

## Piston Ring & Outer Cylinder Wear Measurement

	2.2 (1965-69)	2.2 (1970-71)	2.4 (1972-73)	2.7 (1974)	2.7/3.0 Turbo (1975-77)	3.0/3.3 Turbo (1978-81)	3.0/3.2/3.3 Turbo (1982-89)
<b>Piston Top Ring Side Clearance</b>							
Groove	1.565 - 1.585	1.565 - 1.585	1.560 - 1.590	1.560 - 1.580	N/A	N/A	N/A
Ring	1.478 - 1.490	1.478 - 1.490	1.478 - 1.490	1.478 - 1.480	N/A	N/A	N/A
Clearances	+0.075 to +0.107	+0.075 to +0.107	+0.070 to +0.112	+0.070 to +0.102	+0.070 to +0.102	+0.070 to +0.102	+0.070 to +0.102
Wear Limit	0.20	0.20	0.20	0.20	0.20	0.20	0.20
<b>Piston Middle Ring Side Clearance</b>							
Groove	2.035 - 2.050	2.035 - 2.050	1.790 - 1.810	1.790 - 1.810	N/A	N/A	N/A
Ring	1.978 - 1.990	1.978 - 1.990	1.728 - 1.740	1.728 - 1.740	N/A	N/A	N/A
Clearances	+0.080 to +0.072	+0.080 to +0.072	+0.060 to +0.082	+0.060 to +0.082	+0.040 to +0.072	+0.040 to +0.072	+0.040 to +0.072
Wear Limit	0.20	0.20	0.20	0.20	0.20	0.20	0.20
<b>Oil Seal Ring Side Clearance</b>							
Groove	4.015 - 4.030	4.015 - 4.030	4.010 - 4.040	4.010 - 4.030	N/A	N/A	N/A
Ring	3.978 - 3.990	3.978 - 3.990	3.978 - 3.990	3.978 - 3.990	N/A	N/A	N/A
Clearances	+0.025 to +0.062	+0.025 to +0.062	+0.020 to +0.062	+0.020 to +0.062	+0.020 to +0.052	+0.020 to +0.052	+0.020 to +0.052
Wear Limit	0.20	0.20	0.20	0.20	0.10	0.10	0.10
<b>Piston Ring Gaps</b>							
Top Ring Gap	+0.15 to +0.45	+0.15 to +0.45	+0.15 to +0.45	+0.15 to +0.45	+0.10 to +0.20	+0.15 to +0.30	+0.20 to +0.40
Wear Limit	1.00	1.00	1.00	1.00	0.80	0.80	0.80
Middle Ring Gap	+0.15 to 0.45	+0.15 to 0.45	+0.15 to 0.45	+0.15 to 0.45	+0.10 to 0.20	+0.15 to 0.30	+0.20 to 0.40
Wear Limit	1.00	1.00	1.00	1.00	0.80	0.80	1.00
Oil Seal Ring	+0.15 to +0.45	+0.15 to +0.45	+0.15 to +0.45	+0.15 to +0.45	+0.15 to +0.30	+0.15 to +0.30	+0.30 to +0.80
Wear Limit	1.00	1.00	1.00	1.00	1.00	1.00	2.00
Oil Seal Ring (3-piece 1.5" ring)					+0.40 to +1.40	+0.40 to +1.40	2.00
Wear Limit					2.00	2.00	
<b>Cylinder Outer Base Diameter to Crankcase</b>							
Bore	92.072 - 92.159	92.072 - 92.159	92.072 - 92.159	92.072 - 92.152	92.072 - 92.152	N/A	N/A
Shell	91.874 - 91.928	91.874 - 91.928	91.874 - 91.928	96.874 - 96.928	96.874 - 96.928	N/A	N/A
Clearances	+0.144 - +0.285	+0.144 - +0.285	+0.144 - +0.285	+0.144 - +0.285	+0.144 to +0.285	N/A	N/A
<b>Cylinder Top Outer Diameter to Cylinder Head</b>							
Bore	86.000 - 86.054	92.072 - 92.159	92.072 - 92.159	92.072 - 92.152	107.000 - 107.073	N/A	N/A
Shell	87.074 - 87.928	96.874 - 96.928	96.874 - 96.928	106.883 - 106.928	106.883 - 106.928	N/A	N/A
Clearances	+0.072 to +0.180	+0.144 to +0.285	+0.144 to +0.285	+0.144 to +0.180	+0.072 to +0.180	N/A	N/A

- N/A = Data not available  
- Piston ring gap measured at point D2 (See earlier diagram)

## Piston & Cylinder Height Groups

	2.0 (1965-69)	2.0 (1969)	2.2/2.4 (1970-73)	911 (1974-89) Turbo (1976-77)	911 Turbo (1978-89)
<b>Height Group 5</b>	82.200 - 82.225	82.200 - 82.225	85.400 - 85.425	85.400 - 85.425	85.600 - 85.625
<b>Height Group 6</b>	82.225 - 82.250	82.225 - 82.250	85.425 - 85.450	85.425 - 85.450	85.625 - 85.650
<b>Height Group R5 (replacement)</b>			81.950 - 81.975		
<b>Height Group R6 (replacement)</b>			81.975 - 82.000		

**Notes:**  
- All cylinders installed onto one side of the engine must belong to the same height group  
- 1973 Carrera 2.7 indicated height groups via a color dot. Red = height group 5. Blue = height group 6

## Piston Pin Tolerances

	911 (1965-69)	911 (1970-75)	911 (1976-89)
<b>Color Code White</b>			
Bore	21.987 - 22.000	22.000 - 22.005	N/A
Shell	22.000 - 22.003	21.998 - 22.000	N/A
Clearance Ft.	0.000 to -0.005	0.000 to -0.009	N/A
<b>Color Code Black</b>			
Bore	21.984 - 21.987		
Shell	21.984 - 21.987		
Clearance Ft.	-0.003 to +0.003		

**Notes:**  
- N/A = Data not available  
- Early piston pins were press fit into the piston. This required heating the piston prior to insertion.

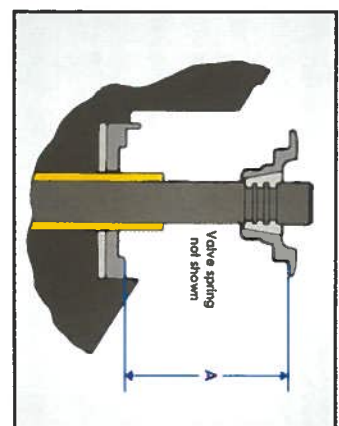
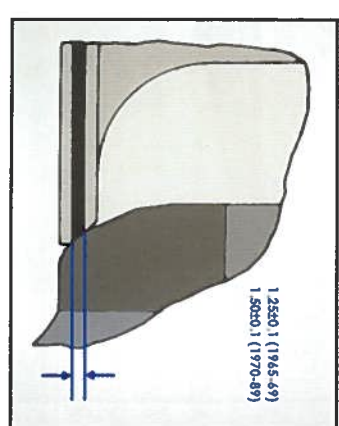
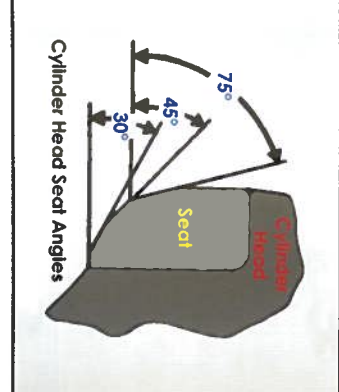
## Valve, Guide, and Seat Dimensions/Tolerances

	911T/L (1965-69)*	911T/E (1969) (1965-68)	911S (1969)	911T/T/E/S (1970-77)	911 (1978-89) Turbo (1978-89)
<b>Head Diameter (H)</b>					
Intake	39.0 ± 0.1	42.0 ± 0.1	45.0 ± 0.1	49.0 ± 0.1	49.0 ± 0.1
Exhaust	35.0 ± 0.1	38.0 ± 0.1	39.0 ± 0.1	40.0 ± 0.1	41.5 ± 0.1
<b>Valve Stem Diameter (S)</b>					
Intake	8.958 - 8.970	8.958 - 8.970	8.958 - 8.970	8.958 - 8.970	8.958 - 8.970
Exhaust	8.938 - 8.950	8.938 - 8.950	8.938 - 8.950	8.938 - 8.950	8.938 - 8.950
<b>Total Valve Length (L)</b>					
Intake	111.15 ± 0.05	114.0 ± 0.1	113.3 ± 0.1	114.0 ± 0.1	101 ± 0.25
Exhaust	111.75 ± 0.05	113.5 ± 0.1	112.2 ± 0.1	113.3 ± 0.1	108.4 ± 0.25
<b>Valve Height (distance A)**</b>					
Intake / Exhaust	49.85 - 49.05	47.50 ± 0.80	47.50 ± 0.80	47.50 ± 0.80	46.00 ± 0.30
<b>Intake Valve Seat - Sid</b>					
Bore (D1)	42.000 - 42.025	45.000 - 45.025	47.000 - 47.025	48.000 - 48.025	51.800 - 51.830
Shell (d1)	42.180 - 42.184	45.180 - 45.184	47.180 - 47.184	48.180 - 48.184	51.880 - 51.891
Press Fit	-0.155 to -0.164	-0.155 to -0.164	-0.155 to -0.164	-0.153 to -0.164	-0.150 to -0.161
<b>Intake Valve Seat - 1st Oversize</b>					
Bore (D1)	42.320 - 42.345	45.320 - 45.345	47.320 - 47.345	48.320 - 48.345	51.820 - 51.850
Shell (d1)	42.500 - 42.494	45.500 - 45.494	47.500 - 47.494	48.500 - 48.494	52.000 - 51.991
Press Fit	-0.155 to -0.164	-0.155 to -0.164	-0.155 to -0.164	-0.155 to -0.164	-0.150 to -0.161
<b>Exhaust Valve Seat - Sid</b>					
Bore (D1)	38.000 - 38.025	41.000 - 41.025	41.200 - 41.184	42.000 - 42.025	44.000 - 44.025
Shell (d1)	38.200 - 38.184	41.200 - 41.184	41.200 - 41.184	42.200 - 42.184	44.200 - 44.184
Press Fit	-0.175 to -0.184	-0.175 to -0.184	-0.175 to -0.184	-0.175 to -0.184	-0.173 to -0.184
<b>Exhaust Valve Seat - 1st Oversize</b>					
Bore (D1)	38.380 - 38.385	41.580 - 41.585	41.580 - 41.585	42.580 - 42.585	44.580 - 44.585
Shell (d1)	38.780 - 38.744	41.780 - 41.744	41.780 - 41.744	42.780 - 42.744	44.780 - 44.744
Press Fit	-0.175 to -0.184	-0.175 to -0.184	-0.175 to -0.184	-0.175 to -0.184	-0.175 to -0.184

**Notes:**  
- Oversized guides were listed as available for 1965 58 (13,269-18,248 and 13,490-13,449)  
- Valve height data for SC and later 911s may require modifications to work with late-style heads.  
- Includes European Carrera 3.0  
- Valve stem diameter must be within spec across the entire length of the valve.

## Valve Guide Tolerances

	911 (1965-68) up to engine 9111.001	911T/L (1965-68) from engine 9111.001	911S (1969)	911T/T/E/S (1970-77)	911 (1978-89) Turbo (1978-89)
<b>Cylinder Head to Valve Guide Interface - Standard Size</b>					
Bore (D2)	13.000 - 13.018	13.000 - 13.018	13.000 - 13.018	13.000 - 13.018	13.000 - 13.018
Shell (d2)	13.049 - 13.060	13.049 - 13.060	13.049 - 13.060	13.049 - 13.060	13.049 - 13.060
Press Fit	-0.061 to +0.060	-0.061 to +0.060	-0.061 to +0.060	-0.061 to +0.060	-0.061 to +0.060
<b>Cylinder Head to Valve Guide Interface - 1st Oversize</b>					
Bore (D2)	13.200 - 13.218	13.200 - 13.218	13.200 - 13.218	13.200 - 13.218	13.200 - 13.218
Shell (d2)	13.249 - 13.260	13.249 - 13.260	13.249 - 13.260	13.249 - 13.260	13.249 - 13.260
Press Fit	-0.061 to +0.060	-0.061 to +0.060	-0.061 to +0.060	-0.061 to +0.060	-0.061 to +0.060
<b>Cylinder Head to Valve Guide Interface - 2nd Oversize</b>					
Bore (D2)	13.400 - 13.418	13.400 - 13.418	13.400 - 13.418	13.400 - 13.418	13.400 - 13.418
Shell (d2)	13.449 - 13.460	13.449 - 13.460	13.449 - 13.460	13.449 - 13.460	13.449 - 13.460
Press Fit	-0.061 to +0.060	-0.061 to +0.060	-0.061 to +0.060	-0.061 to +0.060	-0.061 to +0.060
<b>Intake Valve Guide</b>					
Bore (D2)	9.000 - 9.015	9.000 - 9.015	9.000 - 9.015	9.000 - 9.015	9.000 - 9.015
Shell (d2)	8.958 - 8.990	8.958 - 8.990	8.958 - 8.990	8.958 - 8.990	8.958 - 8.990
Clearances	+0.030 to +0.057	+0.030 to +0.057	+0.030 to +0.057	+0.030 to +0.057	+0.030 to +0.057
Wear Limit	0.15	0.15	0.15	0.15	0.15
<b>Exhaust Valve Guide</b>					
Bore (D2)	9.000 - 9.015	9.000 - 9.015	9.000 - 9.015	9.000 - 9.015	9.000 - 9.015
Shell (d2)	8.958 - 8.990	8.958 - 8.990	8.958 - 8.990	8.958 - 8.990	8.958 - 8.990
Clearances	+0.030 to +0.077	+0.030 to +0.077	+0.030 to +0.077	+0.030 to +0.077	+0.030 to +0.077
Wear Limit	0.20	0.20	0.20	0.20	0.20



## Installation Length of Valve Springs

	Intake	Exhaust
911 (1965-68) up to engine 9111.001	36.0 ± 0.3	36.0 ± 0.3
911T/L (1965-68) from engine 9111.001	35.0 ± 0.3	35.0 ± 0.3
911S (1969)	35.0 ± 0.3	35.0 ± 0.3
911T (1968)	33.0 ± 0.3	33.0 ± 0.3
911T (1968) single spring*	40.75 ± 0.25	40.75 ± 0.25
911E (1968-71)	36.0 ± 0.3	36.0 ± 0.3
911E (1969-71)	35.5 ± 0.3	35.5 ± 0.3
911S (1969-71)	35.5 ± 0.3	35.5 ± 0.3
911T (1972-73)	35.0 ± 0.3	35.0 ± 0.3
911E (1972-73)	34.0 ± 0.3	34.0 ± 0.3
911S (1972-73)	35.5 ± 0.3	35.5 ± 0.3
Carrera RS (1973)	34.5 ± 0.3	34.5 ± 0.3
911S/Carrera (1974)	35.0 ± 0.3	35.0 ± 0.3
911T/911S (1975-77)	35.0 ± 0.3	35.0 ± 0.3
Carrera MFI (1974-75)	34.5 ± 0.3	34.5 ± 0.3
Turbo (1975)	33.5 ± 0.3	33.5 ± 0.3
Carrera 3.0 (1976-77)	34.5 ± 0.3	34.5 ± 0.3
911 Turbo (1976-89)	33.5 ± 0.3	33.5 ± 0.3
911 (1978-89)	34.5 ± 0.15	34.5 ± 0.15

\*See main engine chart for part sizes.  
- Dimension d1 references the outer dimension of the valve seat. Dimension D1 (not shown) represents the inside bore that the seat is pressed into.  
- Dimension d2 references the outer dimension of the valve guide. Dimension D2 (not shown) represents the bore inside the cylinder head that the valve guide pressed into.