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1. General information

This document specifies the tightening torque of the clamping screws of the MAPAL products and their accessories.

The single pictures serve for a better understanding. Details that are not specified in the pictures must be selected accordingly.

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2. Clamping screw for cutting systems

2.1. Torx Plus screw for ISO inserts

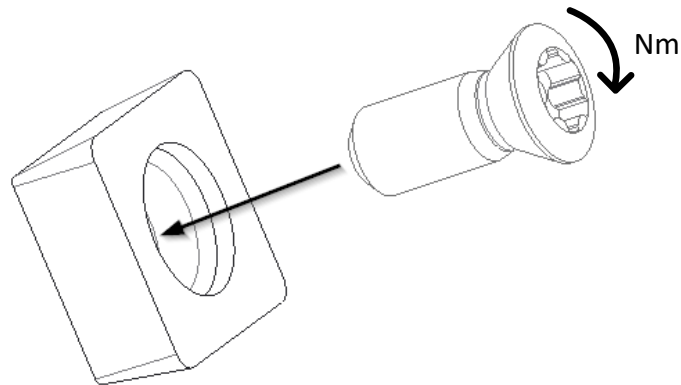


Figure 1, Torx Plus screw for ISO inserts

Table 1, Torx Plus screw for ISO inserts

Material number	Technical specification	Tightening Torque [Nm]
MN659	MN659 M2x...	0,5
	MN659 M2.2x...	0,8
	MN659 M2.5x...	1,0
	MN659 M3x...	1,8
	MN659 M3.5x...	2,8
	MN659 M4x...	4,0
	MN659 M5x...	7,5
	MN659 M6x	13
31161858	M1.8X3.7-TX6-IP	0,6
31161854	M2.5X5.5-TX7-IP	1,4
31161859	M3.5X7.2-TX15-IP	3,5
31161860	M3.5X8.6-TX15-IP	3,5
31161861	M4.5X10.5-TX20-IP	5,5

2.2. Torx-Plus screw for HPR-cutting system

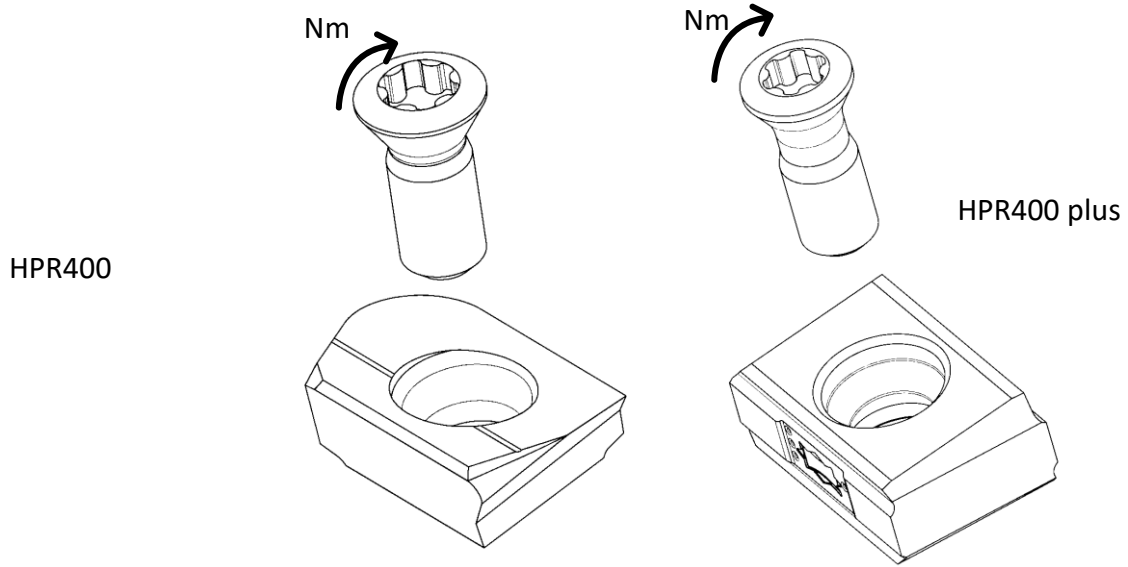


Figure 2, Torx-Plus screw for HPR-cutting system

Series	Technical specification	Tightening Torque [Nm]
HPR400	MN659 M3.5x...	3,1
HPR400 plus	MN659 M2.5x...	1,1
HPR400 plus	MN659 M4x...	3,5

Table 2, Torx-Plus screw for HPR-cutting system

2.3. Torx screw for ISO-cutting system

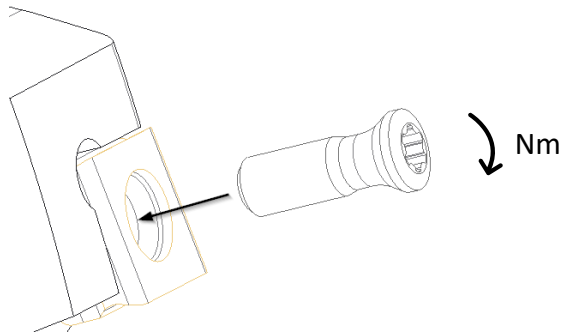


Figure 3, Torx screw for ISO-cutting system

Material number	Technical specification	Tightening Torque [Nm]
10036776	M1.6X3.9-TX5	0,2
10036778	M1.6X4.4-TX5	0,2
10036780	M2X4-TX6	0,4
10036781	M2X5-TX6	0,4
10036783	M2.5X4.8-TX7	1,0
10036784	M2.5X5.2-TX7	1,0
30419329	M4x6.9-TX15	3,5
31161862	M6X15-T25	6

Table 3, Torx screw for ISO-cutting system

2.4. Torx-screw and threaded spindle for reaming systems with clamping plates

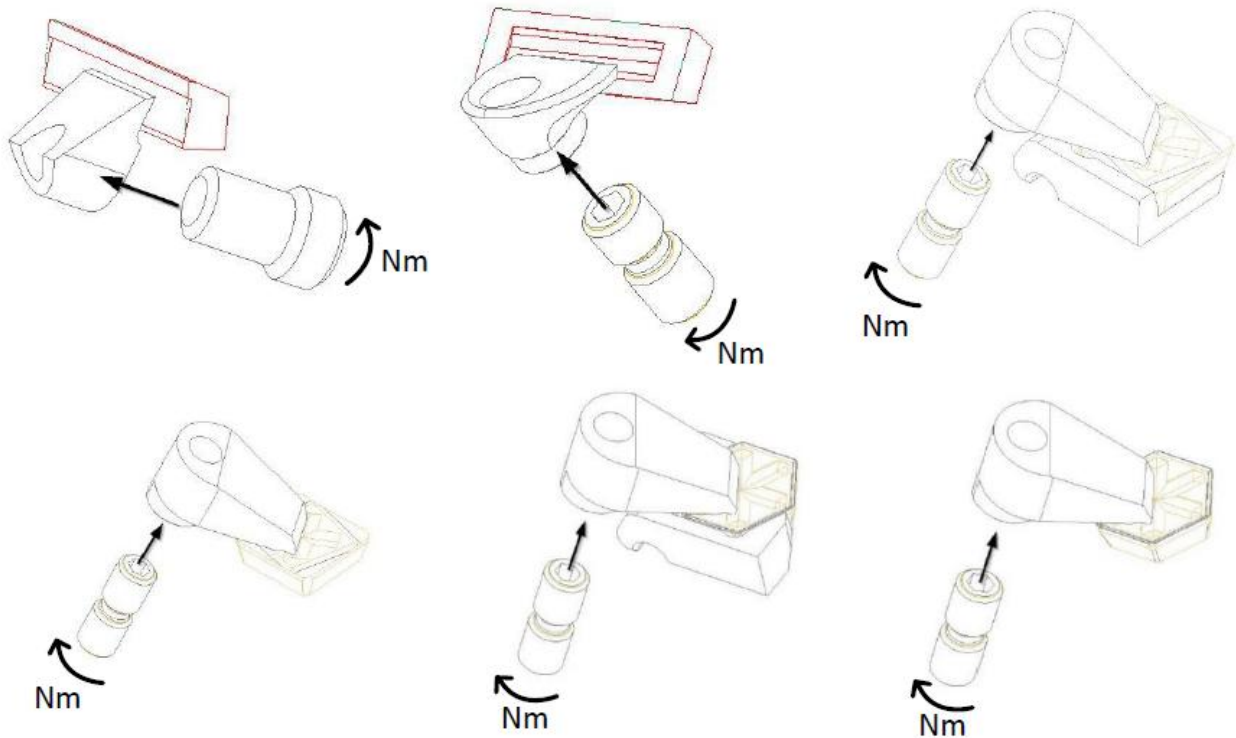


Figure 4, Torx-screw and threaded spindle for reaming systems with clamping plates

Material number	Technical specification	Tightening Torque [Nm]
10036776	M1.6X3.9-TX5	0,3
10036784	M2.5X5.2-TX7	0,6
10036710	MN 618-A M2.5LH/RHX5.5	0,6
10036722	MN 618-A M3LH/RHX6	0,8
10036723	MN 618-A M3LH/RHX8	0,8
10036711	MN 618-A M3LH/RHX5	0,8
10036724	MN 618-A M4X0.5LH/RHX6.5	1,2
10036725	MN 618-A M4x0.5LH/RHX9	1,2
10036726 *	MN 618-A M4X0.5LH/RHX11	1,2
M6LI/REx12	M6LH/RHX12	7,0
10036727	MN 618-A M6LH/RHX14	7,0

*Also to use for HPR500 or HPR600 reaming system application

Table 4, Torx-screw and threaded spindle for reaming systems with clamping plates

2.5. Threaded spindle for clamping plates into compensator and Kamset holder

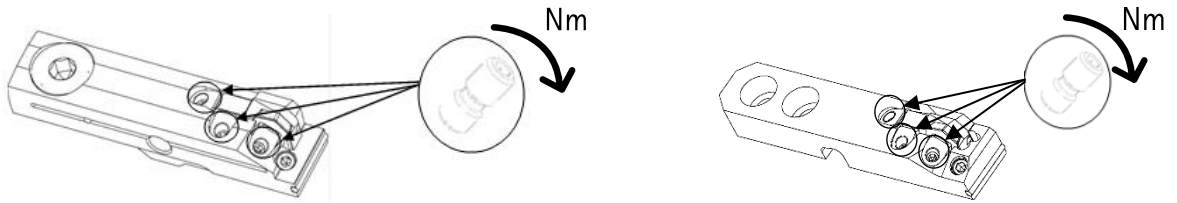


Figure 5, Threaded spindle for clamping plates into compensator and Kamset holder

Table 5, Threaded spindle for clamping plates into compensator and Kamset holder

Material number	Technical specification	Tightening Torque [Nm]
10036724	MN 618-A M4x0.5L/Rx6.5	1,2
10036725	MN 618-A M4x0.5L/Rx9	1,2
10036726	MN 618-A M4x0.5L/Rx11	1,2

2.6. Hexagon socket button head screw for clamping cartridges

Per MN616BL2

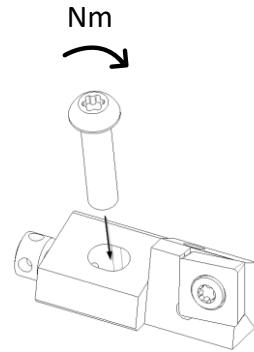


Figure 6, Hexagon socket button head screw for clamping cartridges

Table 6, Hexagon socket button head screw for clamping cartridges

Material number	Technical specification	Tightening Torque [Nm]
30005484	ISO 7380-1-M3X10-010.9	1,4
10016040	ISO 7380-1-M4X12-010.9	1,9
30002941	ISO 7380-1-M4X14-010.9	
10019424	ISO 7380-1-M5X16-010.9	4,1
10019367	ISO 7380-1-M6X16-010.9	7,7
10027182	ISO 7380-1-M6X20-010.9	
30606065	M3X10-TX9-IP	1,4
30606067	M4X14-TX15-IP	1,9
30638923	M5X16-TX20-IP	4,1
30606068	M6X20-TX25-IP	7,7
30606074	M6X25-TX25-IP	

2.7. Hexagon socket head cap screw for short clamping cartridges

Per MN616BL2

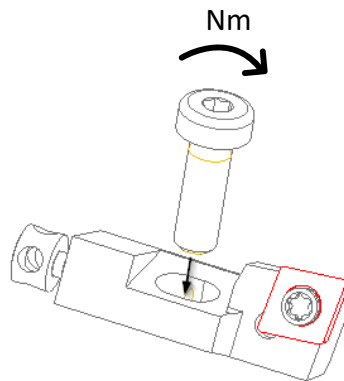


Figure 7, Hexagon socket head cap screw for short clamping cartridges

Table 7, Hexagon socket head cap screw for short clamping cartridges

Material number	Technical specification	Tightening Torque [Nm]
10019695	DIN 7984-M4X12-10.9	3,4
10019685	DIN 7984-M4X16-10.9	
10019703	DIN 7984-M6X16-10.9	7,7
10019671	DIN 7984-M6X20-10.9	
10003620	ISO 4762-M6X25-12.9	
10019674	DIN 7984-M8X30-10.9	18,0

3. Clamping screw for interface

3.1. Cutter retaining screws for milling cutter connection

3.1.1. Cutter retaining screws for milling cutter connection

Per DIN 6367

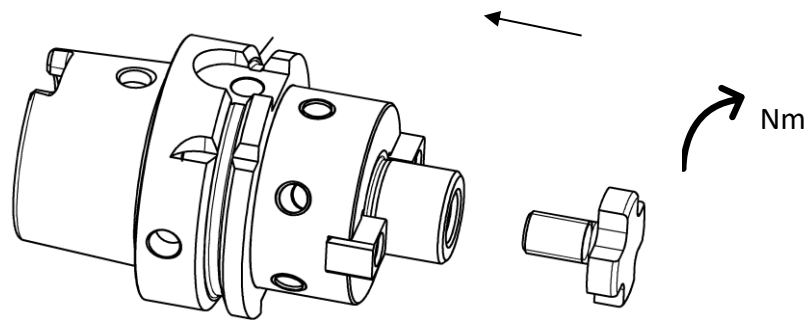


Figure 8, Milling cutter connection

Table 8, Milling cutter connection

Material number	Technical specification	Tightening torque [Nm]
10009830	DIN 6367-M6	16
10007286	DIN 6367-M8	37
10006016	DIN 6367-M10	77
10005164	DIN 6367-M12	137
10004065	DIN 6367-M16	320
10004066	DIN 6367-M20	622
10010417	DIN 6367-M24	1079
10017544	DIN 6367-M30	2089

3.1.2. Cutter retaining screw with hexagon socket

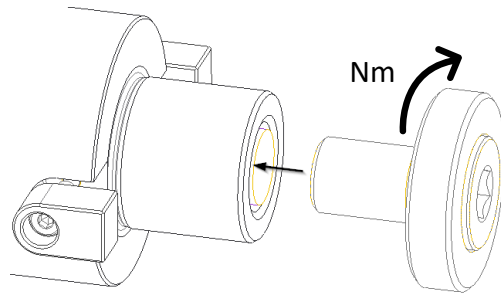


Figure 9, Cutter retaining screw with hexagon socket

Table 9, Cutter retaining screw with hexagon socket

Material number	Technical specification	Tightening Torque [Nm]
10041356	M8	28
10009642	M10	50
10006125	M12	70
10009686	M16	95
10006126	M20	125
10006127	M24	290

3.1.3. Socket head screw with hexagon socket

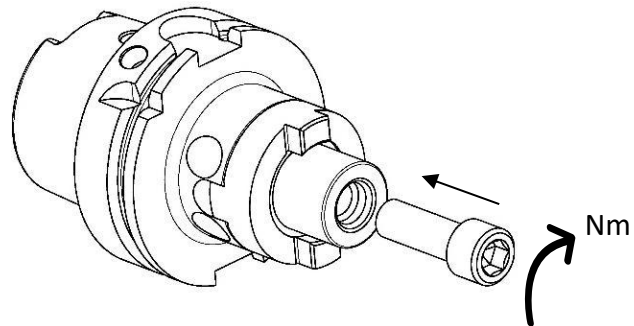


Figure 10, Socket head screw with hexagon socket

Table 10, Socket head screw with hexagon socket

Material number	Technical specification	Tightening Torque [Nm]
10003638	ISO 4762-M8X30-12.9	35
10003660	ISO 4762-M10x30-12.9	70
10003677	ISO 4762-M12X35-12.9	120
10003690	ISO 4762-M16X35-12.9	300
10111521	ISO 4762-M20X45-12.9	550

3.1.4. Socket head screw with hexagon socket and central coolant bore

Per MN692BL4

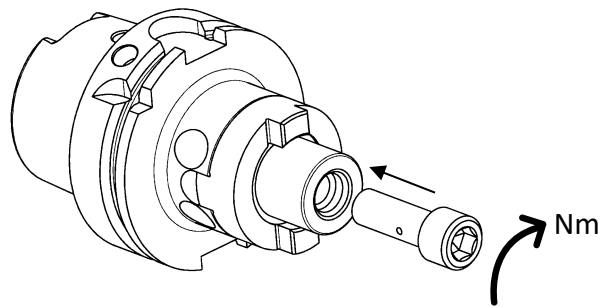


Figure 11, Socket head screw with central coolant bore

Table 11, Socket head screw with central coolant bore

Material number	Technical specification	Tightening Torque [Nm]
31006779	MN692BL4-M8x30-12.9-IK	30
31006800	MN692BL4-M10x30-12.9-IK	60
31008546	MN692BL4-M12x35-12.9-IK	100
31008547	MN692BL4-M16x40-12.9-IK	250
31009716	MN692BL4-M20x45-12.9-IK	450

3.1.5. Hexagon socket head cap screw for drive keys

of milling cutter arbors per MN692-1, DIN2079 and similar. etc.

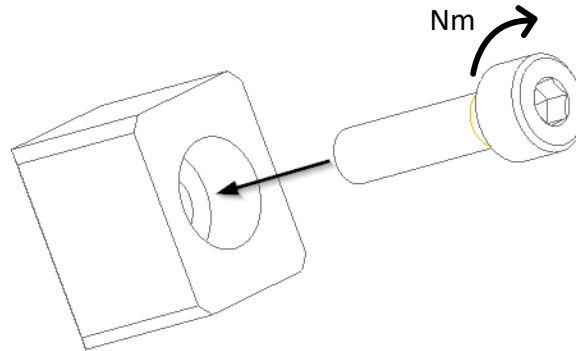


Figure 12, Hexagon socket head cap screw for drive keys

Table 12 Hexagon socket head cap screw for drive keys

Arbor-Ø	Material number	Technical specification	Tightening Torque [Nm]
16	10003571	ISO 4762-M3x10-12.9	2,1
16	10003572	ISO 4762-M3x12-12.9	2,1
22	10003583	ISO 4762-M4x10-12.9	4,4
22	10003584	ISO 4762-M4x12-12.9	4,4
27	10003586	ISO 4762-M4x16-12.9	4,4
27	10003599	ISO 4762-M5x12-12.9	8,7
32	10003601	ISO 4762-M5x16-12.9	8,7
40	10003601	ISO 4762-M5x16-12.9	8,7
40	10003603	ISO 4762-M5x20-12.9	8,7
50	10003634	ISO 4762-M8x16-12.9	36
50	10003636	ISO 4762-M8x20-12.9	36
60	10003675	ISO 4762-M12x25-12.9	125

3.2. Hexagon socket head cap screws for adaptor flange, mounting flange and flange module for TFB

Per MN5000-30, MN5000-31, MN5000-34, MN5000-35, MN5000-36, MN5000-38, MN5000-39, MN5000-17

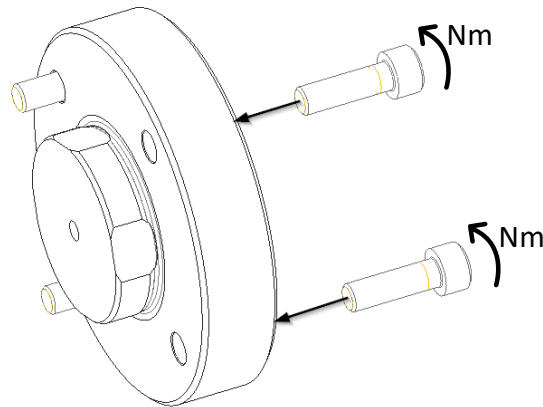


Figure 13, Hexagon socket head cap screws for adaptor flange, mounting flange and flange module for TFB

Table 13, Hexagon socket head cap screws for adaptor flange, mounting flange and flange module for TFB

Adaptor flange [Module-Ø]	Mounting flange [Module-Ø]	Flange module TFB [Module-Ø]	Technical specification	Tightening Torque [Nm]
	40		ISO 4762-M3x...-12.9	1,9
50	50		ISO 4762-M4x...-12.9	4,4
60	45 + 55 +63		ISO 4762-M5x...-12.9	8,7
70 + 80	80	55 + 75	ISO 4762-M6x...-12.9	15
100 + 117	100 + 117	100	ISO 4762-M8x...-12.9	36
140	140	140	ISO 4762-M10x...-12.9	72
180+210	180 + 210		ISO 4762-M12X...-12.9	125

3.3. HFS interface, axial clamping system

3.3.1. Hexagon socket head screw for axial clamping per MN622/MN641

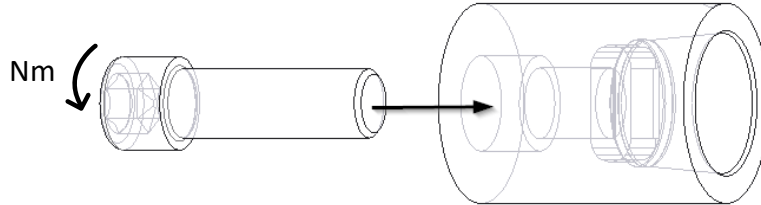


Figure 14, Hexagon socket head cap screw for axial clamping

Table 14, Hexagon socket head cap screw for axial clamping

HFS - size	Tightening Torque [Nm]
6	3
8	3
10	6
12	10
14	10
16	20
20	20
24	35

3.3.2. Threaded spindle for axial clamping per MN617/MN640

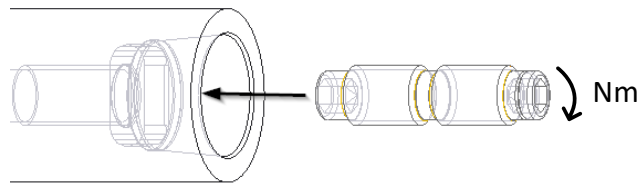


Figure 15, Threaded spindle for axial clamping

Table 15, Threaded spindle for axial clamping

HFS size	Tightening Torque [Nm]
6	3
8	3
10	4
11,7	6
12	6
14	6
16	15
20	15
24	20

3.4. HFS interface, radial clamping system

Eccentric pin for radial clamping as per MN630

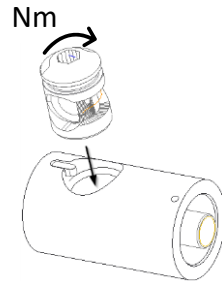


Figure 16, Eccentric pin for radial clamping

Table 16, Eccentric pin for radial clamping

HFS size	Tightening Torque [Nm]
12	7
14	7
16	12
20	12

3.5. PSS interface

Per MN704BL1

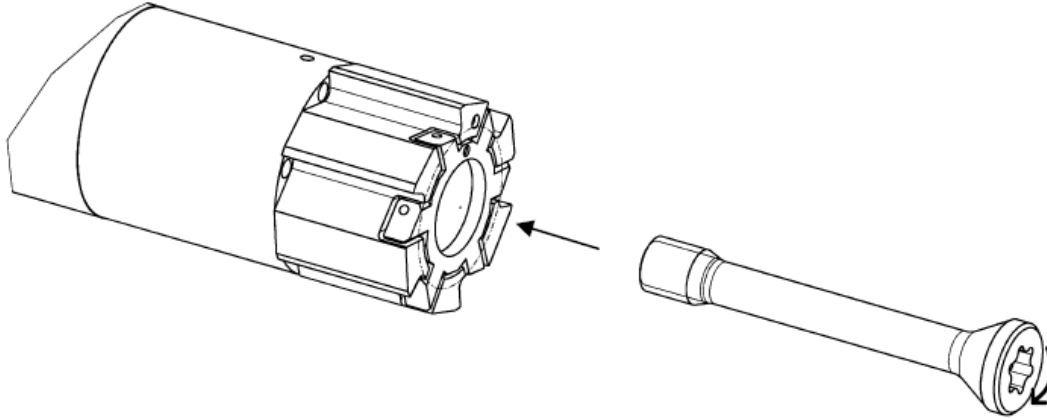


Figure 17, PSS interface

Table 17, PSS interface

PSS size	Tightening torque [Nm]
MN704-GR7A-B MN704-GR7B-B	2
MN704-GR9A-B MN704-GR9B-B	4
MN704-GR12A-B MN704-GR12B-B	7,5

3.6. Threaded pin and differential screw for TTS interface

Per MN654BL2 and MN654BL3

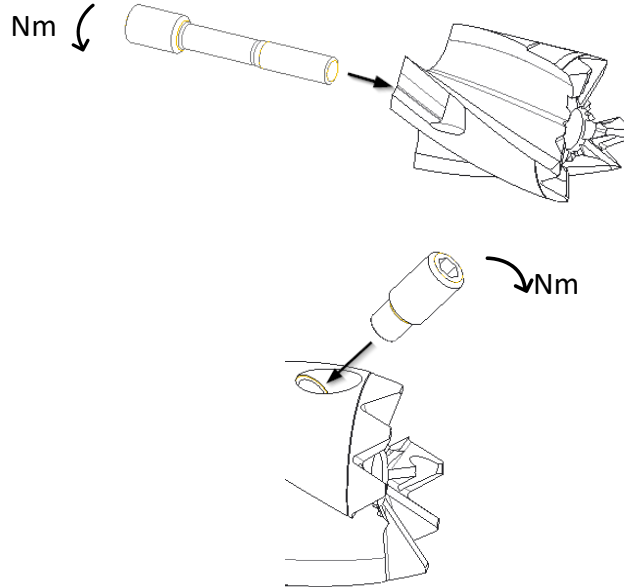


Figure 18, Theaded pin and differential screw for TTS interface

Table 18, Theaded pin and differential screw for TTS interface

Range TTS size	Material number	Technical specification	Tightening Torque [Nm]
TTS-R1200	30259117	M2.5x5-45H-KL	1,0
TTS-R1250 bis 1300	30259118	M2.5x6-45H-KL	1,0
TTS-R1350 bis 1400	30259119	M3x6-45H-KL	1,3
TTS-R1450 bis 1550	30193231	M3x7-45H-KL	1,3
TTS-R1650 bis 1950	30193232	M4x0.5x7.5-45H-KL	3,5
TTS-R2050 bis 2350	30193233	M4x0.5x10-45H-KL	3,5
TTS-R2450 bis 2750	30193234	M5x0.5x11-45H-KL	4,0
TTS-R2850 bis 3150	30193235	M5x0.5x14-45H-KL	4,0
TTS-R3250 bis 3450	30320812	M6x0.5x20-45H-KL	6,0
TTS-R3550 bis 3750	30320811	M6x0.5x16-45H-KL	6,0
TTS-R3950	30320810	M6x0.5x18-45H-KL	6,0
TTS-R4150 bis 4350	30320806	M8x1x20-45H-KL	10
TTS-B1200 bis 1350	30731497	M2X0.4RH-M3X0.5RH	0,4
TTS-B1400 bis 1650	30793828	M2.5X0.45RH-M3.5X0.6RH	0,7
TTS-B1750 bis 1850	30756923	M3X0.5RH-M4X0.7RH	1,3
TTS-B1950 bis 2350	30793198	M3.5X0.6RH-M5X0.8RH	2,0
TTS-B2450 bis 2750	30800834	M4X0.7RH-M6X1RH	3,1
TTS-B2850 bis 3150	30800835	M5X0.8RH-M6X1RH	5,6

3.7. Threaded spindle for KS clamping cartridge

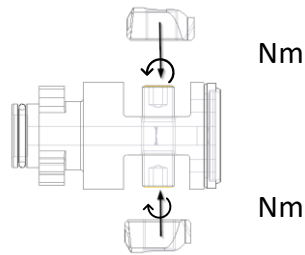


Figure 19, Threaded spindle for KS clamping cartridge

Table 19, Threaded spindle for KS clamping cartridge

HSK size	Tightening Torque Standard type ^A [Nm]	Tightening Torque High pressure type ^B [Nm]	Tightening Torque MQL type ^C [Nm]
25	4	4	-
32	6	6	-
40	7	7	6
50	15	15	15
63	20	20	20
80	30	30	30
100	50	50	50
125	70	-	-
160	110	-	-

^A Example Techn. specification „KS63-08“
^B Example Techn. specification „KS63-08-D“
^C Example Techn. specification „KS63-08-MQL“, „KS63-08-MQL1“

3.8. Torx Plus screw for QTS interface

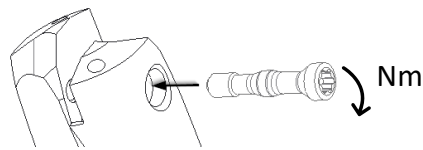


Figure 20, Torx Plus screw for QTS interface

Table 20, Torx Plus screw for QTS interface

Diameter range	Material number	Technical specification	Tightening Torque [Nm]
8,00 - 8,99	30604440	M1,2x7,5-TX5-IP	0,2
9,00 - 10,99	30546309	M1,2x8,5-TX5-IP	0,2
11,00 - 12,99	30604180	M1,6x10,5-TX6-IP	0,4
13,00 - 13,99	30510826	M2x12-TX7-IP	0,6
14,00 - 15,99	30510827	M2,2x13-TX8-IP	0,9
16,00 - 18,99	30495432	M2,5x15-TX8-IP	1,2
19,00 - 21,99	30510829	M3x18-TX9-IP	2,2
22,00 - 24,99	30510830	M3,5x21-TX10-IP	3,3
25,00 - 27,99	30510831	M4x24-TX15-IP	5,0
28,00 - 30,99	30510832	M4,5x27-TX15-IP	5,7
31,00 - 32,99	30510833	M5x30-TX20-IP	7,5
33,00 - 36,99	30651830	M5x32-TX20-IP	7,5
37,00 - 44,99	30651399	M6x35-TX25-IP	15
45,00 - 50,99	30651510	M6x43-TX25-IP	15

3.9. CFS interface

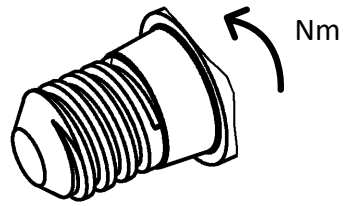


Figure 21, CFS interface

Table 21, CFS interface

CFS size	Tightening Torque [Nm]
6	5
8	12,5
10	15
12	20
14	20
16	25
20	30
24	35

3.10. PGK interface

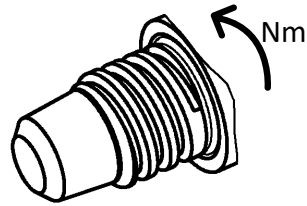


Figure 22, PGK interface

Table 22, PGK interface

PGK size	Tightening Torque [Nm]
8	8
10	10
12	15
16	25
20	35

3.11. Threaded pin according to MN672BL7 for shrink-fit chucks

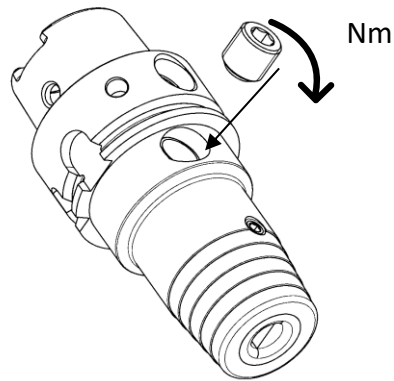


Figure 23, Threaded pin for shrink-fit chucks

Table 23, Threaded pin for shrink-fit chucks

Technical specification	Tightening Torque [Nm]
s.ISO 4026-M8x1x...	7
ISO 4026-M8x...	
s.ISO 4026-M10x1x...	
ISO 4026-M10x...	
MN715BL1-M10...	

3.12. Clamping screw for brush

Per MN679BL1

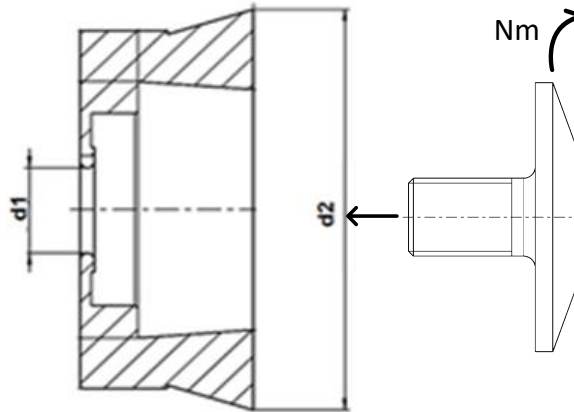


Figure 24, Brush and clamping screw

Table 24, Dimension of brush and tightening torque for the clamping screw

Brush inner- \varnothing d1 [mm]	Brush outer- \varnothing d2 [mm]	Tightening Torque [Nm]
16	0-85	15
22	0-125	20
27	0-125	25
40	0-250	30

3.13. Slotted nut

Turn buckle for RFS interface per MN688

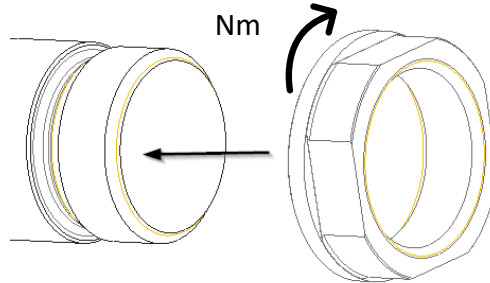


Figure 25, Slotted nut

Table 25, Slotted nut

RFS size	Type	Tightening Torque [Nm]
16	A	20
16	B	40
20	A	20
24	A	20

3.14. Clamping screw for MillChuck System-HB

Per MN700BL1

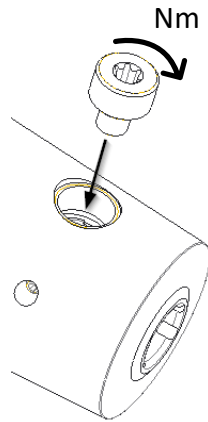


Figure 26, Clamping screw for MillChuck System-HB

Table 26, Clamping screw for MillChuck System-HB

Tool shank-Ø	Torx size	Tightening torque [Nm]
6	T15	10
8	T25	10
10	T25	7
12	T30	13
14	T30	13
16	T40	23
18	T40	23
20	T40	25
25	T50	47
32	T50	50

3.15. Clamping screw for tool holders for cylindrical shanks

Per DIN1835-2

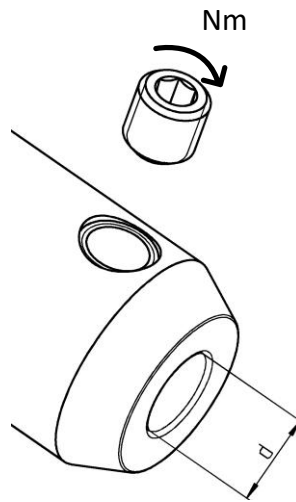


Figure 27, Clamping screw DIN1835

Table 27, Clamping screw DIN1835

Tool shank- \varnothing [mm]	Technical Specification	Tightening torque [Nm]
6	DIN 1835-M6X9	5
8	DIN 1835-M8X9	10
10	DIN 1835-M10X12	15
12	DIN 1835-M12X14	20
14	DIN 1835-M12X14	20
16	DIN 1835-M14X16	25
18	DIN 1835-M14X16	25
20	DIN 1835-M16X16	30
25	DIN 1835-M18X2X20	35
32	DIN 1835-M20X2X20	40
40	DIN 1835-M20X2X20	40

3.16. BFS connection

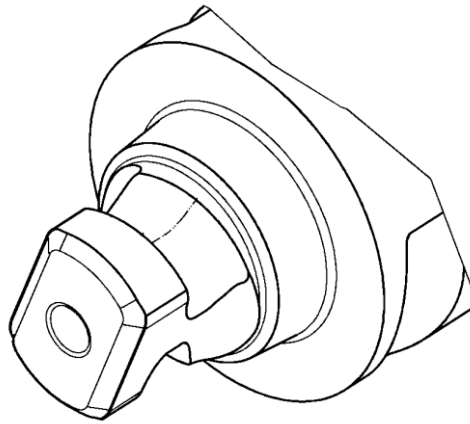


Figure 28, BFS connection

Table 28, BFS connection

MN733-1 / MN733-2	
BFS size	Tightening torque [Nm]
BFS01	11
BFS02	13
BFS03	16
BFS04	20
BFS05	25
BFS06	30
BFS07	37

4. General applications

4.1. Threaded pin for clamping cartridges, ISO tools, fine boring tools and adaptors

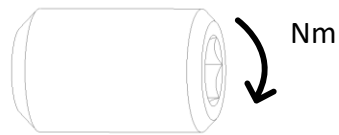


Figure 29, Threaded pin for clamping cartridges, ISO tools, fine boring tools and adaptors

Table 29, Threaded pin for clamping cartridges, ISO tools, fine boring tools and adaptors

Thearded pin per	Technical specification	Tightening torque [Nm]
ISO 4026 ISO 4027 ISO 4028 ISO 4029	ISO 402...-M2X...-45H	0,35
	ISO 402...-M2.5X...-45H	0,53
	ISO 402...-M3X...-45H	0,85
	ISO 402...-M4X...-45H	1,7
	ISO 402...-M5X...-45H	4
	ISO 402...-M6X...-45H	7,5
	ISO 402...-M8X...-45H	18
	ISO 402...-M10X...-45H	25
	ISO 402...-M12X...-45H	35

5. Coolant applications or other applications

5.1. Threaded pin for coolant outlet

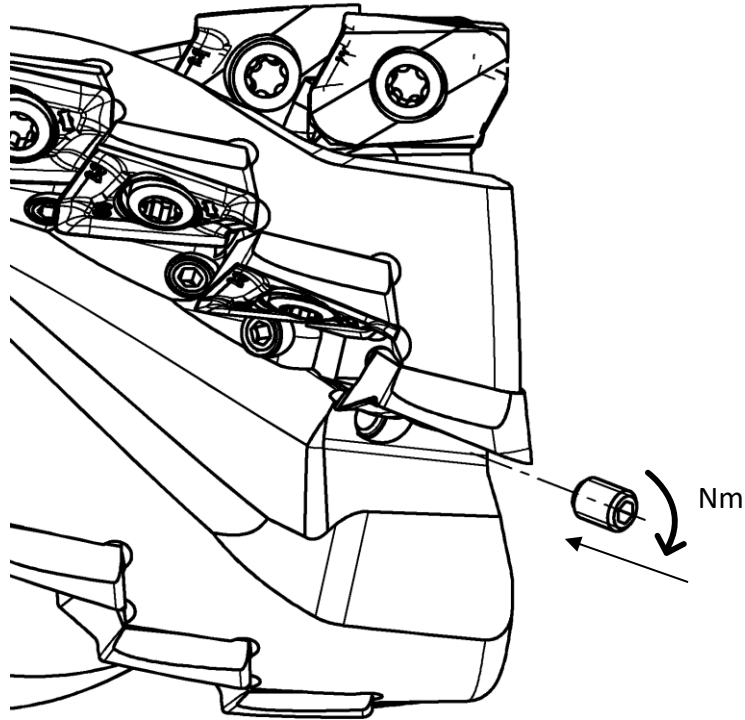


Figure 30, Threaded pin for coolant outlet

Table 30, Threaded pin for coolant outlet

Threaded pin per	Technical specification	Tightening Torque [Nm]
MN620BL1	MN 620-AD M3x...	0,8

5.2. Sealing screws for coolant outlet

The tightening torque for a DIN 906 sealing screw shall be used for the coolant outlet on steel milling heads.

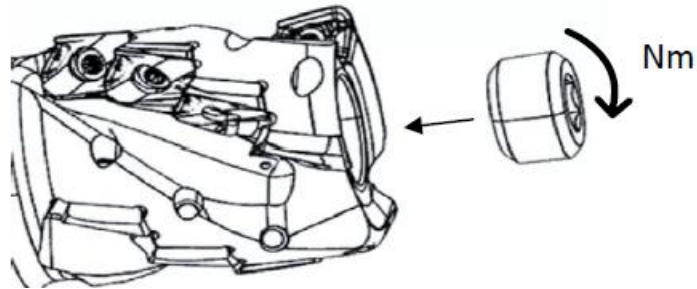


Figure 31, sealing screws

Table 31, sealing screws

Material number	Thread size	Technical specification	Tightening Torque [Nm]
31143577	M16x1,5	DIN 906-M16x1,5-ST	5
10033245	M18x1,5	DIN 906-M18x1,5-ST	7
31248082	M22x1,5	DIN 906-M22x1,5-ST	16
31248083	M27x2	DIN 906-M27x2,0-ST	20

5.3. Coolant tube

Tightening Torque per DIN69895 / DIN 69895:2006-11/ISO 22402-1

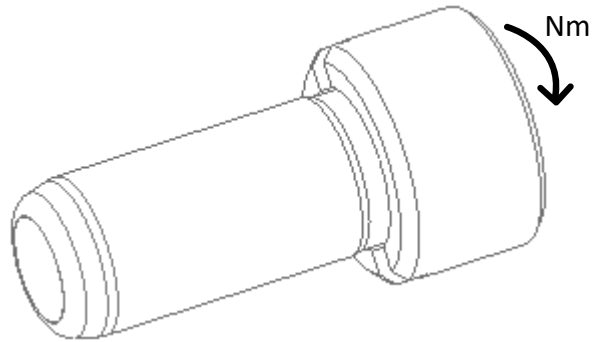


Figure 32, Coolant tube

5.4. Hexagon socket head cap screw for slide tools

General with hexagon socket head cap screw per ISO 4762

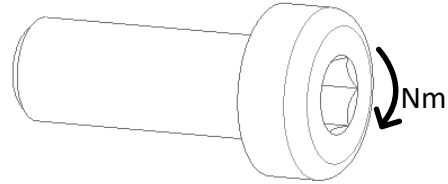


Figure 33, Hexagon socket head cap screw for slide tools

Table 32, Hexagon socket head cap screw for slide tools

Thread size	Tightening Torque [Nm] according to strength class		
	8.8	10.9	12.9
M2	0,25	0,36	0,44
M2,3	0,42	0,58	0,7
M2,6	0,6	0,84	1,0
M3	0,9	1,3	1,58
M3,5	1,4	1,8	2,4
M4	2,1	2,3	3,5
M5	4	6	7
M6	7	10	12
M8	17	25	30
M10	35	52	60
M12	60	88	102
M14	95	142	165
M16	148	218	255
M18	200	286	340
M20	299	428	500
M22	389	546	655
M24	495	697	862
M27	731	1033	1239
M30	992	1404	1679