MOTORSERVICE
RHEINMETALL AUTOMOTIVE

Valve Seat Inserts

KOLBENSCHMIDT

TRW
EngineComponents

Valve Seat Inserts

Since usage of aluminium cylinder heads, valve seat inserts have significantly gained in importance. Together with the valves they seal off the combustion chamber of the cylinder head. The valve seat insert prevents the impact/burying of the valve into the cylinder head. It absorbs a proportion of the combustion heat with which the valve is charged. The valve seat insert gives off this heat to the cylinder head. To meet the different strains, an optimum material composition of the valve seat inserts must be found. Not only must the operating conditions in the engine be considered, but also the machinability of the material for the engine reconditioner.

Materials

In the most recent engine generations of renowned car manufacturers, valve seat inserts made of sintered material (powder metallurgical procedure) are used.
The increasingly high, thermal strain of the seat insert in the combustion chamber can hardly be met anymore by materials from conventional casting processes.

For this reason, Motorservice offers sintered valve seat inserts amongst others from three different material combinations, which covers the entire application range of future engines.

Overview

	HM	HT	HT+	G1	G2	G3
Fuel type/ combustion	Petrol (unleaded), Diesel	Petrol (unleaded), Diesel	Petrol (unleaded), Diesel, CNG, LPG, propane gas, flex fuel	Petrol (unleaded), Diesel	CNG, LPG, flex fuel, petrol (unleaded), Diesel	CNG, LPG, flex fuel, petrol (unleaded), Diesel
Cylinder head materials	Aluminium, grey cast iron	Aluminium, grey cast iron	Aluminium, grey cast iron	Aluminium, grey cast iron	Aluminium, grey cast iron	Aluminium, grey cast iron
Engines	low-power petrol and Diesel engines with low to normal strain	powerful, highly charged and highly stressed petrol and Diesel engines	used in gas engines like LPG, CNG, propane gas, flex fuel, powerful petrol and Diesel engines	naturally aspirated engines, turbocharged engines	highly strained engines, performance-enhanced engines, all above mentioned gas engines	highly strained engines, performance-enhanced engines, all above mentioned gas engines

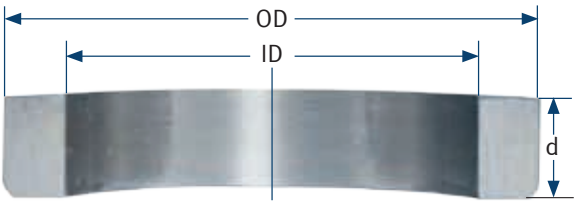
Caution!
Extreme operating conditions as well as high strains of the respective engine must be taken into consideration and are the responsibility of the engine repairer. The selection of the specification of engine parts must be carefully checked by the engine repairer.

HM = High Machinability
HT = High Temperature Resistance
HT+ = High Temperature Resistance +
G1 = High Temperature Resistance
G2 = High Wear-Resistance
G3 = High Temperature & Wear – Resistance

Installation instructions

Kolbenschmidt/TRW valve seat inserts are machined and finished on the external diameter.

The dimension for the locating hole in the cylinder head can be determined based on the following overlap table. For the sintered metal seat inserts, the valve seat angle must be machined after insertion. The cast iron seat inserts are finished.



Main dimensions of a valve seat insert
OD = overall diameter, ID = internal diameter, d = depth

Insert the sintered metal valve seat inserts
Make sure that the seat insert to be inserted is always attached with the radius side downwards.

Due to the radius and the “spring effect”, the Kolbenschmidt sintered metal valve seat insert does not require liquid nitrogen for cooling down the seat inserts and no heating up of the cylinder head to press in the valve seat inserts into the cylinder head. The seat inserts are driven in cold with a respective tool.

Note:
Replacing valve seat inserts and valves within the scope of the gas conversion always represents an interference with the original engine specifications. Whether the new material combinations harmonise and the desired results are achieved under the changed conditions can only be estimated in advance. Extreme operating conditions and the specific engine strains must be taken into consideration. These are the sole responsibility of the engine modifier.

Attention:
Heed valve specifications when performing conversion work.

Kolbenschmidt/TRW recommends the following overlaps/press fittings

Outer diameter valve seat insert		Cast iron cylinder head		Aluminium cylinder head	
[mm]	[inch]	[mm]	[inch]	[mm]	[inch]
20–30	0.7874–1.1811	0.06	0.0024	0.08	0.0031
30–40	1.1811–1.5748	0.08	0.0031	0.10	0.0040
40–50	1.5748–1.9685	0.10	0.0040	0.12	0.0047
50–60	1.9685–2.3622	0.12	0.0047	0.14	0.0055
60–70	2.3622–2.7559	0.14	0.0055	0.16	0.0063

MOTORSERVICE
RHEINMETALL AUTOMOTIVE

Motorservice Partner:

Headquarters:
MS Motorservice International GmbH
Wilhelm-Maybach-Straße 14–18
74196 Neuenstadt, Germany
www.ms-motorservice.com

FL 1688-02 – EN – 01/17 (012017)

MOTORSERVICE
RHEINMETALL AUTOMOTIVE

Valve Seat Inserts

[mm]

OD	ID	Depth	HM semifinished	HT semifinished	HT+ semifinished	G1|G2|G3 finished**	Valve seat angle
22,00	19,00	8,00		50009624			
24,00	18,00	8,00		50009610	50009650		
24,10	18,80	6,50		50009602			
24,10	18,00	6,50		50009603			
25,00	19,00	8,00		50009611	50009651		
25,12	20,00	6,00	50004700				
26,00	20,00	8,00		50009612			
26,70	20,00	5,70	50004701	50004900	50009696		
27,00	21,00	10,00		50009613			
27,00	20,00	8,00			50009693		
27,13	22,10	6,40	50004702				
27,15	20,10	6,60	50004703				
28,00	22,00	10,00	50004811	50004932	50009652		
28,50	22,00	10,00	50004812	50004933	50009653		
28,70	22,10	4,90	50004704				
28,75	21,00	7,20	50004705				
28,80	24,00	8,60		50009615			
29,00	23,00	10,00	50004813	50004934	50009654		
29,00	18,00	10,00		50009614	50009697		
29,50	23,00	10,00	50004814	50004935	50009655		
30,00	23,00	10,00	50004815	50004936	50009656		
30,00	20,00	10,00	50004816	50004937	50009657		
30,02	23,50	6,20	50004706				
30,15	25,00	6,30	50004707	50004901			
30,19	24,10	8,10		50004920	50009658		
30,30	23,70	6,40	50004708				
30,31	22,10	6,40	50004709				
30,33	23,70	6,60	50004710				
30,50	25,00	6,50	50004711				
30,50	23,00	10,00	50004817	50004938	50009659		
31,00	24,00	10,00	50004818	50004939	50009660		
31,00	21,00	10,00	50004819	50004940	50009661		
31,00	18,00	7,50			50009623		
31,50	24,00	10,00	50004820	50004941	50009662		
31,83	27,40	8,50		50004921	50009698		
31,88	26,80	6,40	50004712				
31,88	25,40	6,40	50004713				
31,90	25,30	6,40	50004715				
31,90	23,70	6,40	50004714				
31,93	23,10	7,20	50004716				
32,00	22,00	10,00	50004822	50004943	50009665		
32,00	24,00	9,00		50004928	50009663		
32,00	25,00	10,00	50004821	50004942	50009664		
32,33	27,40	8,50		50009600			
32,50	25,00	10,00	50004823	50004944	50009666		
32,65	25,50	8,00	50004717				
32,65	26,00	8,50	50004718				
32,80	28,50	8,80		50009616			
32,83	27,40	8,50		50009601			
33,00	25,00	8,50	50004719				
33,00	25,00	4,50	50004796				
33,00	26,00	10,00	50004824	50004945	50009667		
33,00	23,00	10,00	50004825	50004946	50009668		
33,47	25,40	6,40	50004720				
33,48	25,30	6,40	50004721				
33,48	26,90	6,40	50004722				
33,50	26,50	8,00	50004723				
33,50	24,80	7,10	50004724				
33,50	27,00	9,00	50004805				
33,50	26,00	10,00	50004826	50004947	50009669		
33,70	27,00	8,00	50004725	50004902	50009699		
33,70	28,60	6,40	50004726	50004903			
34,00	26,00	8,50	50004727				
34,00	27,00	10,00	50004801	50004948	50009670		
34,00	24,00	10,00	50004827	50004949	50009671		
34,25	27,00	8,00	50004728				
34,50	27,00	10,00	50004828	50004950	50009672		
34,70	28,30	7,50	50004729				
34,76	32,10	7,80				92-22016	30,0 deg
34,91	29,60	5,80				92-17000	20,0 deg
34,91	29,50	5,80				92-17001	20,0 deg
35,00	28,50	7,90	50004730				
35,00	28,00	10,00	50004829	50004951	50009673		
35,00	25,00	10,00	50004830	50004952	50009674		
35,05	27,00	6,40	50004731				
35,07	28,50	6,40	50004733				
35,07	26,90	6,40	50004732				
35,08	28,00	7,65				92-16165	0,0 deg
35,10	25,40	10,40	50004734				
35,10	25,40	7,10	50004735				
35,25	28,00	8,00	50004736				
35,37	28,00	7,70				92-16159	0,0 deg
35,50	29,00	10,00	50004802				
35,50	29,50	9,50	50004806				
35,50	28,00	10,00	50004831	50004953	50009500		
35,60	29,00	8,00	50004737				
35,90	29,70	7,90				92-22015	30,0 deg
36,00	29,00	10,00	50004832	50004954	50009675		

[mm]

OD	ID	Depth	HM semifinished	HT semifinished	HT+ semifinished	G1|G2|G3 finished**	Valve seat angle
36,00	26,00	10,00	50004833	50004955	50009676		
36,12	29,30	8,00	50004738				
36,50	29,00	10,00	50004834	50004956	50009677		
36,59	30,10	7,90	50004739				
36,64	28,60	6,40	50004740				
36,64	28,60	8,00	50004741				
36,66	26,90	6,40	50004742				
36,68	31,20	6,40	50004743				
36,80	28,40	7,50				92-22020	30,0 deg
37,00	28,00	9,00	50004744				
37,00	30,00	8,00	50004745	50004904			
37,00	31,00	10,00	50004803				
37,00	30,00	10,00	50004835	50004957	50009678		
37,01	30,15	7,55				92-22008	45,0 deg
37,03	27,90	9,00	50004746				
37,07	28,60	7,20				92-22011	45,0 deg
37,08	30,56	7,00				92-16124	30,0 deg
37,20	30,00	7,00	50004747	50004905			
37,50	31,00	8,50	50004748				
37,50	30,00	10,00	50004836	50004958	50009501		
37,50	31,20	6,95		50009617			
37,59	30,50	7,30				92-16125	0,0 deg
38,00	30,00	7,00	50004749	50004906			
38,00	31,00	10,00	50004804	50004959	50009679		
38,00	28,00	10,00	50004837	50004960	50009680		
38,07	30,00	7,90				92-16154	45,0 deg
38,07	30,00	8,50				92-16109	45,0 deg
38,08	30,00	8,50				92-16108	45,0 deg
38,10	30,20	6,40	50004797				
38,21	28,60	6,40	50004750				
38,23	31,00	8,00	50004755	50004907	50009503		
38,23	28,60	6,40	50004753				
38,23	31,80	9,50	50004754				
38,25	31,70	6,40	50004752				
38,25	30,10	6,40	50004751				
38,28	27,90	8,00	50004756				
38,38	30,00	8,50				92-16131	45,0 deg
38,50	31,00	10,00	50004838	50004961	50009504		
38,95	31,00	8,50	50004757	50004908			
39,00	29,00	10,00	50004840	50004963			
39,00	32,00	10,00	50004839	50004962	50009681		
39,30	31,20	7,50				92-22019	45,0 deg
39,30	32,00	8,00	50004758				
39,50	33,00	8,50	50004759				
39,50	32,00	10,00	50004841	50004964			
39,60	33,50	9,50	50004807				
39,70	31,80	6,40	50004798				
39,77	30,10	9,50	50004760				
39,81	31,80	6,40	50004761				
39,83	30,10	6,40	50004763				
39,85	31,20	7,90	50004764				
39,85	30,00	7,70	50004765				
39,85	33,00	6,50	50004766				
39,98	30,10	7,40				92-22014	45,0 deg
40,00	33,00	8,00				92-25016	45,0 deg
40,00	29,00	10,00	50004843	50004966	50009682		
40,00	33,50	9,00	50004808				
40,00	32,00	10,00	50004842	50004965	50009506		
40,05	31,00	7,40				92-47023	30,0 deg
40,05	31,00	6,40				92-47025	30,0 deg
40,08	31,20	8,05				92-16166	16,0 deg
40,08	31,00	8,00				92-16167	16,0 deg
40,09	33,50	7,00				92-16120	45,0 deg
40,10	31,00	7,50				92-16118	0,0 deg
40,14	33,00	8,00			50009694		
40,16	31,00	9,75				92-22003	45,0 deg
40,17	32,90	7,10				92-27000	45,0 deg
40,19	29,97	10,50		50004909			
40,19	30,00	10,50	50004767				
40,20	34,00	7,50	50004768	50004910			
40,26	31,00	7,50				92-16146	0,0 deg
40,26	31,00	9,75				92-22004	45,0 deg
40,38	31,00	8,50				92-16160	45,0 deg
40,46	31,00	7,50				92-16143	45,0 deg
40,50	32,00	10,00	50004844	50004967	50009507		
40,59	33,50	7,30				92-16121	0,0 deg
41,00	34,00	7,50	50004769	50004911			
41,00	33,00	10,00	50004845	50004968	50009683		
41,00	30,00	10,00	50004846	50004969	50009508		
41,05	31,00	7,40				92-47024	30,0 deg
41,28	33,40	6,40	50004799				
41,40	31,80	9,50	50004771				
41,40	31,80	6,40	50004770				
41,50	33,00	10,00	50004847	50004970	50009684		
41,62	34,00	8,00	50004772	50004912			
42,00	32,40	8,00				92-25015	30,0 deg
42,00	31,00	10,00	50004849	50004972	50009510		
42,00	34,00	10,00	50004848	50004971	50009511		

[mm]

OD	ID	Depth	HM semifinished	HT semifinished	HT+ semifinished	G1|G2|G3 finished**	Valve seat angle
42,05	32,70	8,64				92-47022	45,0 deg
42,14	33,00	8,00			50009695		
42,20	33,50	10,50	50004773				
42,50	34,00	10,00	50004850	50004973			
42,67	34,18	7,30				92-22012	45,0 deg
42,78	33,70	6,85				92-22007	30,0 deg
42,98	33,30	8,00	50004775				
43,00	35,00	10,00	50004851	50004974	50009513		
43,00	32,00	10,00	50004852	50004975	50009512		
43,00	32,00	7,25				92-47019	30,0 deg
43,03	33,00	9,10	50004776				
43,05	32,90	8,00				92-47020	45,0 deg
43,05	33,00	7,50				92-47029	30,0 deg
43,06	35,00	7,90				92-22006	45,0 deg
43,08	31,90	8,50				92-47026	30,0 deg
43,08	32,90	8,01				92-47027	45,0 deg
43,10	34,00	8,00				92-16158	45,0 deg
43,20	35,80	7,10				92-27001	30,0 deg
43,25	36,00	8,00	50004777	50004913			
43,33	35,20	9,00	50004778	50004914			
43,33	35,20	6,40		50004915			
43,50	35,00	10,00	50004853	50004976			
43,87	34,50	7,80				92-16153	30,0 deg
43,87	34,50	7,40				92-16155	0,0 deg
44,00	36,00	10,00	50004854				
44,00	33,00	10,00	50004855	50004978	50009685		
44,01	35,00	8,50				92-34003	45,0 deg
44,03	33,90	9,50	50004779				
44,07	35,45	7,10				92-22010	45,0 deg
44,08	34,05	9,00				92-47003	45,0 deg
44,10	35,50	7,80				92-34006	30,0 deg
44,10	35,90	7,80				92-25021	45,0 deg
44,11	35,00	8,10				92-25011	45,0 deg
44,13	36,00	9,00		50004999	50009514		
44,13	35,50	6,95		50009618			
44,17	34,50	7,80				92-16116	30,0 deg
44,25	37,00	8,00	50004780				
44,28	34,05	9,20				92-47004	45,0 deg
44,50	36,00	10,00	50004856	50004979	50009516		
44,50	30,00	10,00	50004858	50004981	50009515		
44,50	36,00	11,00	50004857	50004980	50009517		
44,58	34,90	6,40	50004781				
44,58	34,90	8,00	50004782				
45,00	37,00	12,00	50004859	50004982	50004997		
45,00	34,00	12,00	50004860	50004983	50009687		
45,05	34,00	7,50				92-47028	24,0 deg
45,08	37,00	8,30				92-16112	45,0 deg
45,37	35,70	7,30	50004783	50004919			
45,50	37,00	12,00	50004861	50004984			
45,64	36,00	9,90	50004784				
45,66	36,00	10,00				92-22001	45,0 deg
45,76	36,00	10,00				92-22002	45,0 deg
45,87	37,00	8,20				92-16114	45,0 deg
46,00	38,00	12,00	50004862	50004985			
46,00	34,00	12,00	50004863	50004986	50009518		
46,00	36,40	7,90				92-34007	20,0 deg
46,01	36,00	10,00				92-16133	45,0 deg
46,05	37,50	8,10				92-47021	45,0 deg
46,06	34,70	7,90				92-34002	20,0 deg
46,08	34,50	8,90				92-34005	45,0 deg
46,08	35,95	6,85				92-22013	30,0 deg
46,10	37,30	7,82				92-25020	30,0 deg
46,10	37,50	6,17				92-47001	30,0 deg
46,11	36,00	10,00				92-16144	30,0 deg
46,13	38,00	7,00		50004998			
46,15	37,70	6,40	50004785				
46,21	36,00	10,00				92-16137	45,0 deg
46,30	37,50	6,37				92-47002	30,0 deg
46,37	37,00	8,20				92-16115	45,0 deg
46,50	36,50	9,53	50004786				
46,50	38,00	12,00	50004864	50004987			
47,00	39,00	12,00	50004865	50004988			
47,00	36,00	12,00	50004866	50004989	50009688		
47,16	37,00	8,60		50004930			
47,38	40,00	7,70				92-16157	30,0 deg
47,39	36,60	7,80				92-16156	30,0 deg
47,50	39,00	12,00	50004867	50004990			
47,57	38,45	6,65				92-22009	30,0 deg
47,75	38,10	9,50	50004788	50004924			
47,75	38,10	6,40	50004787				
47,78	41,30	9,50	50004790	50004926			
47,78	41,30	6,40	50004789	50004925			
47,80	40,60	6,40	50004791				
48,00	40,00	12,00	50004868	50004991			
48,00	38,00	11,00	50004869	50004992			
48,00	37,00	12,00	50004870	50004993	50009519		
48,06	39,50	6,90				92-34004	20,0 deg
48,10	40,10	8,00				92-25010	45,0 deg

[mm]

OD	ID	Depth	HM semifinished	HT semifinished	HT+ semifinished	G1|G2|G3 finished**	Valve seat angle
48,10	38,05	8,00				92-25009	30,0 deg
49,08	39,00	7,50				92-22005	30,0 deg
49,08	40,00	11,45				92-47013	45,0 deg
49,09	40,00	9,45				92-47015	45,0 deg
49,18	41,98	11,50				92-22018	45,0 deg
49,28	40,00	11,55				92-47014	45,0 deg
49,29	40,00	9,65				92-47016	45,0 deg
50,11	43,00	10,00		50009607			
50,31	43,00	10,20		50009608			
50,51	43,00	10,40		50009609			
50,95	41,30	8,00	50004793				
50,95	41,30	6,40	50004792				
51,06	37,00	7,50				92-16106	45,0 deg
51,10	41,70	7,50				92-25012	30,0 deg
51,11	40,08	9,55				92-47006	45,0 deg
51,26	37,05	7,55				92-16145	30,0 deg
51,26	37,00	7,50				92-16140	45,0 deg
51,46	37,00	7,50				92-16142	45,0 deg
52,00	39,00	10,30				92-34001	45,0 deg
53,09	43,10	9,70	50004871				
53,10	43,00	7,45				92-25004	30,0 deg
53,11	43,00	9,15				92-16126	45,0 deg
53,11	43,00	9,20				92-16127	45,0 deg
53,11	43,00	9,70				92-16104	45,0 deg
53,11	43,00	9,90				92-25003	45,0 deg
53,11	43,00	8,40				92-16162	20,0 deg
53,20	43,00	7,00			50009690		
53,31	43,00	10,10				92-25014	45,0 deg
53,31	43,00	9,90				92-16148	45,0 deg
53,31	43,00	9,40				92-16149	45,0 deg
53,51	43,00	10,20				92-16105	45,0 deg
53,51	43,20	9,60				92-16128	45,0 deg
53,59	43,10	10,20	50004794				
53,70	43,00	10,00			50009691		
54,06	44,35	6,68				92-47011	30,0 deg
54,10	44,40	6,70				92-47005	30,0 deg
54,20	43,00	8,60		50004931	50009689		
54,20	43,00	10,00		50004916	50009520		
54,26	44,35	6,88				92-47012	30,0 deg
54,65	43,69	10,00			50009692		
55,00	44,00	12,00	50004800				
56,00	47,50	7,50				92-34000	20,0 deg
56,01	45,00	10,50				92-16132	45,0 deg
56,11	45,00	10,50				92-16134	45,0 deg
56,17	47,06	11,50				92-22017	45,0 deg
56,21	45,00	10,50				92-16136	45,0 deg
56,60	44,95	9,45				92-47009	45,0 deg
56,90	44,90	9,50				92-47010	45,0 deg
58,30	49,00	6,80				92-47008	45,0 deg
59,12	49,00	6,80				92-47007	30,0 deg
60,09	51,08	8,90	50004872				
60,10	51,00	8,30				92-16161	20,0 deg
60,11	51,00	8,90		50009604*		92-16100	30,0 deg
60,11	51,20	8,40				92-16151	30,0 deg
60,11	49,30	8,40				92-16150	30,0 deg
60,31	51,00	9,10		50009605*		92-16147	30,0 deg
60,31	51,20	8,60				92-16152	30,0 deg
60,51	51,00	9,30		50009606*		92-16101	30,0 deg
60,51	51,20	8,90				92-16123	30,0 deg
61,11	49,00	6,80				92-25005	30,0 deg
61,11	51,00	9,00				92-16163	30,0 deg
61,11	48,00	8,90				92-25001	30,0 deg
61,11	51,00	10,40				92-25000	45,0 deg
61,11	49,00	8,90				92-25008	30,0 deg

* Valve seat angle only for 92-* numbers
5000XXXX numbers remain semifinished and without valve seat angle

** FINISHED valve seats are manufactured in accordance to the original provisions of the OE fabricator. The valve seats angles of the finished valve seats are pre-processed. To ensure the function and interaction of the valve seat inserts with the valves and further to adjust the position of the valve to the valve seat angle, a adaption of the installed valve seat angle according to the OE specifications is necessary.

OD = Overall Diameter
ID = Internal Diameter
HM = High Machinability
HT = High Temperature Resistance
HT+ = High Temperature Resistance +
G1 = High Temperature Resistance
G2 = High Wear-Resistance
G3 = High Temperature & Wear – Resistance

KOLBENSCHMIDT

TRW EngineComponents