

INTRODUCTION

This repair manual is intended to ensure that the maintenance and repair work required for BMW cars is done in the correct manner. Therefore this manual should be used by inspectors and fitters as it helps to supplement the practical and theoretical knowledge they have acquired at our service training school.

The relevant specifications are always provided at the beginning of each main group.

The specifications apply to standard cars that have not been involved in an accident and have not been modified after leaving the factory.

Basically speaking, the Touring models are identical with the saloons so that in the specifications and values quoted reference is only made to points in which the Touring models differ from the other cars.

The group system applied in this manual is taken from our flat rate catalogue.

For example, page 32-21/6 means:

32	main group
-21	sub group
/6	page in sub-group

The special tools required for good repair work are listed in our special tool catalogue — order No. 01 99 9 099 420. Photographs have been provided to show how the special tools must be applied for the individual processes and operations.

Removal/disassembly is always described for each operation. If fitting/assembly is not possible in the opposite order a "note when fitting" is provided.

The following supplements are both alterations and additions. If the word "alteration" has been printed on the sheet, take out the sheet already provided and insert the new one in its place. Sheets marked "addition" must simply be added to the existing manual without removing any old sheets.

On the following page a list should be provided of the supplements inserted in the repair manual.

Apart from the improvements announced by regular circular notes, we recommend that the spare parts catalogues — which have clear illustrations — are used as an additional source of information.

BAYERISCHE MOTOREN WERKE AG
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List of supplements inserted

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Tightening torque values and preload forces

Applicable only for bolts to German standards DIN 912, 931, 933, 960, 961 and 6912, and nuts with height $0.8 \times d$ to DIN 934, and exclusively for $\mu_{\text{tot}} = 0.14$.

(Bolts phosphated, nuts untreated or galvanised. Lubrication : unlubricated or lightly oiled.)

For cadmium plated nuts or bolts ($\mu_{\text{tot}} \approx 0.08$ to 0.09) the tightening torque must be $\approx 30\%$ less than the value in the Tables for the equivalent degree of utilisation of the bolt material.

Not applicable for other surface treatments or methods of thread lubrication, or for different nut heights. In such cases separate determination of values is necessary.

Not applicable either for bolts with tensile (expansion) shank, for self-locking bolt connections or for threaded connections using components made of different materials.

The bolt utilisation factor for standard metric threads is :

$$\sigma_{\text{red}} = 0,09 \cdot \sigma_{0,2}$$

$$1 \text{ mkp} = 7.2 \text{ lb/ft}$$

$$1 \text{ kp} = 2.2 \text{ lb.f}$$

Thread	Tightening torque M_A (mkp)						Preload force P_v (kp)					
	Strength class to DIN 267 standard						Strength class to DIN 267 standard					
	5.6	6.8	6.9	8.8	10.9	12.9	5.6	6.8	6.9	8.8	10.9	12.9
M 6	0,4 ^{+0,1}	0,6 ^{+0,1}	0,7 ^{+0,1}	0,9 ^{+0,1}	1,2 ^{+0,2}	1,5 ^{+0,2}	425	600	685	855	1210	1440
M 8	1,0 ^{+0,1}	1,6 ^{+0,2}	1,8 ^{+0,2}	2,2 ^{+0,2}	3,0 ^{+0,3}	3,6 ^{+0,4}	740	1190	1330	1570	2170	2630
M 10	2,0 ^{+0,2}	3,2 ^{+0,4}	3,6 ^{+0,4}	4,3 ^{+0,5}	6,0 ^{+0,7}	7,3 ^{+0,8}	1160	1880	2090	2500	3480	4200
M 8x1	1,0 ^{+0,1}	1,0 ^{+0,2}	1,8 ^{+0,2}	2,2 ^{+0,2}	3,0 ^{+0,3}	3,6 ^{+0,4}	740	1190	1330	1610	2200	2670
M 10x1,25	2,0 ^{+0,2}	3,2 ^{+0,4}	3,6 ^{+0,4}	4,3 ^{+0,5}	6,0 ^{+0,7}	7,3 ^{+0,8}	1160	1900	2120	2520	3530	4250
M 12x1,25	3,4 ^{+0,4}	5,4 ^{+0,6}	6,1 ^{+0,7}	7,2 ^{+0,8}	10,3 ⁺¹	12,0 ^{+1,5}	1720	2710	3070	3610	5100	6090
M 12x1,5	3,4 ^{+0,4}	5,4 ^{+0,6}	6,1 ^{+0,7}	7,2 ^{+0,8}	10,3 ⁺¹	12,0 ^{+1,5}	1690	2670	3030	3570	5040	6000
M 14x1,5	5,4 ^{+0,6}	8,6 ⁺¹	9,8 ⁺¹	11,5 ^{+1,5}	16,0 ⁺²	20,0 ⁺²	2330	3720	4180	5030	6970	8510
M 16x1,5	8,3 ⁺¹	13,5 ^{+1,5}	15,5 ^{+1,5}	18,0 ⁺²	25,0 ⁺³	30,0 ⁺⁴	3240	5190	5840	6920	9710	11770
M 18x1,5	11,0 ^{+1,5}	18,0 ⁺²	20,0 ^{+2,5}	24,0 ⁺³	34,0 ⁺⁴	40,0 ⁺⁵	3890	6240	7020	8380	11800	13960
M 20x1,5	16,0 ⁺²	26,0 ⁺³	29,0 ^{+3,5}	34,0 ⁺⁴	49,0 ⁺⁵	59,0 ⁺⁶	5070	8170	9180	10680	15200	18250

For a threaded connection conforming to the above conditions the values laid down in the Table are applicable. The tightening torque including the tolerance will only be quoted on the engineering or assembly drawing if :

- a) a value differing from that shown in the Table is necessary for functional reasons
- b) the strength class of the nut and bolt is not evident.

Warning : Special reference is made in the Technical Data to any deviation from these Tables.

A BMW Standard concerning tightening and test torque values for threaded connections using self-locking nuts to DIN 985 and BMW N 113 48.0 standards is in preparation.

Bolts

Description	Head patt.	DIN No.	Str. cat.
Hex bolt		931	8.8 10.9 12.9
		933	
		960	
		961	
		70614	
		561	8.8
Cylindrical head bolt		84	4.8 8.8
		912	8.8
		6912	10.9
Round head bolt		7986	4.8
Flat round head bolt		603	4.6 8.8
Countersunk bolt		63	4.8 8.8
		7987	4.8 8.8
Domed head bolt		920	5.6 ⁴⁾
		921	
		7985	4.8
Domed head counter-sunk bolt		91	4.8 8.8
		7988	4.8
Cylindrical head self-tapping screw		7971	1)
Hex head self-tapping screw		7976	1)

Description	Head patt.	DIN No.	Str. cat.
Countersunk self-tapping screw		7982	1)
Domed head self-tapping screw		7981	1)
Domed head countersunk self-tapping screw		7983	1)
Stud bolt	—	833	8.8
		835	
		836	
		838	
		939	
		940	
Threaded pin		417	2) 4)
		551	
		553	4.8 ⁴⁾
Shank bolt		438	5.8
Wing bolt		427	4.6
Threaded plug		906	4.6
		908	5.6 ⁴⁾
		910	
		7604	
Hollow screw		7623	6.8
		71436	
Collar screw		3871	5.6 ⁴⁾
Slotted plug		71022	5.6 ⁴⁾

Nuts

Description	Pat- tern	DIN No.	Str. cat.
Hex nut		439	5)
		985	8 10 ⁴⁾
		934	3)
		936	6G 8G
		70615	8/10 ⁴⁾
		70616	6G/8G ⁴⁾
Castellated nut		935	8/10
		937	6S/8G
Wing nut		315	GTS

Description	Pat- tern	DIN No.	Str. cat.
Square nut		557	5-2
		562	4D-2
Cap nut		986	8 ⁴⁾
		1587	6-2
Slotted nut		70851	6G ⁴⁾
		70852	
Collar nut		3870	5D-2 ⁴⁾
		7606	
Knurled nut		466	5-2
		467	
Round shoulder nut		74361	8/10
Flat shoulder nut			

1) Case hardening steel, file grade, hardening depth 0.1 — 0.2 mm

2) up to M 10 = 4.8, M 12 and beyond = 4.6

3) up to M 4 = 5-2, M 5 and beyond = 8 and 10

4) prescribed strength categories not in accordance with DIN standard

5) up to M 8 = 4D-2, M 10 = 5S-2

Order No. 01 50 9 699 589

Exchange alteration sheets	Confirmed	Exchange alteration sheets	Confirmed
11- 0/1 to 4 0/3 to 13 00/1 00/21 to 24 00/26/1 to 4 12/3 12/7 14/1 to 4 21/1 to 4 25/1 31/1 to 7 33/1 34/1 41/1 64/11 12- 0/3 to 7 32/1 to 3 41/5 13- 0/1 0/3 to 5 11/3 11/13 to 16 31/1 32/1 16- 0/3 17- 0/3 21- 0/1 0/3 00/1 21/1 to 6 51/1 52/1 23- 0/3 to 5 00/3 to 8 00/13 to 16 24- 0/3 to 5 00/3 to 8 40/1 25- 11/1 26- 0/3 31- 0/1 0/3 to 5 11/1 12/1 to 5 12/7 deleted 20/1 21/1 31/1 to 3 33/1 32- 0/1 0/3 11/1 21/1 to 3 31/1 to 3 32/1 33/3 33- 0/3 to 9		34- 0/1 0/3 to 5 00/1 11/1 to 5 21/3 31/1 to 3 33/1 to 3 41/5 35- 0/3 36- 0/3 41- 0/1 0/5 35/1 51/1 to 2 51- 0/1 0/3 45/3 61- 0/1 0/3 13/1 31/3 to 5 62- 0/1 0/3 11/1 13/1 63- 0/1 0/3 21/1 99/3 99/5 deleted 64- 11/19 65- 11/1 71- 0/3 60/3 to 5	
		Insert additional sheets	Confirmed
		Tool number conversion list	
		11- 0/17 12- 0/9 13- 0/7 62/1 21- 0/5 23- 0/7 24- 0/5a 31- 0/7 21/3 32/1 33/3 32- 31/5 33- 0/11 34- 0/7 00/3 41- 51/3 to 10 61- 0/37 0/39 13/3 31/7 62- 11/3	

Insert this sheet after the Introduction

Tightening torque values
for self-locking hex nuts

BMW N
113 49.0

Applicable only to nuts to BMW N 113 48.0 and DIN 985 standards.

Surface treatment: phosphated or galvanized bolt. Nut galvanized, unwaxed.

Bolt lubrication: either unlubricated or lightly oiled.

For cadmium plated nuts or bolts the torque value must be $\approx 30\%$ less than the value in the tables for an equivalent utilisation factor of the bolt material.

Not applicable for other surface treatments or methods of lubrication, or a bolt strength classification of less than 8.8 (e.g. 6.9) in conjunction with expansion bolts.

In such cases separate determination of values is necessary.

1 kpm = 7.2 lb/ft

Thread	Tightening torque M_A (kpm)					
	Nuts to BMW N 113 48.0 std.			Nuts to DIN 985 std.		
	Strength category			Strength category		
	8	10	12	8	10	12
M 6	1,1 ^{+0,1}	1,5 ^{+0,2}	1,8 ^{+0,2}	1,0 ^{+0,1}	1,3 ^{+0,2}	1,6 ^{+0,2}
M 8 M 8 x 1	2,5 ^{+0,3}	3,4 ^{+0,4}	4,0 ^{+0,5}	2,5 ^{+0,2}	3,3 ^{+0,3}	3,9 ^{+0,4}
M 10 M 10 x 1,25	4,9 ^{+0,5}	6,8 ^{+0,8}	8,0 ^{+0,9}	4,7 ^{+0,5}	6,4 ^{+0,7}	7,7 ^{+0,8}
M 12 M 12 x 1,5	8,1 ^{+0,9}	11,4 ^{+1,3}	13,5 ^{+1,5}	7,8 ^{+0,8}	10,9 ⁺¹	12,6 ^{+1,5}
M 14 M 14 x 1,5	13,0 ^{+1,5}	18,0 ⁺²	22,0 ⁺²	12,7 ^{+1,5}	17,0 ⁺²	21,0 ⁺²
M 16 M 16 x 1,5	22,5 ⁺²	28,0 ⁺³	33,0 ⁺⁴	19,5 ⁺²	26,0 ⁺³	31,0 ⁺⁴
M 18 M 18 x 1,5	27,0 ⁺³	38,0 ⁺⁴	44,0 ⁺⁵	26,0 ⁺³	36,0 ⁺⁴	42,0 ⁺⁵

The corresponding preload forces P_V (kp) relevant to the strength categories concerned are given in the table 'Tightening torque values and preload forces', BMW N 600 02.0.

For a threaded connection conforming to the above mentioned conditions the values laid down in the tables are applicable. The tightening torque including tolerance will only be quoted on the engineering or assembly drawing if for functional reasons a value other than that given in the standard is necessary.

An accurate theoretical and experimental investigation is always necessary for
a threaded connection subjected to high dynamic stress.

**Conversion list for special tool numbers
(new to old)**

New Order No.	Old Order No.	New Order No.	Old Order No.
00 1 500	6000	13 5 240	6078
00 2 000	CARTOOL	13 5 260	7028
Friction Meter	Friction Meter	16 1 000	6067
00 2 050	7035	16 1 010	6068
00 2 500	5104	17 0 000	Manual tester
00 2 510	5104 A	21 2 060	7061
00 2 50	6027	21 2 100	603
00 5 000	7051	23 0 000	7060
00 5 500	5120	23 0 010	7060/1
00 5 550	5079	23 0 040	6002
00 7 500	Kukko 17/K	23 0 050	6002-2
00 8 500	Kukko 204/2	23 0 150	7002
00 8 510	Kukko 21/1 and 22/1	23 0 160	7024
00 8 550	Kukko 21/5 and 22/2	23 1 000	611
11 0 000	600	23 1 140	6039
11 0 020	7000	23 1 150	604
11 0 100	6001	23 1 200	607
11 0 120	7001	23 1 210	SW 30/83
11 1 000	6017	23 1 300	7026
11 1 040	6025-1	23 1 400	7010
11 1 060	7003-1	23 2 000	6206
11 1 100	609	23 2 010	6206 E
11 1 120	610	23 2 040	6304
11 1 240	6060	23 2 050	6305
11 2 000	7006	23 2 060	6306
11 2 040	6018	23 2 100	6044
11 2 100	6069	23 2 150	7026/1
11 2 120	6069-1	23 2 200	1846c/3
11 2 140	6013	23 2 210	1846a/3
11 2 160	7007	23 2 240	6055
11 2 180	7013	24 0 000	6042
11 2 200	7025	24 0 010	6085
11 2 260	7005	24 0 100	7044
11 2 290	6020	24 0 150	6002-1
11 3 000	6019	34 0 160	7030
11 3 040	6012	24 1 000	6041
11 3 060	7004	24 1 040	6030
11 3 100	7008-1	24 1 050	7052
11 4 000	6065-1	24 1 060	7043
11 5 000	608	24 1 100	7053
12 1 040	6083/1	24 1 160	7039
12 1 050	6083	24 2 000	6050/1-4
12 1 060	7058	24 2 001	6050/1
12 1 100	6066	24 2 002	6050/2
13 0 020	7062	24 2 003	6050/3
13 0 040	011	24 2 004	6050/4
13 0 050	022	24 2 040	6032
13 0 060	010	24 2 050	6034
13 0 500	Unitest synchronizer	24 2 140	6031
13 1 000	6023	24 2 160	7032
13 1 010	6023-1	24 2 180	7038
13 1 030	7020	24 2 190	7037
13 3 000	5125	24 2 250	7035/2
13 3 050	6070	24 2 260	7035/1
13 5 040	6071	24 2 270	7040
13 5 050	6075	24 3 040	7056
13 5 070	6072	24 3 060	7033
13 5 080	6077	24 3 140	6033
13 5 140	6073	24 3 150	7054
13 5 150	6076	24 3 160	7031

Insert after bolt and nut table

ew Order No.	Old Order No.	New Order No.	Old Order No.
1 3 260	7041	41 5 000	7057
1 3 460	7036	41 6 000	6048
1 4 000	6028-1	51 1 000	6009
1 4 040	6062	51 1 050	6049
1 4 042	6062/2	51 1 060	6064
1 4 043	6062/1	51 2 000	6052
1 4 050	7055	51 2 020	6079
1 4 061	7034	51 2 050	7018
1 4 062	6062/3	51 2 100	7022
5 1 000	6043	51 3 050	Happich insertion tool
5 1 000	6006-4	51 3 100	6084/1-4
5 1 050	538	51 3 101	6084/1
1 1 000	6011	51 3 102	6084/2
1 1 007	6011-1	51 3 103	6084/3
1 2 000	6014-1	51 3 150	6084/4
1 2 040	6080	64 1 000	6086
1 3 000	6037	64 5 000	6074
1 3 100	6035		
1 3 140	6047		
1 3 160	6016		
2 1 000	7015		
2 2 000	7027		
2 2 020	6059		
2 2 050	6056		
2 2 070	6082		
2 2 090	7009		
2 3 000	6024		
2 3 050	7021/1-4		
2 3 100	6087		
2 4 000	7017		
2 4 050	7016		
3 1 000	6003		
3 1 040	6003-3		
3 1 060	6003-1		
3 1 100	6081-1		
3 1 150	7019		
3 1 180	5103		
3 1 250	7011-2		
3 1 270	6046		
3 1 300	Rollex puller with cups HM 89 449, LM 503 349 and pressure pad 6058		
33 1 350	6053		
33 1 400	6054		
33 1 420	5104/1		
33 1 450	7023		
33 2 000	6045		
33 3 000	6007-2		
34 1 000	7029		
34 1 010	3.9314-1400.2		
34 1 050	3.9314-1800.2		
34 1 060	3.9314-1500.2		
34 1 100	3.9314-0900.1		
34 1 120	3.9314-0600.1		
34 1 150	3.4314-1901.2		
34 1 170	3.9315-1900.2		
34 1 200	7807		
34 1 250	3.9314-1300.2		
34 2 000	6038		
34 3 000	6063		
34 4 000	7014		
35 3 000	6021		
36 1 000	Wheel runout tester		
36 1 050	6036		

**Conversion list for special tool numbers
(old to new)**

Old Order No.	New Order No.	Old Order No.	New Order No.
010	13 0 060	6042	24 0 000
011	13 0 040	6043	25 1 000
022	13 0 050	6044	23 2 100
538	26 1 050	6045	33 2 000
600	11 0 000	6046	33 1 270
603	21 2 100	6047	31 3 140
604	23 1 150	6048	41 6 000
607	34 1 200	6049	51 1 050
608	11 5 000	6050/1-4	24 2 000
609	11 1 100	6050/1	24 2 001
610	11 1 120	6050/2	24 2 002
611	23 1 000	6050/3	24 2 003
1846c/3	23 2 200	6050/4	24 2 004
1846a/3	23 2 210	6052	51 2 000
5079	00 5 550	6053	33 1 350
5103	33 1 180	6054	33 1 400
5104	00 2 500	6055	23 2 240
5104/1	33 1 420	6056	32 2 050
5104 A	00 2 510	6059	32 2 020
5120	00 5 500	6060	11 1 240
5125	13 3 000	6062	24 4 040
6000	00 1 500	6062/1	24 4 043
6001	11 0 100	6062/2	24 4 042
6002	23 0 040	6062/3	24 4 062
6002-1	24 0 150	6063	34 3 000
6002-2	23 0 050	6064	51 1 060
6003	33 1 000	6065-1	11 4 000
6003-1	33 1 060	6066	12 1 100
6003-3	33 1 040	6067	16 1 000
6006-4	26 1 000	6068	16 1 010
6007-2	33 3 000	6069	11 2 100
6009	51 1 000	6069-1	11 2 120
6011	31 1 000	6070	13 3 050
6011-1	31 1 007	6071	13 5 040
6012	11 3 040	6072	13 5 070
6013	11 2 140	6073	13 5 140
6014-1	31 2 000	6074	64 5 000
6016	31 3 160	6075	13 5 050
6017	11 1 000	6075	13 5 150
6018	11 2 040	6077	13 5 080
6019	11 3 000	6078	13 5 240
6020	11 2 290	6079	51 2 020
6021	35 3 000	6080	31 2 040
6023	13 1 000	6081-1	33 1 100
6023-1	13 1 010	6082	32 2 070
6024	32 3 000	6083	12 1 050
6025-1	11 1 040	6083/1	12 1 040
6027	00 2 550	6084/1-4	51 3 100
6028-1	24 4 000	6084/1	51 3 101
6030	24 1 040	6084/2	51 3 102
6031	24 2 140	6084/3	51 3 103
6032	24 2 040	6084/4	51 3 150
6033	24 3 140	6085	24 0 010
6034	24 2 050	6086	64 1 000
6035	31 3 100	6087	32 3 100
6036	36 1 050	6206	23 2 000
6037	31 3 000	6206 E	23 2 010
6038	34 2 000	6304	23 2 040
6039	23 1 140	6305	23 2 050
6041	24 1 000	6306	23 2 060
		7000	11 0 020

Insert after bolt and nut table

Id Order No.	New Order No.	Old Order No.	New Order No.
001	11 0 120	7041	24 3 260
002	23 0 150	7043	24 1 060
003-1	11 1 060	7044	24 0 100
004	11 3 060	7051	00 5 000
005	11 2 260	7052	24 1 050
006	11 2 000	7053	24 1 100
007	11 2 160	7054	24 3 150
008-1	11 3 100	7055	24 4 050
009	32 2 090	7056	24 3 040
010	23 1 400	7057	41 5 000
011-2	33 1 250	7058	12 1 060
013	11 2 180	7060	23 0 000
014	34 4 000	7060-1	23 0 010
015	32 1 000	7061	21 2 060
016	32 4 050	7062	13 0 020
017	32 4 000	7807	34 1 200
018	51 2 050	SW 30/83	23 1 210
019	33 1 150	3.9314-0600.1	34 1 120
020	13 1 030	3.9314-0900.1	34 1 100
021/1-4	32 3 050	3.9314-1300.2	34 1 250
022	51 2 100	3.9314-1400.2	34 1 010
023	33 1 450	3.9314-1500.2	34 1 060
024	23 0 160	3.9314-1800.2	34 1 050
025	11 2 200	3.9314-1900.2	34 1 170
026	23 1 300	3.9314-1901.2	34 1 150
026/1	23 2 150	Kukko 17/K	00 7 500
027	32 2 000	Kukko 204/2	00 8 500
028	13 5 260	Kukko 21/1 and 22/1	00 8 510
029	34 1 000	Kukko 21/5 and 22/2	00 8 550
030	24 0 160	CARTOOL	
031	24 3 160	Friction Meter	00 2 000
032	24 2 160	UNITEST synchroniser	13 0 500
033	24 3 060	Manual tester	17 0 000
034	24 4 061	Happich insertion tool	51 3 050
035	00 2 050	Wheel runout tester	36 1 000
035/1	24 2 260	Roller puller with cups	33 1 300
035/2	24 2 250	HM 89449,	
036	24 3 460	LM 503349	
037	24 2 190	and pressure pad	
038	24 2 180	6058	
039	24 1 180		
040	24 2 270		