

24 Ferritisch, martensitisch > 850 - < 1150 N/mm²

1.4057	X20CrNi17 2
1.4125	X105CrMo17
1.4704	45 SiCr16 11
1.4748	X85CrMoV18 2

41 Reintitan

3.7024	Grad 1
3.7034	Grad 2
3.7055	Grad 3
3.7065	Grad 4

51 Nickellegierung 1 < 850 N/mm²

1.3912	Ni36 (Invar)
2.4360	NiCu 30 Fe (Monel 400)
2.4816	NiCr 15 Fe (Inconel 600)
2.4876	X10NiCrAlTi32 20 Hastelloy

61 Reinkupfer (Elektrolytkupfer)

2.0060	E-Cu57 (E-Cu)

63 Messing (langspanend)

2.0240	CuZn15 (Ms85)
2.0265	CuZn30 (Ms70)
2.0321	CuZn37 (Ms63)

71 Al unlegiert

3.0205	Al 99
3.0255	Al 99.5

72 Al legiert Si < 1.5%

3.1255	AlCuSiMn
3.1355	AlCuMg 2
3.2315	AlMgSi 1
3.3206	AlMgSi 0.5
3.4345	AlZnMgCu 0.5

73 Al legiert Si > 1.5% - < 10%

3.2161	G-AlSi8Cu3
3.2162	GD-AlSi8Cu3
3.2341	G-AlSi5Mg
3.2371	G-AlSi7 Mg

Reference: AISI/ASTM

11 Free-cutting steels

1.0711	1212
1.0715	1213
1.0718	12 L 13
1.0726	1140
1.0737	12 L 14

12 Structural, cementation steels

1.0037	1015
1.0050	
1.0060	
1.5919	4320
1.7131	5115

13 Carbon steels

1.0503	1043
1.0535	1055
1.0601	1060
1.1545	W 110
1.2067	L 3

14 Alloy steels < 850 N/mm²

1.2363	A 2
1.3551	M 50
1.4922	
1.7218	4130
1.7220	4135

15 Alloy steels hard./temp. > 850 - < 1150 N/mm²

1.3553	
1.6580	
1.7220	4135
1.7225	4140
1.8507	K 23510 (UNS)

21 Free machining stainless steels

1.4005	416
1.4006	410
1.4016	430
1.4104	430 F
1.4305	303

22 Austenitic stainless steels

1.4301	304
1.4406	316 LN
1.4435	316 L
1.4541	321
1.4571	316 Ti

23 Ferritic and martensitic < 850 N/mm²

1.4112	440 B
1.4582	
1.4762	446
1.4821	

24 Ferritic and martensitic > 850 - < 1150 N/mm²

1.4057	431
1.4125	440 C
1.4704	HNV 2 (SAE)
1.4748	

41 Pure titanium

3.7024	Gr. 1
3.7034	Gr. 2
3.7055	Gr. 3
3.7065	Gr. 4

51 Nickel alloys 1 < 850 N/mm²

1.3912	Invar
2.4360	Monell alloy 400
2.4816	Inconel alloy 600
2.4876	Incoloy alloy 800 Hastelloy

61 Pure copper (electrolitic copper)

2.0060	

63 Long chip brass

2.0240	C 2300
2.0265	C 26000
2.0321	C 27200

71 Al unalloyed

3.0205	1200
3.0255	1050 A

72 Al alloyed Si < 1.5%

3.1255	2014
3.1355	2024
3.2315	6082
3.3206	6060
3.4345	7020

73 Al alloyed Si > 1.5% - < 10%

3.2161	A 380.1
3.2162	
3.2341	
3.2371	A 356.2

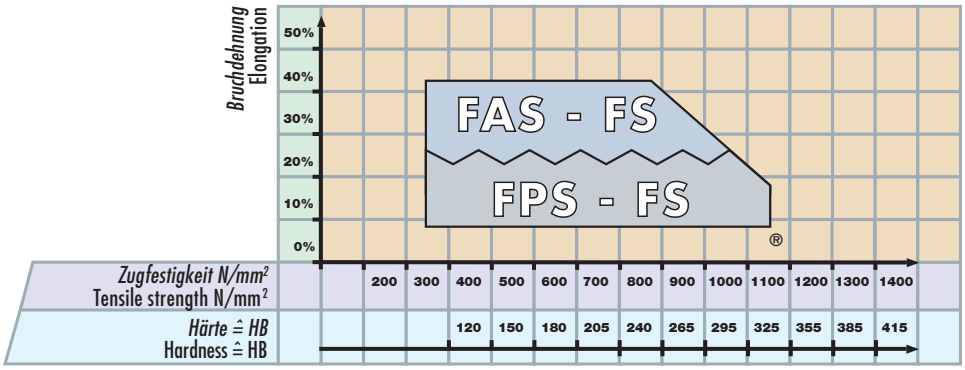
ANWENDUNGSTABELLE – APPLICATION CHART

Einsatz – Use

- S *Optimal mit Schneidöl*
- S *Geeignet mit Schneidöl*
- E *Optimal mit Emulsion*
- E *Geeignet mit Emulsion*

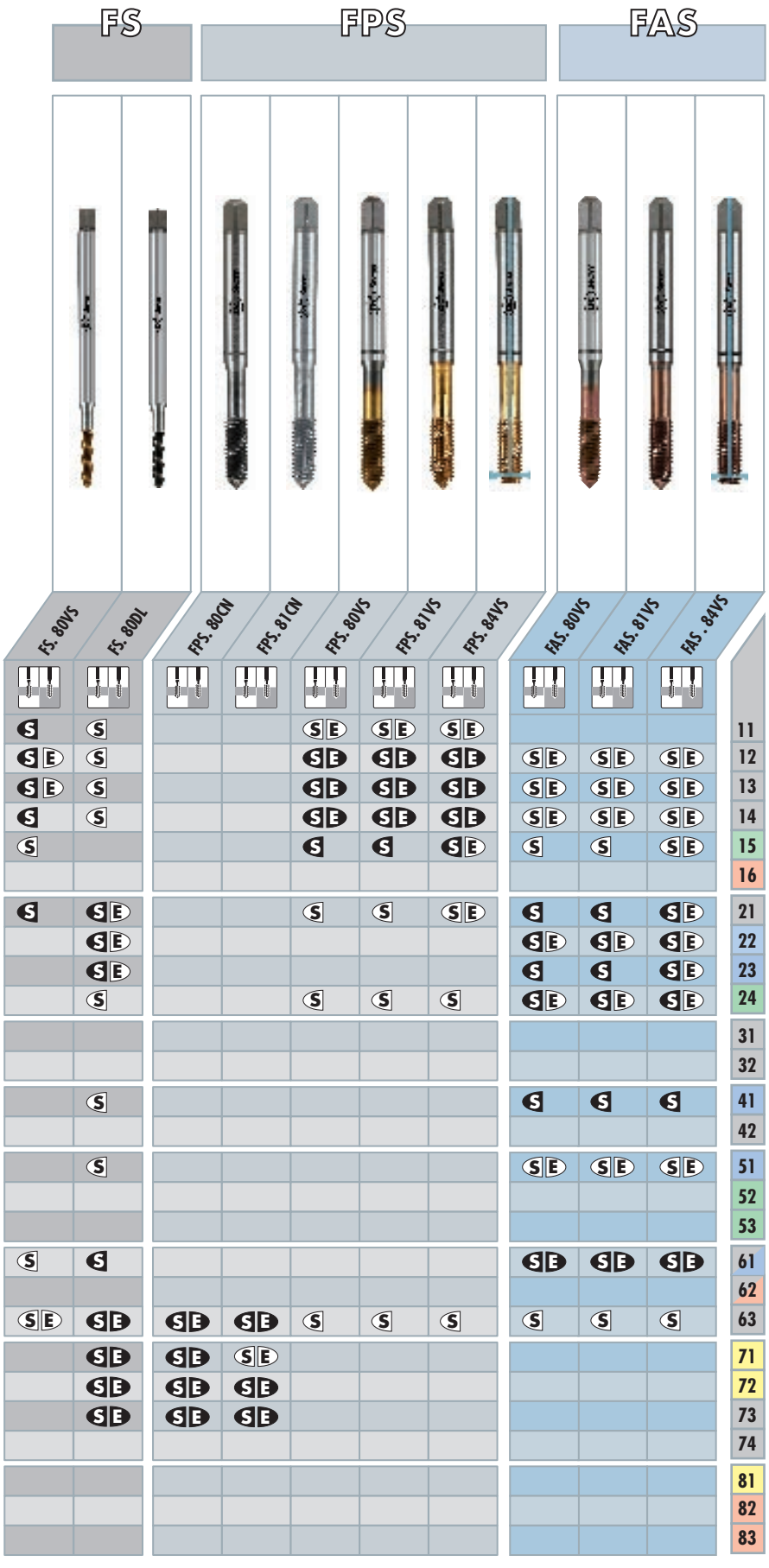
- S Optimal with cutting oil
- S Suitable with cutting oil
- E Optimal with emulsion
- E Suitable with emulsion

Gewindeformen
Thread forming



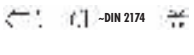
Anwendungsgruppen – Material classification

Werkstoff-Gruppen Material groups		*Werkstoffbezeichnung*	Material designation	*Härte* Hardness (HB)	*Festigkeit* Tensile strength Rm (N/mm²)	*Dehnung* Elongation A (%)	Vc (m/min) < Ø 20 mm (Guide line) *Beschichtet VS + CN + DL* Coated VS + CN + DL
10 *Stahl* Steels	11	*Automatenstahl*	Free-cutting steels	< 200	< 700	< 10	20 – 40
	12	*Baustahl, Einsatzstahl*	Structural / cementation steels	< 200	< 700	< 30	20 – 40
	13	*Kohlenstoffstahl*	Carbon steels	< 300	<1000	< 20	20 – 30
	14	*Stahl legiert <850 N/mm²*	Alloy steels <850 N/mm²	< 250	< 850	< 30	20 – 30
	15	*Stahl legiert / vergütet >850 - <1150 N/mm²*	Alloy steels hard. / temp. >850 - <1150 N/mm²	> 250	> 850	< 30	10 – 15
	16	*Hochfester Stahl*	High tensile alloy steels	> 250	> 850	< 12	
20 *Rostfreier Stahl* Stainless Steels	21	*Rostfreier Stahl / geschwefelt*	Free machining stainless steels	< 250	< 850	< 25	10 – 20
	22	*Austenitisch*	Austenitic stainless steels	< 250	< 850	> 20	10 – 15
	23	*Ferritisch, martensitisch <850 N/mm²*	Ferritic and martensitic <850 N/mm²	< 250	< 850	> 20	6 – 12
	24	*Ferritisch, martensitisch >850 - <1150 N/mm²*	Ferritic and martens. >850 - <1150 N/mm²	> 250	> 850	> 15	6 – 12
30 *Guss* Cast iron	31	*Grauguss*	Cast iron	< 250	< 850	< 10	
	32	*Kugelgraphitguss, Temperguss*	Spheroidal graphite + malleable cast iron	< 250	< 850	> 10	
40 *Titan* Titanium	41	*Reintitan*	Pure titanium	< 250	< 850	> 20	10 – 20
	42	*Titanlegierung*	Titanium alloys	> 250	> 850	< 20	
50 *Nickel* Nickel	51	*Nickellegierung 1 <850 N/mm²*	Nickel alloys 1 <850 N/mm²	< 250	< 850	> 25	10 – 15
	52	*Nickellegierung 2 >850 - <1150 N/mm²*	Nickel alloys 2 >850 - <1150 N/mm²	> 250	> 850	< 25	
	53	*Nickellegierung 3 >1150 - ≤1600 N/mm²*	Nickel alloys 3 >1150 - ≤1600 N/mm²	> 340	> 1150	< 20	
60 *Kupfer* Copper	61	*Reinkupfer (Elektrolytkupfer)*	Pure copper (electrolitic copper)	< 120	< 400	> 12	10 – 20
	62	*Messing, Bronze, Rotguss (kurzspanend)*	Short chip brass, phosphor bronze, gun metal	< 200	< 700	< 12	
	63	*Messing (langspanend)*	Long chip brass	< 200	< 700	> 12	20 – 30
70 *Aluminium Magnesium* Aluminium Magnesium	71	*Al unlegiert*	Al unalloyed	< 100	< 350	> 15	20 – 40
	72	*Al legiert Si < 1.5 %*	Al alloyed Si < 1.5 %	< 150	< 500	> 15	20 – 40
	73	*Al legiert Si > 1.5 % - < 10 %*	Al alloyed Si > 1.5 % - < 10 %	< 120	< 400	< 15	20 – 40
	74	*Al legiert Si > 10 %, Mg-Legierung*	Al alloyed Si > 10 %, Mg-Alloys	< 120	< 400	< 10	
80 *Kunststoff* Plastic compounds	81	*Thermoplaste*	Thermoplastics	-	-	-	
	82	*Duroplaste*	Duroplastics	-	-	-	
	83	*Faserverstärkte Kunststoffe*	Glass fibre reinforced plastics	-	-	-	



Piktogramme – Pictographs

Für Werkstoffgruppen gemäss (DC) -Anwendungstabelle
For material groups as per (DC) application chart



Verstärkter Schaft, ~DIN 2174 / 2184-1
Reinforced shank, ~DIN 2174 / 2184-1

Durchfallender Schaft, ~DIN 2174 / ~2189
Reduced shank, ~DIN 2174 / ~2189

PM

HSSE-PM
HSSE-PM

Gewindeformer
Thread former

Gewindeformer mit Schmiernuten
Thread former with lubrication grooves

Innenkühlung mit seitlichem Schmiermittelaustritt
Internal coolant with radial outflow

Durchgangs- und Sacklöcher, < 2.5 x D
Through and blind holes, < 2.5 x D

Durchgangs- und Sacklöcher, > 2.5 x D
Through and blind holes, > 2.5 x D

2 - 3 Gewindegänge, Form C
2 - 3 chamfered threads, form C

EL

Extra-lang
Extra-long

6HX

Toleranzklasse 6HX
Tolerance class 6HX

CrN

Chromnitrid-Beschichtung
Chromenitride coating

VS

(DC) -Verschleissschutzschicht
(DC) wear-protective coating

DL

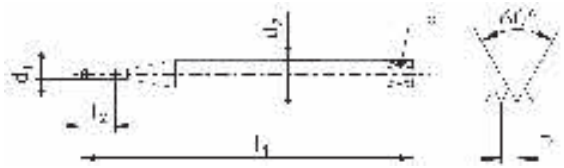
DLC-Beschichtung
DLC coating

FS FORMING

FS380VS-5 VS

FS380VS-3 VS

FS380VS-5	FS380VS-3	FS380VS-3	FS380VS-3
			
			
			
6HX	6HX	6HX	6GX



∅ d_1 M	P mm	l_1 mm	l_2 mm	d_2 mm	a mm	4HX 6HX	Tol.	ID	ID	ID	ID	6H + mm
1	0.25	40	3.0	2.5		0.88	+ 0.02	157171	173452			
1.2	0.25	40	3.6	2.5		1.08	+ 0.02	157172	173455			
1.4	0.30	40	4.2	2.5		1.25	+ 0.02	157173	173458			
1.6	0.35	40	4.8	2.5		1.45	+/- 0.01	157174	169779			
1.7	0.35	40	5.1	2.5		1.55	+/- 0.01		169782			
1.8	0.35	40	5.4	2.5		1.65	+/- 0.01	157175	169785			
2	0.40	45	8.0	2.8	2.1	1.80	+/- 0.01			157176	157180	0.019
2.5	0.45	50	10.0	2.8	2.1	2.30	+/- 0.02			157178	157181	0.020
2.6	0.45	50	10.0	2.8	2.1	2.40	+/- 0.02			157179		

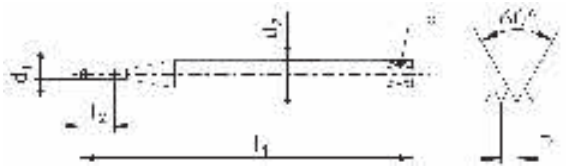
≤ M1.5 4HX

PM ~DIN 2174

FS FORMING

FS380DL-5 DL

FS380DL-3 DL

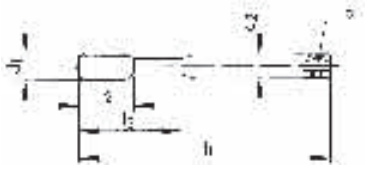
FS380DL-5	FS380DL-3	FS380DL-3	FS380DL-3
			
NEW	NEW	NEW	NEW
			
				
	6HX	6HX	6HX	6GX

∅ d_1 M	P mm	l_1 mm	l_2 mm	d_2 mm	a mm	4HX 6HX	Tol.	ID	ID	ID	ID	6H + mm
1	0.25	40	3.0	2.5		0.88	+ 0.02	172839	173461			
1.2	0.25	40	3.6	2.5		1.08	+ 0.02	172840	173464			
1.4	0.30	40	4.2	2.5		1.25	+ 0.02	172841	173467			
1.6	0.35	40	4.8	2.5		1.45	+/- 0.01	170585	170916			
1.7	0.35	40	5.1	2.5		1.55	+/- 0.01		172843			
1.8	0.35	40	5.4	2.5		1.65	+/- 0.01	172842	172844			
2	0.40	45	8.0	2.8	2.1	1.80	+/- 0.01			158814	172849	0.019
2.5	0.45	50	10.0	2.8	2.1	2.30	+/- 0.02			172845	173246	0.020
2.6	0.45	50	10.0	2.8	2.1	2.40	+/- 0.02			172846		

≤ M1.5 4HX

FPS FORMING

FPS380CN-3	CrN	63 71 72 73
FPS381CN-3	CrN	63 71 72 73
FPS380VS-3	VS	11 12 13 14 15 21 24 63
FPS381VS-3	VS	11 12 13 14 15 21 24 63



FPS380CN-3	FPS381CN-3	FPS380VS-3	FPS381VS-3
			
			
			
6HX	6HX	6HX	6HX

∅ d_1 M	P mm	l_1 mm	l_2 mm	l_3 mm	d_2 mm	α mm	6HX	Tol.	ID	ID	ID	ID
3	0.50	56	12.0	18	3.5	2.7	2.80	+/- 0.03	166613	166615	166614	166616
3.5	0.60	56	13.0	20	4.0	3.0	3.25	+/- 0.03	166619	166621	166620	166622
4	0.70	63	14.0	21	4.5	3.4	3.70	+/- 0.03	166626	166628	166627	166629
5	0.80	70	15.0	25	6.0	4.9	4.65	+/- 0.03	166634	166636	166635	166637
6	1.00	80	17.0	30	6.0	4.9	5.55	+/- 0.05	166643	166645	166644	166646
8	1.25	90	20.0	35	8.0	6.2	7.40	+/- 0.05	166653	166655	166654	166656
10	1.50	100	22.0	39	10.0	8.0	9.30	+/- 0.05	166663	166665	166664	166666

											6GX	6GX
∅ d_1 M	P mm	l_1 mm	l_2 mm	l_3 mm	d_2 mm	α mm	6HX	Tol.			ID 6H + mm	ID 6H + mm
3	0.50	56	12.0	18	3.5	2.7	2.80	+/- 0.03			166697 0.020	166617 0.020
3.5	0.60	56	13.0	20	4.0	3.0	3.25	+/- 0.03			166687 0.021	166623 0.021
4	0.70	63	14.0	21	4.5	3.4	3.70	+/- 0.03			166688 0.022	166630 0.022
5	0.80	70	15.0	25	6.0	4.9	4.65	+/- 0.03			166689 0.024	166638 0.024
6	1.00	80	17.0	30	6.0	4.9	5.55	+/- 0.05			166686 0.026	166647 0.026
8	1.25	90	20.0	35	8.0	6.2	7.40	+/- 0.05			166740 0.028	166657 0.028
10	1.50	100	22.0	39	10.0	8.0	9.30	+/- 0.05			166739 0.032	166667 0.032

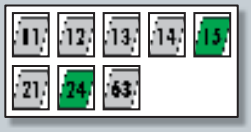
FPS FORMING

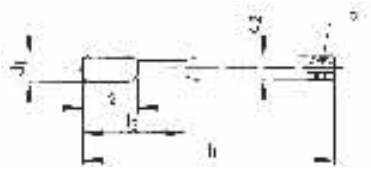
	FPS481VS-3		FPS581VS-3	FPS681VS-3
			 NEW	 NEW
				
				
	6HX		6HX	6HX

FPS481VS-3  VS

FPS581VS-3  EL VS

FPS681VS-3  EL VS

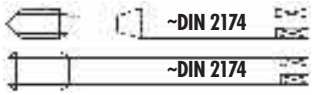




∅ d_1 M	P mm	l_1 mm	l_2 mm	d_2 mm	a mm	6HX	Tol.	ID
12	1.75	110	24.0	9.0	7.0	11.20	+/- 0.05	166673
14	2.00	110	28.0	11.0	9.0	13.10	+/- 0.05	166678
16	2.00	110	30.0	12.0	9.0	15.10	+/- 0.05	166683
20	2.50	140	36.0	16.0	12.0	18.85	+/- 0.05	168713

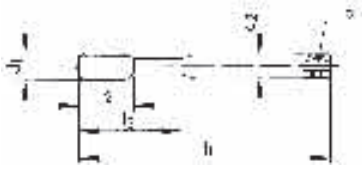
∅ d_1 M	P mm	l_1 mm	l_2 mm	l_3 mm	d_2 mm	a mm	6HX	Tol.	ID	ID
3	0.50	100	12.0	18	3.5	2.7	2.80	+/- 0.03	172824	
4	0.70	125	14.0	21	4.5	3.4	3.70	+/- 0.03	172826	
5	0.80	140	15.0	25	6.0	4.9	4.65	+/- 0.03	172828	
6	1.00	160	17.0	30	6.0	4.9	5.55	+/- 0.05	172830	
8	1.25	180	20.0	35	8.0	6.2	7.40	+/- 0.05	172832	
10	1.50	200	22.0	39	10.0	8.0	9.30	+/- 0.05	172834	
12	1.75	224	24.0		9.0	7.0	11.20	+/- 0.05		172836

PM



FPS FORMING

	FPS384VS-3	FPS484VS-3	FPS584VS-3	FPS684VS-3
	VS	VS	EL VS	EL VS
	11 12 13 14 15 21 24 63	11 12 13 14 15 21 24 63	11 12 13 14 15 21 24 63	11 12 13 14 15 21 24 63

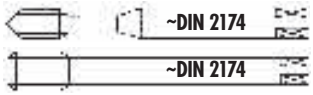


∅ d_1 M	P mm	l_1 mm	l_2 mm	l_3 mm	d_2 mm	a mm	6HX → ←	Tol.	ID	ID
3	0.50	56	12.0	18	3.5	2.7	2.80	+/- 0.03	166737	
4	0.70	63	14.0	21	4.5	3.4	3.70	+/- 0.03	166738	
5	0.80	70	15.0	25	6.0	4.9	4.65	+/- 0.03	166640	
6	1.00	80	17.0	30	6.0	4.9	5.55	+/- 0.05	166650	
8	1.25	90	20.0	35	8.0	6.2	7.40	+/- 0.05	166660	
10	1.50	100	22.0	39	10.0	8.0	9.30	+/- 0.05	166670	
12	1.75	110	24.0		9.0	7.0	11.20	+/- 0.05		166675
14	2.00	110	28.0		11.0	9.0	13.10	+/- 0.05		166680
16	2.00	110	30.0		12.0	9.0	15.10	+/- 0.05		166685

∅ d_1 M	P mm	l_1 mm	l_2 mm	l_3 mm	d_2 mm	a mm	6HX → ←	Tol.	ID	ID
3	0.50	100	12.0	18	3.5	2.7	2.80	+/- 0.03	172763	
4	0.70	125	14.0	21	4.5	3.4	3.70	+/- 0.03	172766	
5	0.80	140	15.0	25	6.0	4.9	4.65	+/- 0.03	172769	
6	1.00	160	17.0	30	6.0	4.9	5.55	+/- 0.05	172772	
8	1.25	180	20.0	35	8.0	6.2	7.40	+/- 0.05	172775	
10	1.50	200	22.0	39	10.0	8.0	9.30	+/- 0.05	172778	
12	1.75	224	24.0		9.0	7.0	11.20	+/- 0.05		172781

M ISO DIN 13

PM

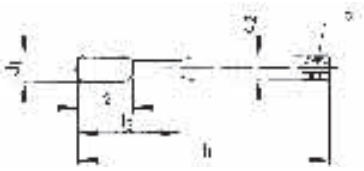


FAS FORMING

FAS380VS-3 VS

FAS381VS-3 VS

FAS481VS-3 VS



FAS380VS-3		FAS381VS-3	FAS481VS-3
			
			
			
6HX		6HX	6HX

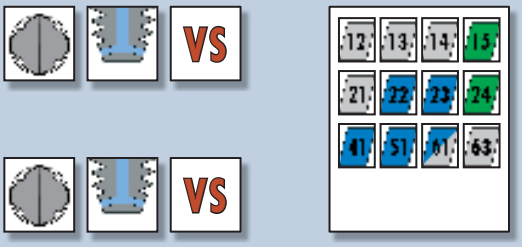
∅ d_1 M	P mm	l_1 mm	l_2 mm	l_3 mm	d_2 mm	a mm	6HX → ←	Tol.	ID	ID	ID
3	0.50	56	12.0	18	3.5	2.7	2.80	+/- 0.03	170603	166612	
3.5	0.60	56	13.0	20	4.0	3.0	3.25	+/- 0.03	170605	166618	
4	0.70	63	14.0	21	4.5	3.4	3.70	+/- 0.03	170607	166624	
5	0.80	70	15.0	25	6.0	4.9	4.65	+/- 0.03	170609	166632	
6	1.00	80	17.0	30	6.0	4.9	5.55	+/- 0.05	170611	166641	
8	1.25	90	20.0	35	8.0	6.2	7.40	+/- 0.05	170616	166651	
10	1.50	100	22.0	39	10.0	8.0	9.30	+/- 0.05	170618	166661	
12	1.75	110	24.0		9.0	7.0	11.20	+/- 0.05			166671
14	2.00	110	28.0		11.0	9.0	13.10	+/- 0.05			166676
16	2.00	110	30.0		12.0	9.0	15.10	+/- 0.05			166681
20	2.50	140	36.0		16.0	12.0	18.85	+/- 0.05			168711

										6GX		6GX	
∅ d_1 M	P mm	l_1 mm	l_2 mm	l_3 mm	d_2 mm	a mm	6HX → ←	Tol.		ID	6H + mm	ID	6H + mm
3	0.50	56	12.0	18	3.5	2.7	2.80	+/- 0.03		166703	0.020		
3.5	0.60	56	13.0	20	4.0	3.0	3.25	+/- 0.03		166704	0.021		
4	0.70	63	14.0	21	4.5	3.4	3.70	+/- 0.03		166705	0.022		
5	0.80	70	15.0	25	6.0	4.9	4.65	+/- 0.03		166706	0.024		
6	1.00	80	17.0	30	6.0	4.9	5.55	+/- 0.05		166707	0.026		
8	1.25	90	20.0	35	8.0	6.2	7.40	+/- 0.05		166708	0.028		
10	1.50	100	22.0	39	10.0	8.0	9.30	+/- 0.05		166709	0.032		
12	1.75	110	24.0		9.0	7.0	11.20	+/- 0.05				166710	0.034
14	2.00	110	28.0		11.0	9.0	13.10	+/- 0.05				166711	0.038
16	2.00	110	30.0		12.0	9.0	15.10	+/- 0.05				166712	0.038

FAS FORMING

FAS384VS-3

FAS484VS-3



∅ d_1 M	P mm	l_1 mm	l_2 mm	l_3 mm	d_2 mm	a mm	6HX	Tol.	ID	ID
3	0.50	56	12.0	18	3.5	2.7	2.80	+/- 0.03	166741	
4	0.70	63	14.0	21	4.5	3.4	3.70	+/- 0.03	166742	
5	0.80	70	15.0	25	6.0	4.9	4.65	+/- 0.03	166690	
6	1.00	80	17.0	30	6.0	4.9	5.55	+/- 0.05	166691	
8	1.25	90	20.0	35	8.0	6.2	7.40	+/- 0.05	166692	
10	1.50	100	22.0	39	10.0	8.0	9.30	+/- 0.05	166693	
12	1.75	110	24.0		9.0	7.0	11.20	+/- 0.05		166694
14	2.00	110	28.0		11.0	9.0	13.10	+/- 0.05		166695
16	2.00	110	30.0		12.0	9.0	15.10	+/- 0.05		166696

PM

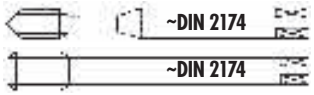
FAS FORMING

	FAS581VS-3	FAS681VS-3	FAS584VS-3	FAS684VS-3
	EL VS	EL VS	EL VS	EL VS
	12 13 14 15 21 22 23 24 41 51 61 63	12 13 14 15 21 22 23 24 41 51 61 63	12 13 14 15 21 22 23 24 41 51 61 63	12 13 14 15 21 22 23 24 41 51 61 63
	NEW	NEW	NEW	NEW
	< 2.5 x D	< 2.5 x D	< 3 x D	< 3 x D
	C 2.5 x P	C 2.5 x P	C 2.5 x P	C 2.5 x P
	6HX	6HX	6HX	6HX

∅ d_1 M	P mm	l_1 mm	l_2 mm	l_3 mm	d_2 mm	a mm	6HX	Tol.	ID	ID	ID	ID
3	0.50	100	12.0	18	3.5	2.7	2.80	+/- 0.03	172784		172805	
4	0.70	125	14.0	21	4.5	3.4	3.70	+/- 0.03	172787		172808	
5	0.80	140	15.0	25	6.0	4.9	4.65	+/- 0.03	172790		172811	
6	1.00	160	17.0	30	6.0	4.9	5.55	+/- 0.05	172793		172814	
8	1.25	180	20.0	35	8.0	6.2	7.40	+/- 0.05	172796		172817	
10	1.50	200	22.0	39	10.0	8.0	9.30	+/- 0.05	172799		172820	
12	1.75	224	24.0		9.0	7.0	11.20	+/- 0.05		172802		172822

MF ISO DIN 13

PM



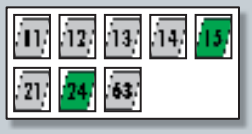
FPS FORMING

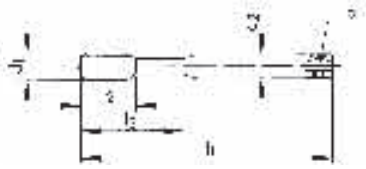
	FPS381CN-3	FPS381VS-3	FPS481VS-3
			
			
			
	6HX	6HX	6HX

FPS381CN-3  

FPS381VS-3  

FPS481VS-3  

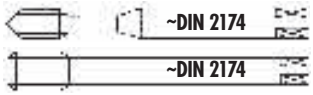




∅ d_1 MF	P mm	l_1 mm	l_2 mm	l_3 mm	d_2 mm	a mm	6HX	Tol.	ID	ID	ID
4	0.50	63	14.0	21	4.5	3.4	3.80	+/- 0.03		166631	
5	0.50	70	15.0	25	6.0	4.9	4.80	+/- 0.03		166639	
6	0.50	80	17.0	30	6.0	4.9	5.80	+/- 0.03		166699	
6	0.75	80	17.0	30	6.0	4.9	5.65	+/- 0.03	166648	166649	
8	0.75	90	20.0	35	8.0	6.2	7.65	+/- 0.03	166701	166702	
8	1.00	90	20.0	35	8.0	6.2	7.55	+/- 0.05	166658	166659	
10	1.00	100	22.0	39	10.0	8.0	9.55	+/- 0.05	166668	166669	
12	1.00	100	19.0		9.0	7.0	11.55	+/- 0.05			166674
14	1.50	100	24.0		11.0	9.0	13.30	+/- 0.05			166679
16	1.50	100	26.0		12.0	9.0	15.30	+/- 0.05			166684

MF ISO DIN 13

PM

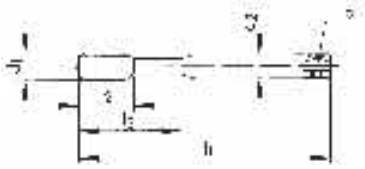


FAS FORMING

	FAS381VS-3	FAS481VS-3		
				
				
				
	6HX	6HX		
∅ d_1 MF	P mm	l_1 mm	l_2 mm	l_3 mm	d_2 mm	a mm	6HX	Tol.	ID	ID
4	0.50	63	14.0	21	4.5	3.4	3.80	+/- 0.03	166625	
5	0.50	70	15.0	25	6.0	4.9	4.80	+/- 0.03	166633	
6	0.50	80	17.0	30	6.0	4.9	5.80	+/- 0.03	166698	
6	0.75	80	17.0	30	6.0	4.9	5.65	+/- 0.03	166642	
8	0.75	90	20.0	35	8.0	6.2	7.65	+/- 0.03	166700	
8	1.00	90	20.0	35	8.0	6.2	7.55	+/- 0.05	166652	
10	1.00	100	22.0	39	10.0	8.0	9.55	+/- 0.05	166662	
12	1.00	100	19.0		9.0	7.0	11.55	+/- 0.05		166672
14	1.50	100	24.0		11.0	9.0	13.30	+/- 0.05		166677
16	1.50	100	26.0		12.0	9.0	15.30	+/- 0.05		166682

FAS381VS-3 VS

FAS481VS-3 VS

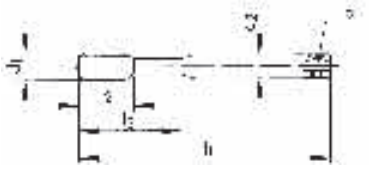


UNC-UNF ANSI B1.1

PM ~DIN 2184-1

FS FPS FAS FORMING

FS380VS-3	VS
FS380VS-5	VS
FPS381VS-3	VS
FAS381VS-3	VS



	FS380VS-3	FS380VS-5	FPS381VS-3	FAS381VS-3
				
				
	C 2.5 x P	E 1.5 x P	C 2.5 x P	C 2.5 x P
	2BX	2BX	2BX	2BX

Ø" d_1 UNC	P TPI	d_1 mm	l_1 mm	l_2 mm	l_3 mm	d_2 mm	a mm	2BX Tol.		FS380VS-3 ID	FS380VS-5 ID	FPS381VS-3 ID	FAS381VS-3 ID
2	56	2.18	45	9.0		2.8	2.1	1.95	+/- 0.02	157285			
4	40	2.84	56	12.0	18	3.5	2.7	2.55	+/- 0.03			170063	170065
6	32	3.50	56	13.0	20	4.0	3.0	3.15	+/- 0.03			166713	166725
8	32	4.16	63	14.0	21	4.5	3.4	3.80	+/- 0.03			166714	166726
10	24	4.82	70	15.0	25	6.0	4.9	4.35	+/- 0.05			166715	166727
1/4	20	6.35	80	17.0	30	7.0	5.5	5.75	+/- 0.05			166716	166728
5/16	18	7.93	90	20.0	35	8.0	6.2	7.30	+/- 0.05			166717	166729

Ø" d_1 UNF	P TPI	d_1 mm	l_1 mm	l_2 mm	l_3 mm	d_2 mm	a mm	2BX Tol.		FS380VS-3 ID	FS380VS-5 ID	FPS381VS-3 ID	FAS381VS-3 ID
0	80	1.52	40	4.6		2.5		1.37	+/- 0.02		161498		
10	32	4.82	70	15.0	25	6.0	4.9	4.45	+/- 0.03			166718	166730
1/4	28	6.35	80	17.0	30	7.0	5.5	5.95	+/- 0.05			166719	166731
5/16	24	7.93	90	20.0	35	8.0	6.2	7.45	+/- 0.05			166720	166732

G DIN ISO 228 (BSP)

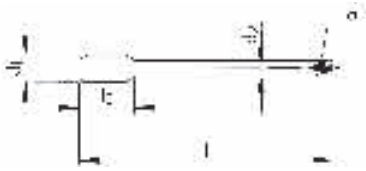
PM

~DIN 2189

FPS FAS FORMING

FPS481VS-3 VS

FAS481VS-3 VS



	FPS481VS-3	FAS481VS-3
		
		
		

∅" d_1 G	P TPI	d_1 mm	l_1 mm	l_2 mm	d_2 mm	a mm		Tol.	ID	ID
1/8	28	9.72	90	22.0	7.0	5.5	9.25	+/- 0.05	166721	166733
1/4	19	13.15	100	20.0	11.0	9.0	12.50	+/- 0.05	166722	166734
3/8	19	16.66	100	20.0	12.0	9.0	16.00	+/- 0.05	166723	166735
1/2	14	20.95	125	22.0	16.0	12.0	20.00	+/- 0.05	166724	166736