

Bonded Seals



Double-acting

Static seal for screw and flange connections

Material:

Elastomers bonded to metal



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■ Bonded Seals

DESCRIPTION

Bonded Seals, also known as U-Seals and Usit Rings, are composed of a metal washer with an elastomer sealing lip vulcanized to the inner diameter. They are primarily used to seal bolted connections and mounting elements, mostly in industrial applications, such as pipe connections and couplings. When the bolted connection is tightened, the sealing lip is pressed against the flat surfaces for a leak-tight seal.

The metal washer ensures that the components to be connected are reliably and securely held. Its thickness limits the compression of the elastomer seal, ensuring a reliable seal. Internal pressure increases sealing force by energizing the elastomer lip.

Various types of Bonded Seals are suitable for sealing continuous or stepped threads in general engineering. They are applicable to smooth flanges, countersinks and a number of different screw types.

Bonded Seals are available with special designs for use in aerospace applications or in accordance with MIL specifications. Contact your local Customer Solution Center for more information.

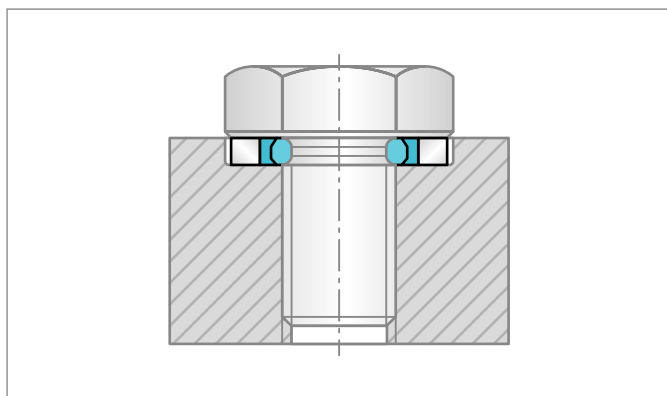


Figure 9: GM500

FEATURES AND BENEFITS

- Cost-effective solution for sealing of bolt/thread, bolt heads and flanges
- Versatile and applicable to all threaded bolts, studs and clearance holes
- Available in metric, Whitworth, BSP and other European thread sizes
- Large choice of elastomer and metal materials for different media and application conditions
- Wide temperature resistance
- Reliable high and low pressure sealing
- Metal washer prevents over compression and extrusion
- Usable for overhead installation
- Can be automatically installed
- Visible from the outside for assembly

APPLICATIONS

- Flanges
- Plates
- Engines
- Bolts
- Valves
- Hydraulics
- Cylinder / valve connections

OPERATING CONDITIONS

Pressure:	Depending on size and material selected.
Temperature:	-30 °C to +100 °C / -22 °F to +212 °F NBR -15 °C to +200 °C / +5 °F to +392 °F FKM
Media:	Depending on material selected. Oil-based hydraulic fluids, lubricating oils, water, air and other media.



GM500

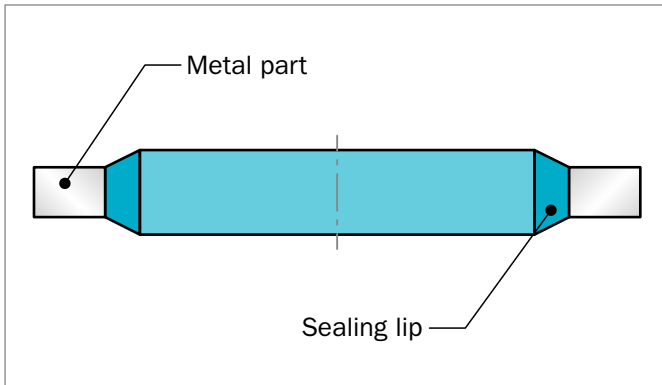


Figure 10: GM500

GM500 SELF-CENTERING

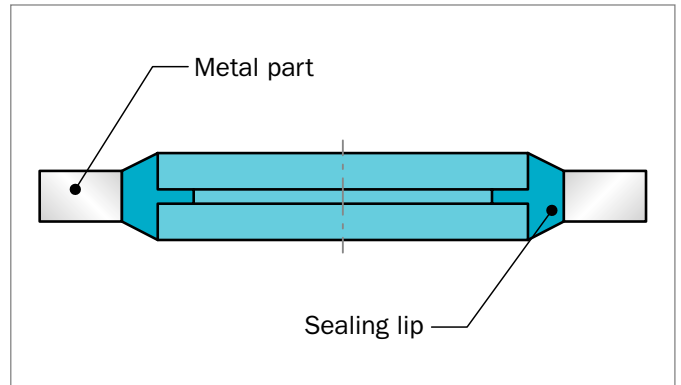


Figure 12: GM500 self-centering

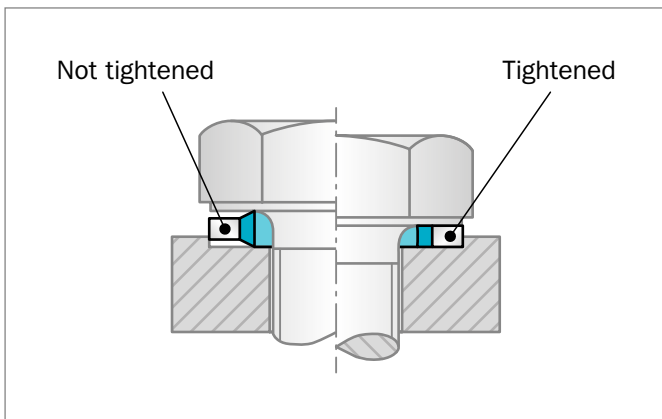


Figure 11: Installation GM500

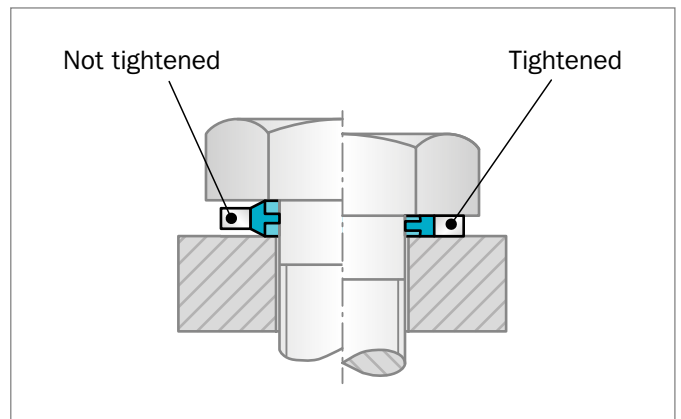


Figure 13: Installation GM500 self-centering

GM500 was originally designed to replace copper-type washers in high-pressure systems. Simple in construction, the seal comprises a metal ring with a square or rectangular cross-section, bonded to an elastomeric ring with a trapezoidal cross-section. The metal ring resists bursting force and limits deformation of the elastomer element.

- Used with a wide range of different bolts
- Suitable for flat flanges or recessed bolt holes

Developed to eliminate leakage due to seal offset, GM500 self-centering has the additional benefit of pre-assembling on to threads for savings on secondary operations. The thin seal membrane offers little resistance during assembly.

- Centrally located
- Positively retained
- Ability to pre-assemble
- Easy to assemble
- All European thread sizes available



GM 1000 SELF-CENTERING

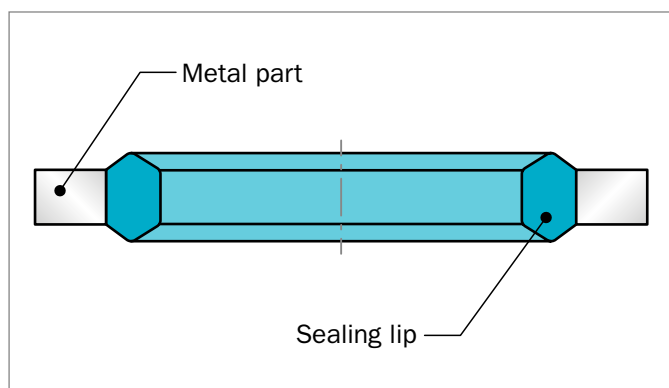


Figure 14: GM1000

GM2000 SELF-CENTERING

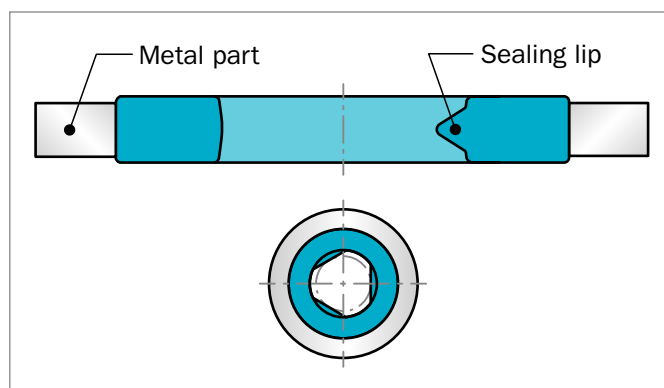


Figure 16: GM2000

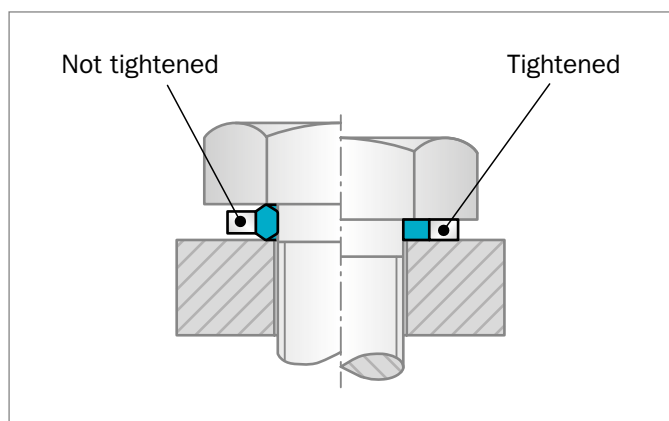


Figure 15: Installation GM1000

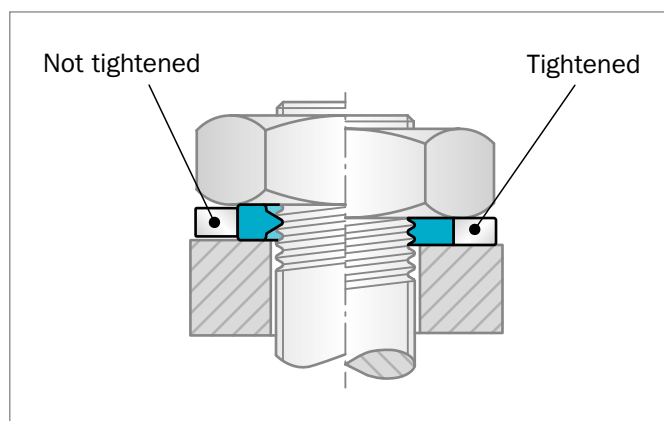


Figure 17: Installation GM2000

GM1000 is a more robust version of self-centering Bonded Seal.

- Easy to install: during assembly, screw connections can be tightened and loosened several times
- Good sealing even with low tightness
- No need for a countersink to center the seal due to lip design
- For metric bolts with hexagonal heads as per DIN specifications
- Can be manufactured to inch sizes or with special designs

A self-centering Bonded Seal for threads and nuts.

- No need for a countersink to center the seal due to lip design
- Three contact lips seal the thread to the nut and machine component to prevent leakage
- Positively retained

IMPORTANT NOTE

During assembly, make sure that the seal is pushed over the thread and not turned.



CUSTOMIZED SOLUTIONS

Sealing plates can be manufactured to customer drawings and specifications. The sealing lip is customized based on application requirements and can be used to replace O-Rings, square rings and other molded parts.

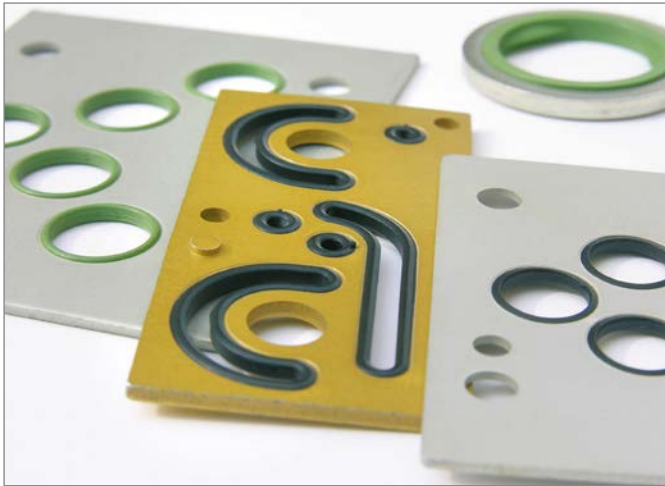


Figure 18: Customized solutions

**Table 5: Sealing lip - standard compounds**

Basic Polymer	Compound code	Color	Hardness Shore A	Temperature Range*
HNBR 80	H8M_H	black	80 ± 5	-30 °C to +130 °C
NBR 70	N7M_H	black	70 ± 5	-30 °C to +100 °C
NBR 90	N9M_H	black	90 ± 5	-35 °C to +100 °C
FKM 75	VCM_H	black	75 ± 5	-20 °C to +200 °C
EPDM 75	E7M_H	black	70 ± 5	-45 °C to +150 °C

Table 6: Sealing lip - aerospace compounds

Basic Polymer	Compound code	Color	Hardness Shore A	Temperature Range*
NBR 90	N9M_V	black	90 ± 5	-30 °C to +100 °C
NBR 80	NCM_G	black	80 ± 5	-30 °C to +100 °C
FVMQ	F8L_G	blue	80 ± 5	-60 °C to +200 °C
FVMQ	F6W_G	white	60 ± 5	-60 °C to +200 °C
EPDM 80	E8M_G	black	80 ± 5	-54 °C to +135 °C
VMQ	SCG_G	black	75 ± 5	-50 °C to +175 °C
FKM 75	VCM_G	black	80 ± 5	-20 °C to +200 °C

Table 7: Metal part - materials and coatings

Metal Code	Segment Type	Reference Code	Material Type	Min. Tensile Strength	Standard	Plating DIN EN ISO 19598	White Rust**	Red Rust**
							Corrosion resistance ISO 9227	
B	Industrial/ Aerospace	.74	Stainless Steel	485 N/mm ²	SUS316L	-	-	-
J	Industrial/ Aerospace	.41	Standard Steel	540 N/mm ²	1.0540	Fe//Zn8//An//T0	8h	72h
Y	Industrial/ Aerospace	.95	Standard Steel	540 N/mm ²	1.0540	Fe//ZnNi8//Cn//T0	120h	720h
5	Industrial/ Aerospace	.08	Stainless Steel	590 N/mm ²	SUS416	-	-	-
Q	Aerospace	.05	Aluminum	370 N/mm ²	AL-Alloy	-	-	-
1	Aerospace	.31	Stainless Steel	540 N/mm ²	1.4550	-	-	-

Other compounds are available on request. Please contact your local Customer Solution Center for more information.

* Maximum and minimum working temperatures have to be agreed with Trelleborg Sealing Solutions according to specific application criteria.

** Indication values for corrosion resistance in salt spray test in accordance with DIN 50021 SS (ISO 9227).



GALVANIC COATINGS

Galvanic coatings consist of zinc or zinc alloys.

Table 8: Zinc and zinc alloys (extract from DIN 50979)

Abbreviation	Definition
Zn	Zinc coating without alloy
ZnFe	Zinc alloy coating with a mass share of 0.3% to 1.0% iron
ZnNi	Zinc alloy coating with a mass share of 12% to 16% nickel

PASSIVATION

Passivating involves making conversion layers using suitable Cr(VI)-free solutions in order to improve the corrosion resistance of the coatings. Coloring is possible.

Table 9: Passivation procedure summary (extract from DIN EN ISO 19598)

Passivation or procedure group	Abbreviation	Appearance of the surface
Transparent passivated (thin layer passivation)	An	Colorless to colored, iridescent
Iridescent passivated (thick layer passivation)	Cn	Colored iridescent
Black passivated	Fn	Black

TREATMENTS

Treatments increase corrosion resistance and usually have a layer thickness of up to 2 µm. They consist of Cr(VI)-free organic and/or inorganic compounds.

Products that can be removed with cold cleaners, for example, oil, grease, or wax, are not considered as treatments in the context of DIN EN ISO 19598. The influence of treatments on the functional properties of the component, such as transition resistance, weldability, compatibility with fuels, or glued joints, is to be assessed based on the component. In case of special requirements for surface functionality, the use of and type of treatment must be agreed with Trelleborg Sealing Solutions.

In most cases, treatments also eliminate interference colors (iridescences) formed by passivating.

Table 10: Codes for products supplied with/without sealant (extract from DIN EN ISO 19598)

Abbreviation	Definition
T0	Without sealant
T2	With sealant

CONSTRUCTION DETAILS

Bonded Seals can be used for shaft screws with external hexagonal heads. Through holes should be in accordance with DIN / EN 20273, grade: fine, medium or rough. For cylinder shafts with hexagonal sockets in accordance with DIN 74 T2, any quality grade is suitable for the access hole, in accordance with DIN / EN 20273.

The inner diameter (d_1) of the Bonded Seal must be larger than the bore (d_4) or the thread or bolt diameter.

Sealing is most reliable when the elastomer is squeezed until the flat metal surfaces are in full contact. Therefore, bores or threaded roofs to be sealed must not have any countersinks on the support surface of the seal.

It is important that all possible leakage paths are removed, such as spiral or longitudinal machined ridges and excessive roughness. Spot facing is recommended to clean these surfaces.

SURFACE FINISH RECOMMENDATIONS

It is recommended that surface roughness values of Rz_{1max} are a maximum of 12 and Rz values are a maximum of 6.3 µm for the plane surface, which must also be free of scratches and machining marks. Bonded Seals are suitable up to a maximum pressure of 2,000 bar (200 MPa) depending on seal size and material. For higher pressures, alternative materials are available on request.

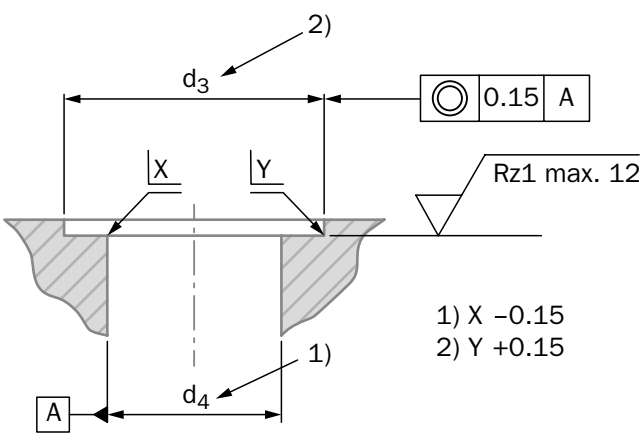


Figure 19: Chamfer and bore design - metric

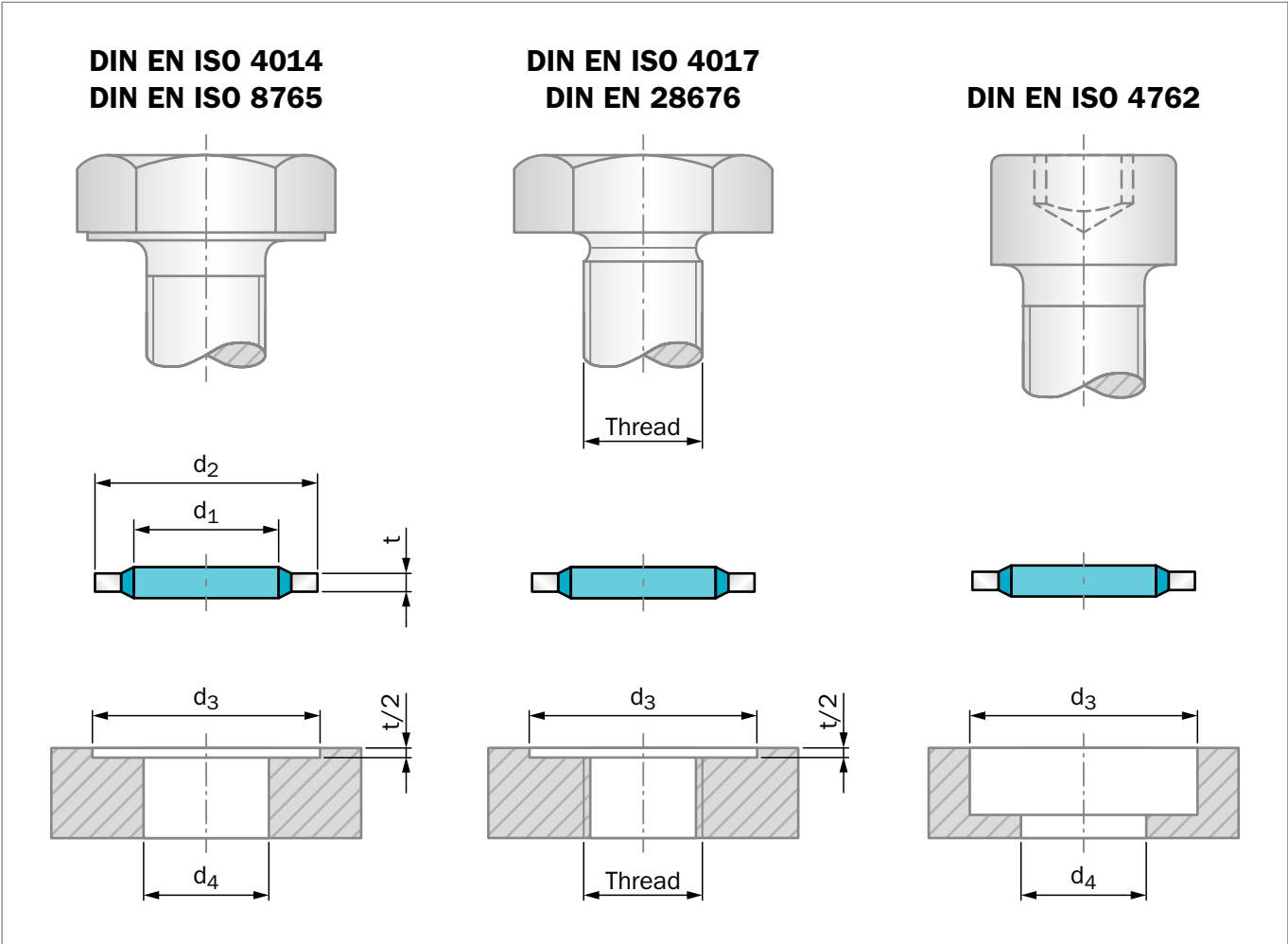


Figure 20: Installation drawings in accordance with ISO standards

Thread and through holes (d_4) In accordance with DIN EN 20273, the quality grade should be fine, medium, or rough, with the fine grade preferred. Hollow (d_3) in accordance with DIN 974-1 series 4/5/6



Table 11: Maximum preload and torque loading

Metric Thread	Bonded Seal Steel 1.0540 Tensile Strength N/mm ²	Preload KN	Max. Permissible Torque Nm	Burst Pressure bar	Metric Thread	Bonded Seal Steel SUS316L Tensile Strength N/mm ²	Preload KN	Max. Permissible Torque Nm	Burst Pressure bar
M4	540	0.7	1	2212	M4	485	0.5	0.9	1886
M5	540	0.9	2	1592	M5	485	0.6	1	1773
M6	540	5	12	1299	M6	485	3.5	8	1446
M8	540	10	32	1381	M8	485	7	23	1385
M10	540	18	72	1358	M10	485	13	51	1512
M12	540	21	98	1194	M12	485	15	70	1185
M14	540	29	159	1260	M14	485	20	114	1231
M16	540	45	284	1358	M16	485	32	203	1402
M18	540	58	416	1154	M18	485	42	298	1285
M20	540	72	570	1127	M20	485	51	408	1162
M22	540	44	384	1103	M22	485	31	275	1100
M24	540	83	793	1029	M24	485	60	568	1026
M30	540	109	1307	889	M30	485	78	935	894
M33	540	128	1683	834	M33	485	92	1204	855
M36	540	138	1978	818	M36	485	99	1415	910
M42	540	170	2830	935	M42	485	121	2025	946

For the force calculation, Trelleborg Sealing Solutions uses screws in accordance with DIN ISO 4014 Grade A.
The figures given are only indicative values. Tensile strength refers to the material chosen for the Bonded Seal.
See Table 7 on page 57 for more information.

Further burst pressure calculations for different materials on request.



GM500 Installation Recommendation - Metric

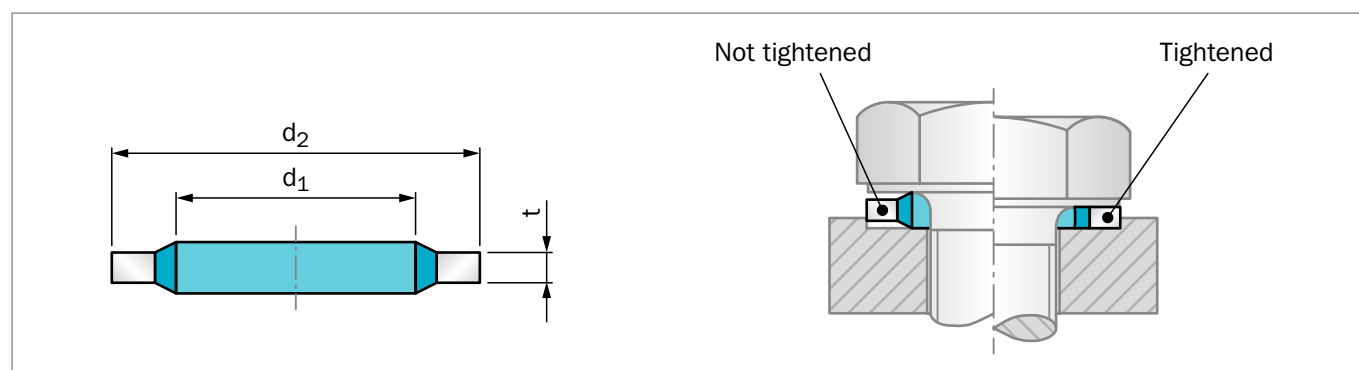


Figure 21: Installation drawing

ORDERING EXAMPLE

GM500 for hexagon head cap screw M4

Dimensions: Inside diameter $d_1 = 4.5 \text{ mm}$
Outside diameter $d_2 = 7.0 \text{ mm}$
Thickness $t = 1.0 \text{ mm}$

Materials: Sealing lip of NBR 90 Shore A (N9M_H)
Flat ring of steel (1.0540)
Plating: Fe//Zn8//An//TO (metal code J)

TSS Article No. **DDM000045 - N9MJH**

TSS Part No. _____

Quality Index (Standard) _____

Material Code (Standard)* _____

* The material code is a combination of compound and metal code. For compound code (digits 1, 2, 3 and 5), see page 57, Table 5 and Table 6. For metal code (digit 4), see page 57, Table 7.

Table 12: GM500/Usit ring recommended metric dimensions

Metric Thread	d_1 ± 0.15	d_2 $-0/+0.15$	t ± 0.1	TSS Part No.	Ref No. GM500	Metric Thread	d_1 ± 0.15	d_2 $-0/+0.15$	t ± 0.1	TSS Part No.	Ref No. GM500
M4	4.1	7.2	1	DDM100041	201	M13	13.7	22	1.5	DDM200137	225
M4	4.5	7	1	DDM000045	202	M13.5	14	18.7	1.5	DDM000140	226
M5	5.7	9	1	DDM000057	203	M14	14.7	22	1.5	DDM000147	227
M5	5.7	10	1	DDM200057	204	M15	16	22.7	1.5	DDM000160	228
M5.5	6.2	9.2	1	DDM000062	205	M16	16.7	24	1.5	DDM000167	229
M6	6.7	10	1	DDM000067	206	M17	17.4	24	1.5	DDM000174	230
M6	6.7	11	1	DDM100067	207	M18	18.7	26	1.5	DDM000187	232
M6	7.3	10.2	1	DDM000073	210	M20	20.7	28	1.5	DDM000207	233
M6	8.5	13.4	1	DDM000085	211	M21	21.5	28.7	2.5	DDM000215	234
M8	8.7	13	1	DDM000087	212	M22	22.5	28	1.5	DDM000225	235
M8	8.7	14	1	DDM100087	213	M22	22.7	30	2	DDM000227	236
M8	8.7	16	1	DDM300087	214	M22	22.7	30	3	DDM100227	237
M8.5	9.3	13.3	1	DDM000093	215	M24	24.7	32	2	DDM000247	238
M10	10.35	16	2	DDM000103	216	-	26.7	35	2	DDM000267	239
M10	10.7	16	1.5	DDM000107	217	M30	31	39	2	DDM000310	242
M10	10.7	18	1.5	DDM100107	218	M33	33.7	42	2	DDM000337	243
M11	11.8	18.5	1.5	DDM000118	220	M36	36.7	46	2	DDM000367	245
M12	12.7	18	1.5	DDM000127	222	M42	42.7	53	3	DDM000427	247
M12	12.7	20	1.5	DDM100127	223	M52	53.3	64.5	3	DDM000533	250
M13	13.7	20	1.5	DDM000137	224						

Given values are maximum tolerances for standard Bonded Seals



GM500 Installation Recommendation According to French sizes - Metric

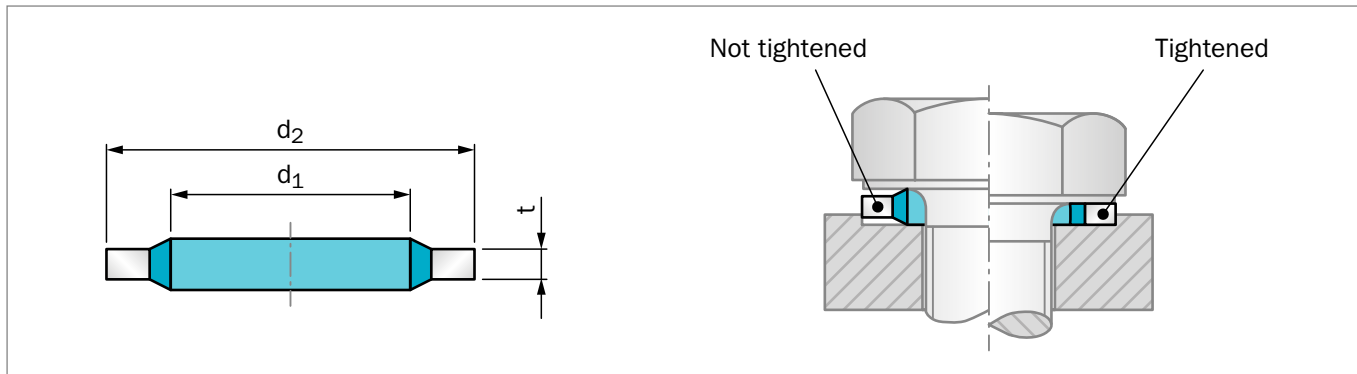


Figure 22: Installation drawing

ORDERING EXAMPLE

GM500 for hexagon head cap screw M4 according to French standard

Dimensions:	Inside diameter	$d_1 = 4.6 \text{ mm}$
	Outside diameter	$d_2 = 9.0 \text{ mm}$
	Thickness	$t = 1.0 \text{ mm}$

Materials:	Sealing lip of NBR 90 Shore A (N9M_H)
	Flat ring of steel (1.0540)
	Plating: Fe//Zn8//An//TO (metal code J)

TSS Article No. **DDM000046 - N9MJH**

TSS Part No. _____

Quality Index (Standard) _____

Material Code (Standard)* _____

* The material code is a combination of compound and metal code. For compound code (digits 1, 2, 3 and 5), see page 57, Table 5 and Table 6. For metal code (digit 4), see page 57, Table 7.

Table 13: GM500/Usit ring recommended French metric dimensions

Metric Thread	d_1 ± 0.15	d_2 $-0/+0.15$	t ± 0.1	TSS Part No.	Ref No. GM500	Metric Thread	d_1 ± 0.15	d_2 $-0/+0.15$	t ± 0.1	TSS Part No.	Ref No. GM500
M3	3.6	7.5	1	DDM000036	301	M20	20.7	29	2	DDM100207	321
M4	4.6	9	1	DDM000046	302	M21	21.7	30	2	DDM000217	323
M5	5.6	10	1	DDM000056	303	M22	22.7	31	2	DDM200227	324
M6	6.6	11	1	DDM000066	304	M24	24.7	33	2	DDM100247	326
M6	7	11.4	1	DDM100070	306	M26	27	35.3	2	DDM100270	327
M8	8.6	13	1	DDM000086	307	M27	27.7	36	2	DDM000277	328
M10	10.7	17	1.5	DDM200107	310	M28	28.6	36	2	DDM000286	329
M12	12.7	19	1.5	DDM200127	313	M30	30.7	39	2	DDM000307	331
M13	13.8	20.1	1.5	DDM000138	315	M36	37	48	2.5	DDM000370	333
M17	17.4	23.7	1.5	DDM200174	318	M48	49	60	2.5	DDM000490	337
M18	18.7	27	2	DDM100187	320						

Given values are maximum tolerances for standard Bonded Seals



GM500 Installation Recommendation - Inch

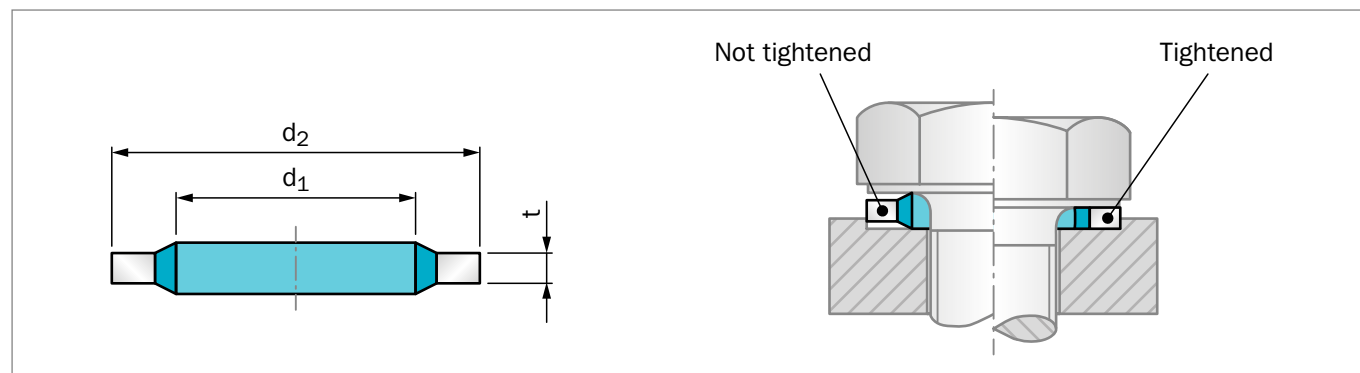


Figure 23: Installation drawing

ORDERING EXAMPLE

GM500 for hexagon head cap screw BSP 1/8

Dimensions:	Inside diameter	$d_1 = 10.37 \text{ mm}$
	Outside diameter	$d_2 = 15.88 \text{ mm}$
	Thickness	$t = 2.0 \text{ mm}$
Materials:	Sealing lip of NBR 90 Shore A (N9M_H)	
	Flat ring of steel (1.0540)	
	Plating: Fe//Zn8//An//TO (metal code J)	

TSS Article No. **DDW400020 - N9MJH**

TSS Part No. _____
 Quality Index (Standard) _____
 Material Code (Standard)* _____

* The material code is a combination of compound and metal code. For compound code (digits 1, 2, 3 and 5), see page 57, Table 5 and Table 6. For metal code (digit 4), see page 57, Table 7.

Table 14: GM500/Usit ring recommended inch dimensions

Bolt Size	BSP*	d_1	d_2	t	TSS Part No.	Ref No.
	nominal size d_1 tube	± 0.15	$-0/+0.13$	± 0.10		GM500
6BA	-	3.05	6.35	1.20	DDW400001	001
4BA	-	4.12	7.26	1.20	DDW400002	002
2BA	-	5.21	8.38	1.20	DDW400003	003
0.25	-	6.86	13.21	1.20	DDW400004	004
0.25	-	6.99	13.34	1.20	DDW400005	005
5/16	-	8.31	13.34	1.20	DDW400006	006
5/16	-	8.64	14.22	1.20	DDW400007	007
3/8	1/8	10.37	15.88	2.00	DDW400020	020
0.40	-	11.26	18.36	2.00	DDW400008	008
7/16	-	11.69	19.05	2.00	DDW400009	009
1/2	1/4	13.74	20.57	2.00	DDW400021	021
9/16	-	14.86	22.23	2.00	DDW400010	010
0.60	-	15.83	22.23	2.00	DDW400022	022
5/8	-	16.51	25.40	2.00	DDW400011	011
-	3/8	17.28	23.80	2.00	DDW400023	023
11/16	-	18.16	25.40	2.30	DDW400012	012
3/4	-	19.69	26.92	2.30	DDW400024	024
13/16	-	21.54	28.58	2.50	DDW400025	025

Table continues on next page.



Bolt Size	BSP*	d ₁	d ₂	t	TSS Part No.	Ref No. GM500
	nominal size d ₁ tube	±0.15	-0/+0.13	±0.10		
7/8	5/8	23.49	31.75	2.30	DDW400026	-
15/16	-	24.26	33.27	2.30	DDW400013	-
1	3/4	27.05	34.93	2.50	DDW400027	027
1 1/16	-	27.82	38.61	2.30	DDW400028	028
1 1/8	-	29.33	36.58	2.30	DDW400014	014
1 3/16	7/8	30.81	38.10	2.30	DDW400029	029
1 1/4	-	32.64	41.40	3.20	DDW400015	015
1 5/16	1	33.89	42.80	3.20	DDW400030	-
1 5/16	1	33.89	42.80	2.30	DDW400031	031
1 3/8	-	35.94	44.45	3.20	DDW400016	-
1 1/2	-	38.96	47.75	3.20	DDW400017	017
1 5/8	1 1/4	42.93	52.38	3.20	DDW400032	-
1 3/4	-	45.34	57.15	3.20	DDW400018	-
1 7/8	1 1/2	48.44	58.60	3.20	DDW400033	-
2	-	51.69	63.50	3.20	DDW400019	-
2 1/8	1 3/4	54.89	69.85	3.20	DDW400034	034
2 1/4	-	58.04	70.36	3.20	DDW400035	035
-	2	60.58	73.03	3.20	DDW400036	036
2 1/2	-	64.39	77.72	3.20	DDW400037	037
-	2 1/4	66.68	79.50	3.20	DDW400038	038
-	2 1/2	76.08	90.17	3.20	DDW400039	-

Given values are maximum tolerances for standard Bonded Seals

* BSP - British Standard Pipe



GM500 Installation Recommendation for Pipe Connections and Couplings

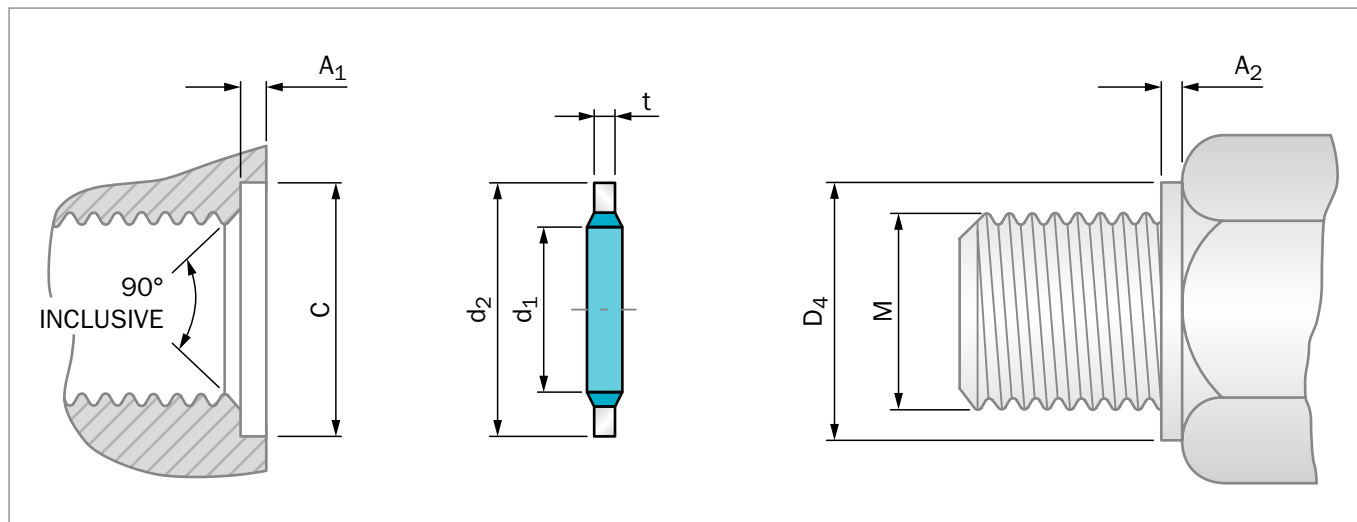


Figure 24: Installation drawing

ORDERING EXAMPLE

GM500 for hexagon head cap screw BSP 1/16

Dimensions:	Inside diameter	$d_1 = 8.3 \text{ mm}$
	Outside diameter	$d_2 = 12.7 \text{ mm}$
	Thickness	$t = 1.2 \text{ mm}$

Materials:	Sealing lip of NBR 90 Shore A (N9M_H)
	Flat ring of steel (1.0540)
	Plating: Fe//Zn8//An//TO (metal code J)

TSS Article No.

DDW400519 - N9MJH

TSS Part No. _____

Quality Index (Standard) _____

Material Code (Standard)* _____

* The material code is a combination of compound and metal code. For compound code (digits 1, 2, 3 and 5), see page 57, Table 5 and Table 6. For metal code (digit 4), see page 57, Table 7.

Table 15: GM500 dimensions for pipe connections and couplings in accordance with ISO 1179

Thread dia. M in BSP	d_1 -0/+0.2	d_2 -0/+0.2	t ± 0.15	TSS Part No.	Ref No. GM500	C +0.4	D_4	A ($A_1 \text{ max.}/A_2 \text{ min.}$)
1/16	8.3	12.7	1.2	DDW400519	519	13	12	1
1/8	10.4	14.7	1.2	DDW400510	510	15	14	1
1/4	13.85	18.7	1.2	DDW400511	511	19	18	1.5
3/8	17.35	22.7	1.2	DDW400512	512	23	22	2
1/2	21.65	26.7	1.2	DDW400513	513	27	26	2.5
3/4	27.3	32.5	1.2	DDW400514	514	33	32	2.5
1	34.2	39.5	2	DDW400515	515	40	39	2.5
1 1/4	42.8	49.5	2	DDW400516	516	50	49	2.5
1 1/2	48.7	55.5	2	DDW400517	517	56	55	2.5
2	60.5	68.5	2	DDW400518	518	69	68	3

Given values are maximum tolerances for standard Bonded Seals



GM500 Self-centering Installation Recommendation - Metric

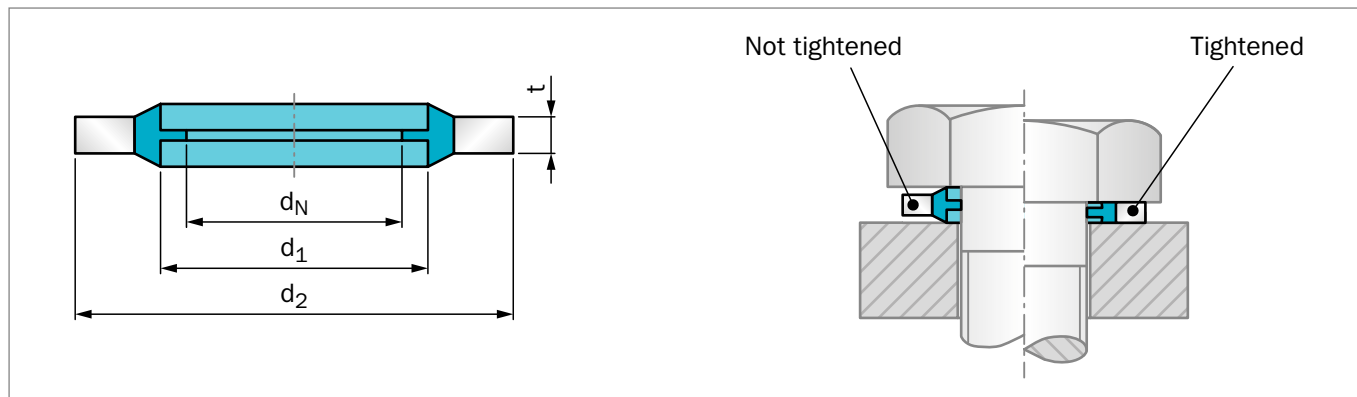


Figure 25: Installation drawing

ORDERING EXAMPLE

GM500 Self-centering for hexagon head cap screw M8

Dimensions:	Inside diameter	$d_1 = 8.7 \text{ mm}$
	Outside diameter	$d_2 = 14.0 \text{ mm}$
	Thickness	$t = 1.0 \text{ mm}$

Material:	Sealing lip of NBR 90 Shore A (N9M_H)
	Flat ring of steel (1.0540)
	Plating: Fe//Zn8//An//TO (metal code J)

TSS Article No. **DDM0C0087 - N9MJH**

TSS Part No. _____

Quality Index (Standard) _____

Material Code (Standard)* _____

* The material code is a combination of compound and metal code. For compound code (digits 1, 2, 3 and 5), see page 57, Table 5 and Table 6. For metal code (digit 4), see page 57, Table 7.

Table 16: GM500 Self-centering recommended metric dimensions

Metric Thread	d_N	d_1	d_2	t	TSS Part No.	Ref No. GM500
		± 0.15	$-0/+0.15$	± 0.10		
M4	3.4	4.5	7	1.00	DDM0C0045	947
M5	4.4	5.6	10	1.00	DDM0C0057	946
M6	4.7	6.7	10	1.00	DDM0C0067	898
M8	6.4	8.7	14	1.00	DDM0C0087	866
M10	8.05	10.7	16	1.50	DDM0C0107	708
M12	9.73	12.7	19	1.50	DDM0C0127	867
M14	11.38	14.7	22	1.50	DDM0C0147	868
M16	13.41	16.7	24	1.50	DDM0C0167	870
M18	14.76	18.7	26	1.50	DDM0C0187	872
M20	16.76	20.7	28	1.50	DDM0C0207	873
M22	18.74	22.7	30	2.00	DDM0C0227	874
M24	23.3	27.7	36	2.00	DDM0C0247	875

Given values are maximum tolerances for standard Bonded Seals



GM500 Self-centering Installation Recommendation - Inch

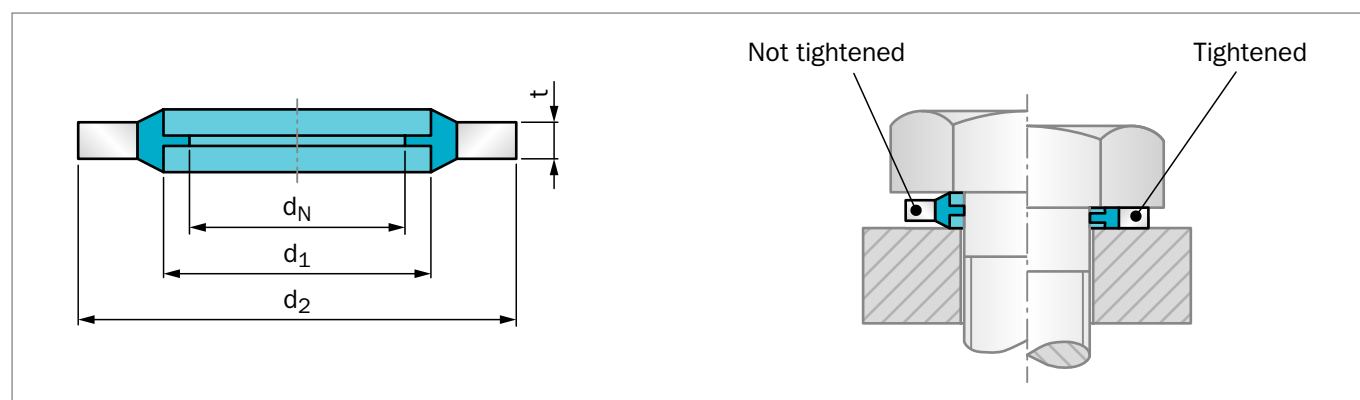


Figure 26: Installation drawing

ORDERING EXAMPLE

GM500 Self-centering for hexagon head cap screw BSP 3/8

Dimensions:	Inside diameter	$d_1 = 17.28 \text{ mm}$
	Outside diameter	$d_2 = 23.80 \text{ mm}$
	Thickness	$t = 2.0 \text{ mm}$

Material:	Sealing lip of NBR 90 Shore A (N9M_H)
	Flat ring of steel (1.0540)
	Plating: Fe//Zn8//An//TO (metal code J)

TSS Article No.

DDW4C0823 - N9MJH

TSS Part No. _____

Quality Index (Standard) _____

Material Code (Standard)* _____

* The material code is a combination of compound and metal code. For compound code (digits 1, 2, 3 and 5), see page 57, Table 5 and Table 6. For metal code (digit 4), see page 57, Table 7.

Table 17: GM500 Self-centering recommended inch dimensions, BSP*

Inch Thread	BSP nominal size ID tube	d_N	d_1 ± 0.10	d_2 $-0/+0.15$	t ± 0.10	TSS Part No.	Ref No. GM500
3/8	BSP1/8	8.26	10.37	15.88	2.00	DDW4C0820	820
1/2	BSP1/4	11.18	13.74	20.57	2.00	DDW4C0821	821
-	BSP 3/8	14.96	17.28	23.80	2.00	DDW4C0823	823
13/16	BSP 1/2	18.64	21.54	28.58	2.50	DDW4C0825	825
1.0	BSP 3/4	24.13	27.05	34.93	2.50	DDW4C0827	827
1.3/16	BSP7/8	27.51	30.81	38.10	2.50	DDW4C0829	829
1.5/16	BSP 1	29.92	33.89	42.80	3.20	DDW4C0830	830
1.5/16	BSP 1	30.30	33.89	42.80	2.50	DDW5C0830	830
1.5/8	BSP 1 1/4	38.45	42.93	52.38	3.20	DDW4C0832	832
1.5/8	BSP1 1/4	38.45	42.93	52.38	2.50	DDW5C0832	832
1.7/8	BSP 1 1/2	44.45	48.44	58.60	3.20	DDW4C0833	833
1.7/8	BSP 1 1/2	44.45	48.44	58.60	2.50	DDW5C0833	833
2.1/8	BSP 1 3/4	50.42	54.89	69.85	3.20	DDW4C0834	834
-	BSP 2	56.26	60.58	73.03	3.20	DDW4C0836	836
-	BSP 2	56.26	60.58	73.03	2.50	DDW5C0836	836
-	BSP 2 1/4	62.36	66.68	79.50	3.20	DDW4C0838	838
-	BSP 2 1/2	71.50	76.08	90.17	3.20	DDW4C0839	839

Given values are maximum tolerances for standard Bonded Seals

* BSP - British Standard Pipe



GM1000 Installation Recommendation - Metric

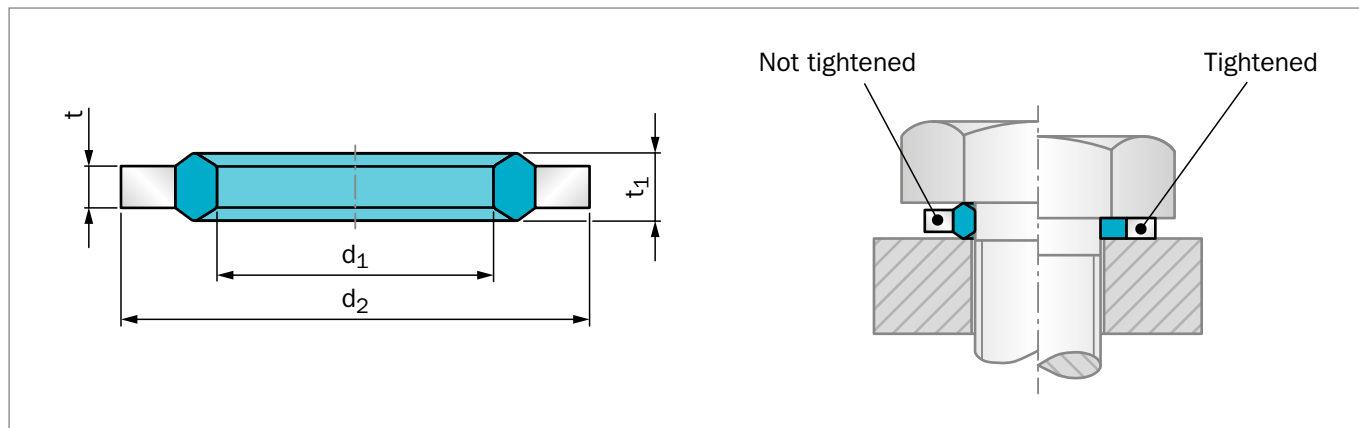


Figure 27: Installation drawing

ORDERING EXAMPLE

GM1000 for hexagon head cap screw M12

Dimensions:	Inside diameter	$d_1 = 12.0 \text{ mm}$
	Outside diameter	$d_2 = 18.9 \text{ mm}$
	Thickness	$t = 1.5 \text{ mm}$
Material:	Sealing lip of NBR 90 Shore A (N9M_H)	
	Flat ring of steel (1.0540)	
	Plating: Fe//Zn8//An//TO (metal code J)	

TSS Article No. **DDG100M12 - N9MJH**

TSS Part No. _____
 Quality Index (Standard) _____
 Material Code (Standard)* _____

* The material code is a combination of compound and metal code. For compound code (digits 1, 2, 3 and 5), see page 57, Table 5 and Table 6. For metal code (digit 4), see page 57, Table 7.

Table 18: GM1000 recommended metric dimensions

Metric Thread	d_1	Tolerance	d_2 ± 0.20	t_1 ± 0.20	t ± 0.20	TSS Part No.
M4	4	± 0.20	7.9	1.30	1.00	DDG100M4
M5	5	± 0.20	8.9	1.50	1.00	DDG100M5
M8	8	± 0.20	13.9	2.00	1.00	DDG100M8
M10	10	± 0.25	16.9	2.50	1.50	DDG100M10
M12	12	± 0.25	18.9	2.50	1.50	DDG100M12
M14	14	± 0.25	21.9	2.50	1.50	DDG100M14

Metric Thread	d_1	Tolerance	d_2 ± 0.20	t_1 ± 0.20	t ± 0.20	TSS Part No.
M16	16	± 0.25	23.9	2.50	1.50	DDG100M16
M18	18	± 0.25	26.9	3.00	2.00	DDG100M18
M20	20	± 0.35	29.9	3.00	2.00	DDG100M20
M22	22	± 0.35	31.9	3.00	2.00	DDG100M22
M24	24	± 0.35	35.9	3.00	2.00	DDG100M24
M30	30	± 0.35	45.9	3.00	2.00	DDG100M30

Given tolerances are maximum tolerances for standard Bonded Seals



GM2000 Installation Recommendation - Metric

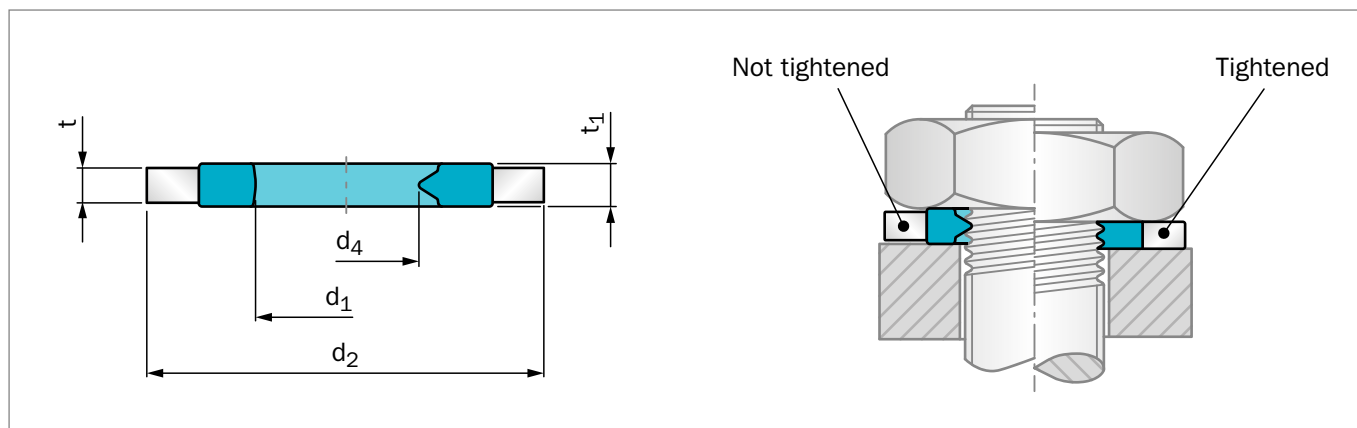


Figure 28: Installation drawing

ORDERING EXAMPLE

GM2000 for hexagon head cap screw M6

Dimensions:	Inside diameter	$d_1 = 6.2 \text{ mm}$
	Outside diameter	$d_2 = 9.9 \text{ mm}$
	Thickness	$t = 1.00 \text{ mm}$
Material:	Sealing lip of NBR 90 Shore A (N9M_H)	
	Flat ring of steel (1.0540)	
	Plating: Fe//Zn8//An//TO (metal code J)	

TSS Article No.

DDG2000M6 - N9MJH

TSS Part No. _____

Quality Index (Standard) _____

Material Code (Standard)* _____

* The material code is a combination of compound and metal code. For compound code (digits 1, 2, 3 and 5), see page 57, Table 5 and Table 6. For metal code (digit 4), see page 57, Table 7.

Table 19: GM2000 recommended metric dimensions

Metric thread	d_4	Tolerance	d_1	Tolerance	d_2 ± 0.15	t_1 ± 0.30	t ± 0.20	TSS Part No.
M4	3.1	± 0.15	4.2	± 0.2	7.9	1.80	1.00	DDG2000M4
M5	4.0	± 0.20	5.2	± 0.2	8.9	1.80	1.00	DDG2000M5
M6	4.7	± 0.20	6.2	± 0.2	9.9	1.80	1.00	DDG2000M6
M8	6.4	± 0.20	8.2	± 0.2	13.9	2.50	1.50	DDG2000M8
M10	8.1	± 0.20	10.2	± 0.2	16.9	2.50	1.50	DDG2000M10
M12	9.8	± 0.20	12.2	± 0.2	18.9	2.50	1.50	DDG2000M12
M14	11.5	± 0.25	14.2	± 0.2	21.9	3.00	2.00	DDG2000M14
M16	13.5	± 0.25	16.2	± 0.25	23.9	3.50	2.50	DDG2000M16
M18	14.8	± 0.25	18.2	± 0.25	26.9	3.50	2.50	DDG2000M18
M20	16.8	± 0.35	20.2	± 0.25	29.9	3.70	2.50	DDG2000M20
M22	18.8	± 0.35	22.2	± 0.25	31.9	3.70	2.50	DDG2000M22
M24	20.2	± 0.35	24.2	± 0.25	35.9	4.20	3.00	DDG2000M24
M30	25.5	± 0.35	30.2	± 0.35	45.9	4.20	3.00	DDG2000M30
M36	31	± 0.40	36.2	± 0.35	54.9	4.20	3.00	DDG2000M36

Given tolerances are maximum tolerances for standard Bonded Seals

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