



MANLEY

POWERS THE WINNERS



**VALVE TRAIN COMPONENTS FOR
HARLEY-DAVIDSON® MOTORCYCLES**

VALVE TRAIN COMPONENTS

VALVES

The standard of the industry since their inception, Manley valves are designed to outflow and outperform all others even in the most severe environments. Manufactured from high temperature materials, these valves feature swirl polished, performance oriented shapes and durable chrome plated or nitride finished stems.

Manley Stainless Steel Valves Feature -

- * Forged Construction
- * Swirl Polished Underhead
- * Fully Machined Combustion Face
- * Hard Tips
- * Compatible With Unleaded Fuels
- * Durable Chrome Plated Stems (Nitride finish also available for many applications)

Manley's nitride finish is a special heat treatment developed to work specifically with Manley's stainless steel alloys. The Manley nitride process imparts a superficially hard and lubricous surface superior to all others. Beware of our competitors' "space age" coatings; they are inferior to Manley's chrome or nitride finishes.

BUDGET PERFORMANCE SERIES

Designed to compete with the "Brand X" cheap copy-cat imports but with all the features and quality of a Manley valve.

RACE MASTER SERIES

Use with confidence in modified street engines. Unsurpassed by the best our competitors have to offer!

SEVERE DUTY® SERIES

The ultimate insurance policy for your Harley engine. State of the art materials, heat treatment and manufacturing technology are combined to produce a valve available only from Manley.

EXTREME DUTY SERIES

Ultra high temperature alloys specifically designed for exhaust valves. The same alloy we use to produce exhaust valves for 6,000 + horsepower Top Fuel Dragsters and Funny Cars.

GEN II SERIES

Manley is the only manufacturer capable of producing a custom stainless valve with a hardened tip in quantities as small as one set. No need to use cumbersome wear caps or other tip protection methods. Available in Race Master, Severe Duty® and Extreme Duty Series. Specify your dimensions and install your Gen II valves with complete confidence.

TITANIUM VALVES

Manley manufactures the best titanium valves in the world. Period. High strength, high temperature alloys are one-piece forged and a special moly stem coating is employed.



CHROME STEM



NITRIDE FINISH



GEN II

VALVE TRAIN COMPONENTS

BRONZE VALVE GUIDES

Manley recommends bronze guides for race only applications and cast iron guides for street use. Manley chrome stem or nitride valves are compatible with either guide material. Each Manley silicon aluminum bronze valve guide is precision machined from a solid bar of material. This provides proper self-lubrication even at elevated operating temperatures. The I.D. is honed and the O.D. is ground to insure tight control of concentricity necessary for repeatability and minimum valve seat machining.



VITON SEALS

Manley high temperature viton material oil seals incorporate a special spring-loaded wiper assembly to wipe excess oil off the valve stems with a minimum of friction.



MACHINED VALVE LOCKS

Manley valve locks are machined from special chrome moly material, not stamped like many of the other brands. Each keeper is heat treated and black oxidized to a beautiful finish for attractive appearance and long wear. Designed for perfect compatibility with stock, Manley or most aftermarket top collars.



STEEL TOP COLLARS

Manufactured from specially heat treated chrome moly material and black oxidized.



LOWER COLLARS

Manley lower collars are not just cheap copies of stock pieces but re-engineered to offer installation advantages and years of trouble free service. Manufactured of specially heat treated chrome moly material and black oxidized, Manley lower collars compliment O.E. Harley, many aftermarket and Manley spring kits perfectly.



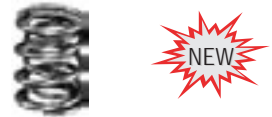
TITANIUM TOP COLLARS

Manufactured from certified aerospace titanium alloy and specially processed for high hardness to improve strength and improve wear resistance.



VALVE SPRINGS

Manufactured from reverse wound chrome silicon alloy and specifically engineered to reduce harmonics and control spring surge. Conical ovate wire valve springs now available for Evolution and Twin Cam applications.



VALVE TRAIN COMPONENT KITS

Manley engineers have assembled complete valve train packages that include Manley's Race Master or Severe Duty® valves, valve spring assemblies, top collars, lower collars and Viton valve guide oil seals, where required and machined valve locks. All kits are perfectly matched for maximum performance. Most spring assemblies included in these kits require no cylinder head machining for installation.



SPORTSTER (EXCEPT EVOLUTION)

STAINLESS STEEL VALVES

| Part No. | Type | Head Diameter | Stem Diameter | Installed Height | O / A Length | Underhead Angle / Radius | Margin Width | Harley Equivalent |
|--|------|---------------|---------------|------------------|--------------|--------------------------|--------------|-------------------|
| SPORTSTER (1957 - 1969) | | | | | | | | |
| SEVERE DUTY® STAINLESS STEEL VALVES | | | | | | | | |
| 99000-2 | Exh. | 1.563 Stock | .3385 Stock | Stock | 3.510 | 12° X 1/4" | .045 | 18080-58A |
| 99034-2 | Int. | 1.815 Stock | .3090 Stock | Stock | 3.610 | 22° x 9/32" | .050 | 18070-58 |
| SPORTSTER (1970 - 1985) | | | | | | | | |
| SEVERE DUTY® STAINLESS STEEL VALVES | | | | | | | | |
| 99000-2 | Exh. | 1.563 Stock | .3385 Stock | Stock | 3.510 | 12° x 1/4" | .045 | 18080-58A |
| 99032-2 | Int. | 1.940 Stock | .3090 Stock | Stock | 3.610 | 22° x 9/32" | .050 | 18070-70 |

VALVE TRAIN HARDWARE

| BRONZE VALVE GUIDES | | VALVE GUIDE OIL SEALS | VALVE LOCKS | TOP COLLARS | LOWER COLLARS | |
|---------------------|--------------------|-----------------------|----------------|-----------------------------|---------------|---------------|
| Std (.564) O.D. | .002 O/S O.D | Viton Material | Machined Steel | Steel | Stock | + .050 Travel |
| 99100-2 Int. (set) | 99102-2 Int. (set) | 99180-4 (set) | 99294-4 (set) | 99248-4 (set) | 99230-4 (set) | 99231-4 (set) |
| 99110-2 Exh. (set) | 99112-2 Exh. (set) | 99180-24 (bulk) | | (For 99209 / 99210 Springs) | | |

PERFORMANCE VALVE SPRING KITS

| Part No. | Springs Used | | Collars Used | | Combined Loads | Coil Bind | Recommended Cam Lift | Spring O.D. |
|---|--|---------|---------------|-------|--------------------------|-----------|----------------------|-------------|
| | Outer | Inner | Top | Lower | | | | |
| STOCK - .490" LIFT KITS WITH STEEL TOP COLLARS | | | | | | | | |
| 99217 | 99209-4 | 99210-4 | 99248-4 Steel | Stock | 85 @ 1.310 295 @ .820 | .790 | Stock - .490 | Stock |
| 99217K | Includes a set of Manley part number 99294-4 valve keys. | | | | | | | |

The above .490" Lift Kit features stock O.D. springs, No machining required for installation. Springs have 20% more pressure than stock. Use with stock lift cams and high lift cams to .490".



99217K

SPORTSTER EVOLUTION

STAINLESS STEEL VALVES

| Part No. | Type | Head Diameter | Stem Diameter | Installed Height | O / A Length | Underhead Angle / Radius | Margin Width | Harley Equivalent |
|--|------|---------------|---------------|------------------|--------------|--------------------------|--------------|-------------------|
| SPORTSTER 883 CC EVOLUTION (1986 - Up) SEVERE DUTY® STAINLESS STEEL VALVES | | | | | | | | |
| 99083-2 | Exh. | 1.345 Stock | .3095 Stock | Stock | 4.645 | 25° x 3/8" | .060 | 18030-86 |
| 99080-2 | Int. | 1.585 Stock | .3100 Stock | Stock | 4.550 | 22° x 1/4" | .060 | 18031-86 |
| SPORTSTER 883 CC EVOLUTION (1986 - Up) 883 to 1200 CONVERSION SEVERE DUTY® STAINLESS STEEL VALVES | | | | | | | | |
| 99063-2 | Exh. | 1.480 Stock | .3095 Stock | Stock | 4.620 | 25° x 3/8" | .060 | None |
| 99062-2 | Int. | 1.715 Stock | .3100 Stock | Stock | 4.550 | 22° x 1/4" | .060 | None |
| SPORTSTER 1200 CC EVOLUTION (1988 - Up) SEVERE DUTY® STAINLESS STEEL VALVES | | | | | | | | |
| 99009-2 | Exh. | 1.480 Stock | .3095 Stock | Stock | 4.560 | 25° x 3/8" | .060 | 18024-87 |
| 99008-2 | Int. | 1.715 Stock | .3100 Stock | Stock | 4.490 | 22° x 1/4" | .060 | 18023-87 |

VALVE TRAIN HARDWARE

| BRONZE VALVE GUIDES | | | VALVE GUIDE OIL SEALS | VALVE LOCKS | TOP COLLARS | | LOWER COLLARS |
|----------------------------------|----------------------------------|----------------------------------|----------------------------------|------------------|--|--|--|
| Std (.563) O.D. | .001 O/S O.D. | .002 O/S O.D. | Viton Material | Machined Steel | Steel | Titanium | Stock Travel |
| 99188-2 Int. or Exh. (set) | 99189-2 Int. or Exh. (set) | 99109-2 Int. or Exh. (set) | 99183-4 (set) 99183-24 (bulk) | 99296-4 (set) | 99254-4 (For 99428 Springs) 99258-4 (For 99206 / 99207 Springs) (sets) | 99255-4 (For 99428 Springs) 99259-4 (For 99206 / 99207 Springs) (sets) | 99266-4 (For 99428 Springs) 99234-4 (For 99206 / 99207 Springs) (sets) |

PERFORMANCE VALVE SPRING KITS

| Part No. | Springs Used | | Collars Used | | Combined Loads | Coil Bind | Recommended Cam Lift |
|--|--|------------------------------|---------------------|---------|----------------------------|-----------|----------------------|
| | Outer | Inner | Top | Lower | | | |
| STOCK - .550" LIFT KITS WITH STEEL TOP COLLARS | | | | | | | |
| 99227 | 99206-4 | 99207-4 | 99258-4 Steel | Stock | 180 @ 1.800 360 @ 1.250 | 1.020 | Stock - .550 |
| 99227K | Includes a set of Manley part number 99296-4 valve keys. | | | | | | |
| STOCK - .600" LIFT KITS WITH STEEL TOP COLLARS | | | | | | | |
| 99240 | 99428-4 | Single Conical Ovate Wire | 99254-4 Steel | 99266-4 | 150 @ 1.800 355 @ 1.200 | 1.085 | Stock - .600 |
| 99240K | Includes a set of Manley part number 99296-4 valve keys. | | | | | | |
| STOCK - .600" LIFT KITS WITH TITANIUM TOP COLLARS | | | | | | | |
| 99241 | 99428-4 | Single Conical Ovate Wire | 99255-4 Titanium | 99266-4 | 150 @ 1.800 355 @ 1.200 | 1.085 | Stock - .600 |
| 99241K | Includes a set of Manley part number 99296-4 valve keys. | | | | | | |
| STOCK - .650" LIFT KITS WITH TITANIUM TOP COLLARS | | | | | | | |
| 99228 | 99206-4 | 99207-4 | 99259-4 Titanium | Stock | 180 @ 1.800 400 @ 1.150 | 1.020 | Stock - .650 |
| 99228K | Includes a set of Manley part number 99296-4 valve keys. | | | | | | |

The above Lift Kits do not require cylinder head machining for installation. Manley strongly suggests the use of titanium top collars on applications exceeding .550" lift, as they provide increased strength and reduced inertia mass.

PAN HEAD, SHOVEL HEAD

STAINLESS STEEL VALVES

PAN HEAD (1948 - 1965)

| Part No. | Type | Head Diameter | Stem Diameter | Installed Height | O / A Length | Underhead Angle / Radius | Margin Width | Harley Equivalent |
|--|------|---------------|---------------|------------------|--------------|--------------------------|--------------|-------------------|
| SEVERE DUTY® STAINLESS STEEL VALVES | | | | | | | | |
| 99011-2 | Exh. | 1.750 Stock | .3745 Stock | Stock | 3.832 | 12° x 1/4" | .060 | 18082-57 |
| 99028-2 | Int. | 1.750 Stock | .3765 Stock | Stock | 3.817 | 25° x 5/16" | .045 | 18071-48 |

SHOVEL HEAD 74 and 80 CID (1966 - 84)

| Part No. | Type | Head Diameter | Stem Diameter | Installed Height | O / A Length | Underhead Angle / Radius | Margin Width | Harley Equivalent |
|--|------|---------------|---------------|------------------|--------------|--------------------------|--------------|-------------------|
| BUDGET PERFORMANCE STAINLESS STEEL VALVES | | | | | | | | |
| 99031-2 | Exh. | 1.750 Stock | .3745 Stock | Stock | 3.832 | 12° x 1/4" | .070 | 18082-57 |
| 99030-2 | Int. | 1.940 Stock | .3765 Stock | Stock | 3.890 | 25° x 5/16" | .050 | 18074-66 |
| BUDGET PERFORMANCE STAINLESS STEEL VALVES WITH NITRIDE FINISH STEMS | | | | | | | | |
| 99031N-2 | Exh. | 1.750 Stock | .3745 Stock | Stock | 3.832 | 12° x 1/4" | .060 | 18082-57 |
| 99030N-2 | Int. | 1.940 Stock | .3765 Stock | Stock | 3.890 | 25° x 5/16" | .045 | 18074-66 |
| RACE MASTER STAINLESS STEEL VALVES | | | | | | | | |
| 99021-2 | Exh. | 1.750 Stock | .3745 Stock | Stock | 3.832 | 12° x 1/4" | .060 | 18082-57 |
| 99020-2 | Int. | 1.940 Stock | .3765 Stock | Stock | 3.890 | 25° x 5/16" | .045 | 18074-66 |
| SEVERE DUTY® STAINLESS STEEL VALVES | | | | | | | | |
| 99011-2 | Exh. | 1.750 Stock | .3745 Stock | Stock | 3.832 | 12° x 1/4" | .060 | 18082-57 |
| 99010-2 | Int. | 1.940 Stock | .3765 Stock | Stock | 3.890 | 25° x 5/16" | .045 | 18074-66 |
| SEVERE DUTY® STAINLESS STEEL VALVES WITH NITRIDE FINISH STEMS | | | | | | | | |
| 99011N-2 | Exh. | 1.750 Stock | .3745 Stock | Stock | 3.832 | 12° x 1/4" | .060 | 18082-57 |
| 99010N-2 | Int. | 1.940 Stock | .3765 Stock | Stock | 3.890 | 25° x 5/16" | .045 | 18074-66 |

Manley's nitride finish is a special heat treatment developed to work specifically with Manley's grade stainless steel alloys. The Manley nitride process imparts a super-ficially hard and lubricious surface superior to all others. Beware of our competitors' "space age" coatings, they are inferior to Manley's chrome or nitride finishes.

VALVE TRAIN HARDWARE

74 and 80 CID (Up to 1979)

| BRONZE VALVE GUIDES | | | | VALVE GUIDE OIL SEALS | VALVE LOCKS | TOP COLLARS | | LOWER COLLARS | |
|---------------------|---------------------|---------------------|---------------------|-----------------------|----------------|---|----------|---------------|---------------|
| Std (.565) O.D. | .002 O/S O.D | .004 O/S O.D | .006 O/S O.D | Viton Material | Machined Steel | Steel | Titanium | Stock | +.030 Travel |
| 99120-2 Int. | 99122-2 Int. | 99124-2 Int. | 99126-2 Int. | 99181-4 (set) | 99295-4 (set) | 99253-4 | 99256-4 | 99232-4 (set) | 99233-4 (set) |
| 99130-2 Exh. (sets) | 99132-2 Exh. (sets) | 99134-2 Exh. (sets) | 99136-2 Exh. (sets) | 99181-24 (bulk) | | (For 99203 / 99204 & 99222 Springs) (set) | | | |

80 CID (1980-84)

| BRONZE VALVE GUIDES (1980 MID 81)(Late 1981-84)(Late 1981-84) | | | VALVE GUIDE OIL SEALS | VALVE LOCKS | TOP COLLARS | | LOWER COLLARS |
|---|---------------------------|---------------------------|-------------------------------|----------------|---|----------|---------------|
| Std (.625) O.D. | .001 O/S O.D | .002 O/S O.D | Viton Material | Machined Steel | Steel | Titanium | +.030 Travel |
| 99161-2 (set) Int. & Exh. | 99178-2 (set) Int. & Exh. | 99179-2 (set) Int. & Exh. | 99182-4 (set) 99182-24 (bulk) | 99295-4 (set) | 99253-4 | 99256-4 | 99236-4 (set) |
| | | | | | (For 99203 / 99204 & 99222 Springs) (set) | | |

PERFORMANCE VALVE SPRING KITS

| Part No. | Springs Used | | Collars Used | | Combined Loads | Coil Bind | Recommended Cam Lift |
|--|--|----------------|--------------|---------|--|-----------|----------------------|
| | Outer | Inner | Top | Lower | | | |
| SHOVEL HEAD 74 and 80 CID (1966-1984) STOCK - .465" LIFT KITS WITH STEEL TOP COLLARS | | | | | | | |
| 99216 | 99203-4 | 99204-4 | 99253-4 | Stock | 170 @ 1.450 315 @ .985 | .880 | Stock - .465 |
| 99216K | Includes a set of Manley part number 99295-4 valve keys. | | | | | | |
| SHOVEL HEAD 74 and 80 CID (1966-1984) STOCK - .465" LIFT KITS WITH TITANIUM TOP COLLARS | | | | | | | |
| 99218 | 99203-4 | 99204-4 | 99256-4 | Stock | 170 @ 1.450 315 @ 1.985 | .880 | Stock - .465 |
| 99218K | Includes a set of Manley part number 99295-4 valve keys. | | | | | | |
| The above .465" Lift Kits do not require cylinder head machining for installation. Do not exceed .465" lift due to potential high stress on springs. | | | | | | | |
| SHOVEL HEAD 74 and 80 CID (Up to 1979) STOCK - .495" LIFT KITS WITH STEEL TOP COLLARS | | | | | | | |
| 99215 | 99203-4 | 99204-4 | 99253-4 | 99233-4 | 160 @ 1.480 315 @ .985 | .880 | Stock - .495 |
| 99215K | Includes a set of Manley part number 99295-4 valve keys. | | | | | | |
| SHOVEL HEAD 74 and 80 CID (Up to 1979) STOCK - .495" LIFT KITS WITH TITANIUM TOP COLLARS | | | | | | | |
| 99229 | 99203-4 | 99204-4 | 99256-4 | 99233-4 | 160 @ 1.480 315 @ 1.985 | .880 | Stock - .495 |
| 99229K | Includes a set of Manley part number 99295-4 valve keys. | | | | | | |
| The above .495" Lift Kits do not require cylinder head machining for installation. These kits are supplied with 99233 lower collars which allows additional spring travel as compared to the stock collar and provides these kits the ability to accept camshafts up to .495" lift. | | | | | | | |
| SHOVEL HEAD 74 and 80 CID (1966-1984) .500" - .650" LIFT KITS WITH TITANIUM TOP COLLARS | | | | | | | |
| 99225 | 99222-4 | Triple Springs | 99256-4 | 99297-6 | 180 @ 1.600 365 @ 1.100 415 @ .950 | .850 | .500 - .650 |
| 99225K | Includes a set of Manley part number 99295-4 valve keys. | | | | | | |
| The above .650" lift kits feature a special tri-spring (outer-intermediate-inner) interference fit to reduce harmonics and control spring surge. Tool 41853M, is required for installation and complete instructions are included. Additional machining is required to lower the height of the valve guide to avoid interference with the top collar. Springs have more pressure than stock and can be used with .500" - .650" lift cams. Tool 41853M is supplied with a 3/8" pilot. | | | | | | | |

VALVE TRAIN COMPONENT KITS

Manley engineers have assembled complete valve train packages that include Manley's Race Master or Severe Duty® valves, valve spring assemblies, top collars, lower collars where required and machined valve locks. All kits are perfectly matched for maximum performance. Most spring assemblies included in these kits require no cylinder head machining for installation.

| Part No. | Valve Part Nos. | | Valve Springs | | Steel Top Collars | Lower Collars | Machined Valve Keys |
|--|-----------------|---------|--------------------|----------------|----------------------|---------------|---------------------|
| | Intake | Exhaust | Outer | Inner | | | |
| RACE MASTER 74 and 80 CID (Up to 1979) STOCK - .495" LIFT | | | | | | | |
| 99212 | 99020-2 | 99021-2 | 99203-4 | 99204-4 | 99253-4 | 99233-4 | 99295-4 |
| RACE MASTER 80 CID (1980 - 1984) STOCK - .495" LIFT | | | | | | | |
| 99211 | 99020-2 | 99021-2 | 99203-4 | 99204-4 | 99253-4 | 99236-4 | 99295-4 |
| Part No. | Valve Part Nos. | | Valve Springs Used | | Titanium Top Collars | Lower Collars | Machined Valve Keys |
| | Intake | Exhaust | | | | | |
| SEVERE DUTY® 74 and 80 CID (1966 - 1984) .500 - 650" LIFT | | | | | | | |
| 99272 | 99010-2 | 99011-2 | 99222-4 | Triple Springs | 99256-4 | 99297-6 | 99295-4 |

The 99272 kit features a special interference fit triple spring to reduce harmonics and control spring surge. Tool 41853M, page 13, is required for installation and complete instructions are included. Additional machining is required to lower the height of the valve guide to avoid interference with the top collar. Springs have more pressure than stock and can be used with .500" - .650" lift cams. Tool 41853M is supplied with a 3/8" pilot.

EVOLUTION 80 CID / TWIN CAM 88 CID UP TO 2004

STAINLESS STEEL VALVES EVOLUTION / TWIN CAM UP TO 2004

| Part No. | Type | Head Diameter | Stem Diameter | Installed Height | O / A Length | Underhead Angle / Radius | Margin Width | Harley Equivalent |
|--|------|---------------|---------------|------------------|--------------|--------------------------|--------------|-------------------|
| BUDGET PERFORMANCE STAINLESS STEEL VALVES | | | | | | | | |
| 99069-2 | Exh. | 1.565 Stock* | .3095 Stock | Stock | 4.525 | 25° x 3/8" | .050 | 18085-99 |
| 99071-2 | Exh. | 1.615 Stock* | .3095 Stock | Stock | 4.525 | 25° x 3/8" | .050 | 18082-83 |
| 99070-2 | Int. | 1.850 Stock | .3100 Stock | Stock | 4.440 | 22° x 1/4" | .050 | 18074-83 |
| 99072-2 | Int. | 1.900 | .3100 Stock | Stock | 4.440 | 22° x 1/4" | .050 | None |
| RACE MASTER STAINLESS STEEL VALVES | | | | | | | | |
| 99059-2 | Exh. | 1.565 Stock* | .3095 Stock | Stock | 4.525 | 25° x 3/8" | .050 | 18085-99 |
| 99061-2 | Exh. | 1.615 Stock* | .3095 Stock | Stock | 4.525 | 25° x 3/8" | .050 | 18082-83 |
| 99060-2 | Int. | 1.850 Stock | .3100 Stock | Stock | 4.440 | 22° x 1/4" | .050 | 18074-83 |
| 99066-2 | Int. | 1.900 | .3100 Stock | Stock | 4.440 | 22° x 1/4" | .050 | None |
| 99064-2 | Int. | 1.940 | .3100 Stock | Stock | 4.440 | 22° x 1/4" | .050 | None |
| SEVERE DUTY® STAINLESS STEEL VALVES | | | | | | | | |
| 99079-2 | Exh. | 1.565 Stock* | .3095 Stock | Stock | 4.525 | 25° x 3/8" | .050 | 18085-99 |
| 99081-2 | Exh. | 1.615 Stock* | .3095 Stock | Stock | 4.525 | 25° x 3/8" | .050 | 18082-83 |
| 99015-2 | Exh. | 1.650 | .3095 Stock | Stock | 4.525 | 25° x 3/8" | .050 | 18074-66 |
| 99082-2 | Int. | 1.850 Stock | .3100 Stock | Stock | 4.440 | 22° x 1/4" | .050 | 18074-83 |
| 99088-2 | Int. | 1.900 | .3100 Stock | Stock | 4.440 | 22° x 1/4" | .050 | None |
| 99092-2 | Int. | 1.940 | .3100 Stock | Stock | 4.440 | 22° x 1/4" | .050 | None |
| 99084-2 | Int. | 1.940 | .3100 Stock | .060 Short | 4.380 | 22° x 1/4" | .050 | None |
| 99014-2 | Int. | 2.000 | .3100 Stock | Stock | 4.440 | 22° x 1/4" | .050 | None |
| SEVERE DUTY® STAINLESS STEEL VALVES WITH NITRIDE FINISH STEMS | | | | | | | | |
| 99079N-2 | Exh. | 1.565 Stock* | .3095 Stock | Stock | 4.525 | 25° x 3/8" | .050 | 18085-99 |
| 99081N-2 | Exh. | 1.615 Stock* | .3095 Stock | Stock | 4.525 | 25° x 3/8" | .050 | 18082-83 |
| 99082N-2 | Int. | 1.850 Stock | .3100 Stock | Stock | 4.440 | 22° x 1/4" | .050 | 18074-83 |

* The Twin Cam 88 has a 1.565" stock diameter exhaust valve. A 1.615" diameter exhaust valve can be installed on the stock seat. The head diameter of the Twin Cam 88 intake valve is 1.850". A 1.900" diameter intake valve can be installed on the stock seat.

VALVE TRAIN HARDWARE

| BRONZE VALVE GUIDES | | | VALVE GUIDE OIL SEALS | VALVE LOCKS | TOP COLLARS | | LOWER COLLARS |
|---------------------|--------------------|--------------------|-----------------------|----------------|-----------------------------|-----------------------------|-----------------------------|
| Std (.563) O.D. | .001 O/S O.D. | .002 O/S O.D. | Viton Material | Machined Steel | Steel | Titanium | Stock Travel |
| 99188-2 | 99189-2 | 99109-2 | 99183-4 (set) | 99296-4 | 99254-4 | 99255-4 | 99266-4 |
| Int. or Exh. (set) | Int. or Exh. (set) | Int. or Exh. (set) | 99183-24 (bulk) | (set) | (For 99428 Springs) | (For 99428 Springs) | (For 99428 Springs) |
| | | | | | 99258-4 | 99259-4 | 99234-4 |
| | | | | | (For 99206 / 99207 Springs) | (For 99206 / 99207 Springs) | (For 99206 / 99207 Springs) |
| | | | | | (sets) | (sets) | (sets) |

EVOLUTION 80 CID / TWIN CAM 88 CID UP TO 2004

PERFORMANCE VALVE SPRING KITS EVOLUTION / TWIN CAM UP TO 2004

| Part No. | Springs Used | | Collars Used | | Combined Loads | Coil Bind | Recommended Cam Lift |
|---------------|--|------------------------------|--|---------|----------------------------|-----------|----------------------|
| | Outer | Inner | Top | Lower | | | |
| 99227 | 99206-4 | 99207-4 | STOCK - .550" LIFT KITS WITH STEEL TOP COLLARS | | 180 @ 1.800 360 @ 1.250 | 1.020 | Stock - .550 |
| 99227K | Includes a set of Manley part number 99296-4 valve keys. | | | | | | |
| 99240 | 99428-4 | Single Conical Ovate Wire | 99254-4 Steel | 99266-4 | 150 @ 1.800 355 @ 1.200 | 1.085 | Stock - .600 |
| 99240K | Includes a set of Manley part number 99296-4 valve keys. | | | | | | |
| 99241 | 99428-4 | Single Conical Ovate Wire | 99255-4 Titanium | 99266-4 | 150 @ 1.800 355 @ 1.200 | 1.085 | Stock - .600 |
| 99241K | Includes a set of Manley part number 99296-4 valve keys. | | | | | | |
| 99228 | 99206-4 | 99207-4 | STOCK - .650" LIFT KITS WITH TITANIUM TOP COLLARS | | 180 @ 1.800 400 @ 1.150 | 1.020 | Stock - .650 |
| 99228K | Includes a set of Manley part number 99296-4 valve keys. | | | | | | |

The above Lift Kits do not require cylinder head machining for installation.

VALVE TRAIN COMPONENT KITS

Manley engineers have assembled complete valve train packages that include Manley's Race Master or Severe Duty® valves, valve spring assemblies, top collars and machined valve locks. All kits are perfectly matched for maximum performance. The spring assemblies included in these kits require no cylinder head machining for installation.

| Part No. | Valve Part Nos. | | Valve Springs | | Steel Top Collars | Lower Collars | Machined Valve Locks |
|--------------|-----------------|---------|--|-------|-------------------|---------------|----------------------|
| | Intake | Exhaust | Outer | Inner | | | |
| 99213 | 99060-2 | 99061-2 | RACE MASTER EVOLUTION 80 CID STOCK - .550" LIFT | | 99258-4 | Stock | 99296-4 |
| 99275 | 99060-2 | 99059-2 | RACE MASTER TWIN CAM 88 CID STOCK - .550" LIFT | | 99258-4 | Stock | 99296-4 |

| Part No. | Valve Part Nos. | | Valve Springs | | Titanium Top Collars | Lower Collars | Machined Valve Locks |
|---------------|------------------------|----------|---|---------|----------------------|---------------|----------------------|
| | Intake | Exhaust | Outer | Inner | | | |
| 99214 | 99060-2 | 99061-2 | RACE MASTER EVOLUTION 80 CID STOCK - .650" LIFT | | 99259-4 | Stock | 99296-4 |
| 99277 | 99082-2 | 99081-2 | SEVERE DUTY® EVOLUTION 80 CID STOCK - .650" LIFT | | 99259-4 | Stock | 99296-4 |
| 99277N | 99082N-2 (Nitrided) | 99081N-2 | 99206-4 | 99207-4 | 99259-4 | Stock | 99296-4 |
| 99279 | 99082-2 | 99079-2 | SEVERE DUTY® TWIN CAM 88 CID STOCK - .650" LIFT | | 99259-4 | Stock | 99296-4 |
| 99279N | 99082N-2 (Nitrided) | 99079N-2 | 99206-4 | 99207-4 | 99259-4 | Stock | 99296-4 |

TWIN CAM 88 CID 2005 & LATER



STAINLESS STEEL VALVES TWIN CAM 2005-UP WITH STOCK TRIPLE KEEPER GROOVE

| Part No. | Type | Head Diameter | Stem Diameter | Installed Height | O / A Length | Underhead Angle / Radius | Margin Width | Harley Equivalent |
|---|------|---------------|---------------|------------------|--------------|--------------------------|--------------|-------------------|
| RACE MASTER STAINLESS STEEL VALVES | | | | | | | | |
| 99041-2 | Exh. | 1.575 Stock | .2755 / 7mm | Stock | 4.520 | 30° x 1/2" | .055 | 18085-05 |
| 99043-2 | Exh. | 1.625 | .2755 / 7mm | Stock | 4.520 | 30° x 1/2" | .055 | None |
| 99040-2 | Int. | 1.805 Stock | .2755 / 7mm | Stock | 4.425 | 28° x 7/16" | .050 | 18074-05 |
| 99042-2 | Int. | 1.900 | .2755 / 7mm | Stock | 4.425 | 28° x 7/16" | .050 | None |

NOTE: Manley can make virtually any valve for your Twin Cam application. Please refer to our Gen II Blanks on page 12 and the blank valve print on page 14 to order your custom valves. Larger head diameters up to 2.000" Int. and 1.650" Exh. are attainable. We can also shorten and lengthen the valve accordingly to suit your requirements.

TWIN CAM 2005-UP WITH MANLEY'S BEAD LOC® SINGLE KEEPER GROOVE

| Part No. | Type | Head Diameter | Stem Diameter | Installed Height | O / A Length | Underhead Angle / Radius | Margin Width | Harley Equivalent |
|---|------|---------------|---------------|------------------|--------------|--------------------------|--------------|-------------------|
| RACE MASTER STAINLESS STEEL VALVES | | | | | | | | |
| 99045-2 | Exh. | 1.575 Stock | .2755 / 7mm | Stock | 4.520 | 30° x 1/2" | .055 | None |
| 99047-2 | Exh. | 1.625 | .2755 / 7mm | Stock | 4.520 | 30° x 1/2" | .055 | None |
| 99044-2 | Int. | 1.805 Stock | .2755 / 7mm | Stock | 4.425 | 28° x 7/16" | .050 | None |
| 99046-2 | Int. | 1.900 | .2755 / 7mm | Stock | 4.425 | 28° x 7/16" | .050 | None |

NOTE: Manley can make virtually any valve for your Twin Cam application. Please refer to our Gen II Blanks on page 12 and the blank valve print on page 14 to order your custom valves. Larger head diameters up to 2.000" Int. and 1.650" Exh. are attainable. We can also shorten and lengthen the valve accordingly to suit your requirements.

VALVE TRAIN HARDWARE



| BRONZE VALVE GUIDES | | VALVE GUIDE OIL SEALS | BEAD LOC® VALVE LOCKS | TOP COLLARS | | LOWER COLLARS |
|----------------------------------|----------------------------------|--|-----------------------|---|--|--|
| Std (.562) O.D. | .002 O/S O.D. | Viton Material | Machined Steel | Steel | Titanium | Stock Travel |
| 99186-2 Int. or Exh. (set) | 99187-2 Int. or Exh. (set) | 99184-4 (set) 99184-24 (bulk) | 99298-4 (set) | 99268-4 (For 99428 Springs) (set) | 99269-4 (For 99428 Springs) 99260-4 (For 99206 / 99207 Springs) (sets) | 99251-4 (For 99428 Springs) 99267-4 (For 99206 / 99207 Springs) (sets) |

TWIN CAM 88 CID 2005 & LATER

PERFORMANCE VALVE SPRING KITS

TWIN CAM 2005-UP WITH STOCK TRIPLE KEEPER GROOVE

Manley offers two proven valve springs that are unequalled in the industry. For stock - .600" lift applications we have our single ovate wire, conical design and for stock - .650" lift we offer our tried and true dual reverse wound chrome silicon alloy design. These kits require no cylinder head machining for installation.



NOTE: The stock cylinder head comes with an integral locator cup (lower collar) and valve guide oil seal. Manley recommends converting this stock set up to our after-market performance spring kit package. Simply discard the integral tophat seal, valve springs, and top collars, then replace with the Manley lower collars, valve springs, top collars, and viton oil seals. The viton seal fits perfectly over the stock guide and there is plenty of clearance for a maximum of .650" lift.

| Part No. | Springs Used | | Collars Used | | Viton Seals | Valve Locks | Combined Loads | Coil Bind | Recommended Cam Lift |
|---|--------------|------------------------------|---------------------|---------|-------------|-------------|----------------------------|-----------|----------------------|
| | Outer | Inner | Top | Lower | | | | | |
| STOCK - .600" LIFT KIT WITH STEEL TOP COLLARS | | | | | | | | | |
| 99242 | 99428-4 | Single Conical Ovate Wire | 99268-4 Steel | 99251-4 | 99184-4 | Stock | 150 @ 1.800 355 @ 1.200 | 1.085 | Stock - .600 |
| STOCK - .600" LIFT KIT WITH TITANIUM TOP COLLARS | | | | | | | | | |
| 99243 | 99428-4 | Single Conical Ovate Wire | 99269-4 Titanium | 99251-4 | 99184-4 | Stock | 150 @ 1.800 355 @ 1.200 | 1.085 | Stock - .600 |
| STOCK - .650" LIFT KIT WITH TITANIUM TOP COLLARS | | | | | | | | | |
| 99244 | 99206-4 | 99207-4 | 99260-4 Titanium | 99267-4 | 99184-4 | Stock | 180 @ 1.800 400 @ 1.150 | 1.020 | Stock - .650 |

TWIN CAM 2005-UP WITH MANLEY'S BEAD LOC® SINGLE KEEPER GROOVE

Manley is proud to offer .600" and .650" lift spring kits for our own Bead Loc® single keeper groove valves. These are the same proven performance kits as above. No cylinder head modifications are required. Simply order our Twin Cam valves with the Bead Loc® single keeper groove on Page 9 and use the Bead Loc® valve locks that are included in the following kits. It's that easy.



| Part No. | Springs Used | | Collars Used | | Viton Seals | Bead Loc® Valve Locks | Combined Loads | Coil Bind | Recommended Cam Lift |
|---|--------------|------------------------------|---------------------|---------|-------------|--------------------------|----------------------------|-----------|----------------------|
| | Outer | Inner | Top | Lower | | | | | |
| STOCK - .600" LIFT KIT WITH STEEL TOP COLLARS | | | | | | | | | |
| 99245K | 99428-4 | Single Conical Ovate Wire | 99268-4 Steel | 99251-4 | 99184-4 | 99298-4 | 150 @ 1.800 355 @ 1.200 | 1.085 | Stock - .600 |
| STOCK - .600" LIFT KIT WITH TITANIUM TOP COLLARS | | | | | | | | | |
| 99246K | 99428-4 | Single Conical Ovate Wire | 99269-4 Titanium | 99251-4 | 99184-4 | 99298-4 | 150 @ 1.800 355 @ 1.200 | 1.085 | Stock - .600 |
| STOCK - .650" LIFT KIT WITH TITANIUM TOP COLLARS | | | | | | | | | |
| 99247K | 99206-4 | 99207-4 | 99260-4 Titanium | 99267-4 | 99184-4 | 99298-4 | 180 @ 1.800 400 @ 1.150 | 1.020 | Stock - .650 |

TWIN CAM 88 CID 2005 & LATER BUELL XB9 2002-2003

VALVE TRAIN COMPONENT KITS

TWIN CAM 2005-UP WITH STOCK TRIPLE KEEPER GROOVE

Manley engineers have assembled valve train packages that include Manley's Race Master valves, valve spring assemblies, top and lower collars, and high temperature viton valve guide oil seals. All kits are perfectly matched for maximum performance. These kits require no cylinder head machining for installation.



| Part No. | Valve Part Nos. | | Valve Spring Kit Used | Top Collars | Valve Guide Oil Seals | Valve Locks |
|----------|-----------------|---------|---|-------------|-----------------------|-------------|
| | Intake | Exhaust | | | | |
| 99280 | 99040-2 | 99041-2 | RACE MASTER STOCK - .600" LIFT 99242 | Steel | Viton | Stock |
| 99281 | 99040-2 | 99041-2 | RACE MASTER STOCK - .600" LIFT 99243 | Titanium | Viton | Stock |
| 99282 | 99040-2 | 99041-2 | RACE MASTER STOCK - .650" LIFT 99244 | Titanium | Viton | Stock |

TWIN CAM 2005-UP WITH MANLEY'S BEAD LOC® SINGLE KEEPER GROOVE

Manley engineers have assembled complete valve train packages that include Manley's Race Master valves, valve spring assemblies, top and lower collars, high temperature viton valve guide oil seals, and machined Bead Loc® valve locks. All kits are perfectly matched for maximum performance. These kits require no cylinder head machining for installation.



| Part No. | Valve Part Nos. | | Valve Spring Kit Used | Top Collars | Valve Guide Oil Seals | Valve Locks |
|----------|-----------------|---------|--|-------------|-----------------------|------------------|
| | Intake | Exhaust | | | | |
| 99283 | 99044-2 | 99045-2 | RACE MASTER STOCK - .600" LIFT 99245K | Steel | Viton | Manley Bead Loc® |
| 99284 | 99044-2 | 99045-2 | RACE MASTER STOCK - .600" LIFT 99246K | Titanium | Viton | Manley Bead Loc® |
| 99285 | 99044-2 | 99045-2 | RACE MASTER STOCK - .650" LIFT 99247K | Titanium | Viton | Manley Bead Loc® |

STAINLESS STEEL VALVES

BUELL XB9 2002-2003 WITH STOCK TRIPLE KEEPER GROOVE



| Part No. | Type | Head Diameter | Stem Diameter | Installed Height | O / A Length | Underhead Angle / Radius | Margin Width |
|------------------------------------|------|---------------|---------------|------------------|--------------|--------------------------|--------------|
| RACE MASTER STAINLESS STEEL VALVES | | | | | | | |
| 99073-2 | Exh. | 1.575 Stock | .2755 / 7mm | Stock | 4.610 | 30° x 1/2" | .055 |
| 99075-2 | Exh. | 1.615 | .2755 / 7mm | Stock | 4.590 | 30° x 1/2" | .055 |
| 99074-2 | Int. | 1.805 Stock | .2755 / 7mm | Stock | 4.525 | 28° x 7/16" | .050 |
| 99076-2 | Int. | 1.900 | .2755 / 7mm | Stock | 4.500 | 28° x 7/16" | .050 |

NOTE: Manley can make virtually any valve for your Buell application. Please refer to our Gen II Blanks on page 12 and the blank valve print on page 14 to order your custom valves. Larger head diameters up to 2.000" Int. and 1.650" Exh. are attainable. We can also shorten and lengthen the valve accordingly to suit your requirements.

GEN II STAINLESS & CUSTOM TITANIUM VALVES

GEN II

CUSTOM STAINLESS STEEL VALVES

Manley is the only manufacturer capable of producing a custom stainless valve with a hardened tip in quantities as small as one set. No need to use cumbersome wear caps or other tip protection methods. Specify your dimensions and install your Gen II valves with complete confidence.

* Hard Tips and Hardened Grooves * No Need for Wear Caps * Chrome Plated Stems

The procedure for ordering a custom Gen II valve is as simple as 1-2-3!

1. Select the blank appropriate for your finished valve.
2. Indicate your final head diameter along with seat and margin widths.
3. Specify the length of the valve you want, along with keeper groove type and location.
(1.250" maximum length reduction except 99012 and 99013 are .800" maximum length reduction.)
4. Please refer to the valve drawing on page 14.



All Gen II custom stainless valve part numbers are priced to include all machining to render a finished valve.

| Part No. | Type | Head Diameter | Stem Diameter | Maximum Length | Underhead Angle / Radius | Margin Width | Seat Width | Top of Head |
|----------------------------|------|---------------|---------------|----------------|--------------------------|--------------|------------|-------------|
| RACE MASTER SERIES | | | | | | | | |
| 99013-1 | Exh. | 1.650 | .2755 / 7mm | 4.700 | 30° x 1/2" | .060 | .100 | 24° dish |
| 99012-1 | Int. | 2.000 | .2755 / 7mm | 4.600 | 28° x 7/16" | .050 | .100 | 22° dish |
| 99005-1 | Exh. | 1.650 | .3095 | 5.400 | 25° x 3/8" | .060 | .100 | 20° dish |
| 99007-1 | Exh. | 1.650 | .3095 | 5.400 | 29° x 3/8" | .060 | .100 | 24° dish |
| 99006-1 | Int. | 2.100 | .3100 | 5.400 | 22° x 1/4" | .050 | .080 | 17° dish |
| SEVERE DUTY® SERIES | | | | | | | | |
| 99049-1 | Exh. | 1.650 | .3095 | 5.400 | 25° x 3/8" | .060 | .100 | 20° dish |
| 99051-1 | Exh. | 1.650 | .3095 | 5.400 | 29° x 3/8" | .060 | .100 | 24° dish |
| 99053-1 | Exh. | 1.750 | .3095 | 5.400 | 25° x 3/8" | .060 | .100 | 20° dish |
| 99050-1 | Int. | 2.100 | .3100 | 5.400 | 22° x 1/4" | .050 | .080 | 17° dish |
| EXTREME DUTY SERIES | | | | | | | | |
| 99055-1 | Exh. | 1.750 | .3095 | 5.400 | 25° x 3/8" | .060 | .100 | 20° dish |



CUSTOM HOLLOW STEM STAINLESS STEEL VALVES



| Part No. | Type | Head Diameter | Stem Diameter | Maximum Length | Underhead Angle / Radius | Margin Width | Seat Width | Top of Head |
|----------|------|---------------|----------------------|----------------|--------------------------|--------------|------------|-------------|
| 99050H-1 | Int. | 2.100 | .3100 Hollow Stem | 5.400 | 22° x 1/4" | .050 | .080 | 17° dish |

TITANIUM VALVES

The procedure for ordering a custom titanium valve is as simple as following these steps!

1. Indicate your final head diameter, seat and margin widths.
2. Specify the length of the valve you want, along with single groove type and location.
3. If you require a dished face order P/N 04026 and specify dish angle and rim width.
4. Order wear cap P/N 99261 to provide tip protection. (A minimum .250" tip length is required).



| Part No. | Type | Head Diameter | Stem Diameter | Installed Height | O / A Length | Tip Length | Underhead Angle / Radius | Margin Width | Seat Width |
|----------|--------------------|---------------|---------------|------------------|--------------|------------|--------------------------|--------------|------------|
| 98010-1 | Custom Exh. & Int. | Up to 2.400 | .3100 | Custom | Up to 5.000 | Custom | Up to 25° x 5/8" | Custom | Custom |

WEAR CAPS

| Part No. | Description | Quantity |
|----------|-------------------------------|-----------------|
| 99261-4 | Wear caps for Titanium Valves | (set of 4 pcs.) |



TOOLS & TECH TIPS

SPRING SEAT CUTTER

- 41853M Required for installation of 74 & 80 CID .500" - .650" lift kit. Supplied with 3/8" pilot.
- 41516M 5/16" pilot for the above
- 41132M 11/32" pilot for the above.



VALVE GUIDE SEAL CUTTERS

- 41711M Cuts .530" diameter and includes 11/32" pilot.
- 41712M Cuts .530" diameter and includes 3/8" pilot.
- 41812M Cuts .562" diameter and includes 3/8" pilot.
- 41816M Cuts .625" diameter and includes 3/8" pilot.
- 41516M 5/16" pilot for any of the above



PISTON RING END GAPPING TOOL

This clever little hand operated grinder will allow the engine builder to custom tailor the end gaps of his rings for tighter fit and more complete combustion seal.

- 41833M End Gap Grinder
- 41817M Replacement Blade - Steel with carbide coating



CYLINDER LEAK DOWN TESTER

The twin gauge leak down tester is a vital tool for the performance enthusiast who wants to monitor the leakage in the combustion chamber. A quick and easy test that has genuine meaning to an engine's efficiency.

- 41892M Manley Leak Down Tester (includes 12mm and 14mm air plugs)



MANLEY TECH TIPS

Following these recommendations will increase the service life of Manley valves and valve train products.

TECH TIP #1

Manley recommends silicon aluminum bronze guides for the race track and cast iron guides for street use. Manley chrome plated or nitride finish stems work well with either guide material. For street applications Manley recommends .0015" - .002" intake valve to guide clearance and .002" - .0025" exhaust valve to guide clearance. Manley's viton oil seals should be installed on all street or race engines. The installation of these seals will positively dry up the combustion chamber and reduce deposits on the back side of the intake valve. Because of their effective oil control, when installing Manley oil seals valve guides should be sized to the high limit.

TECH TIP #2

Valve seat widths are very important as 75% of the heat of the valve is dissipated through seat contact. For street applications, Manley recommends .060" minimum intake seat width and .070" minimum exhaust seat width. Remember, all Manley steel valves are compatible with unleaded fuels and all valve seat materials.

TECH TIP #3

Maintain adequate spring pressure. Even in a stock rebuild, Manley recommends upgrading to a performance spring kit. Inadequate spring pressure results in valve float causing abnormal stress on the valve train and limits r.p.m. potential. In a high performance, high lift application pay particular attention to valve spring coil bind clearance. On all Manley spring kits, a minimum of .030" is recommended to achieve maximum spring life. If your camshaft lift is near Manley's maximum range, move up to the next Manley kit. The increased spring pressure and coil bind clearance will allow you to realize your engine's full potential and down the road your valve train can accept a higher lift camshaft without the need for additional top end work. A definite money saver in the long run!

Manley's tech experts can be reached at (732) 905-3366 for any assistance you may require.

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MANLEY® - SEVERE DUTY® - BEAD LOC®

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PLEASE SEE GEN II CUSTOM VALVE SPECIFICATIONS ON PAGE 12

A WEAR CAP IS NOT NECESSARY WITH GEN II*

PLEASE FILL IN ALL DIMENSIONS AND ORDER INFO

USE BLANK P/N _____

CYLINDER HEAD _____

TIP LENGTH _____

STEM DIAM. _____

GROOVE TYPE

- HARLEY EVOLUTION SQUARE GROOVE
- HARLEY TWIN CAM / BUELL TRIPLE GROOVE
- MANLEY BEAD LOC® RADIUS GROOVE
- OTHER: _____

OVERALL LENGTH _____

1ST BACKCUT _____

WIDTH _____
 ANGLE _____

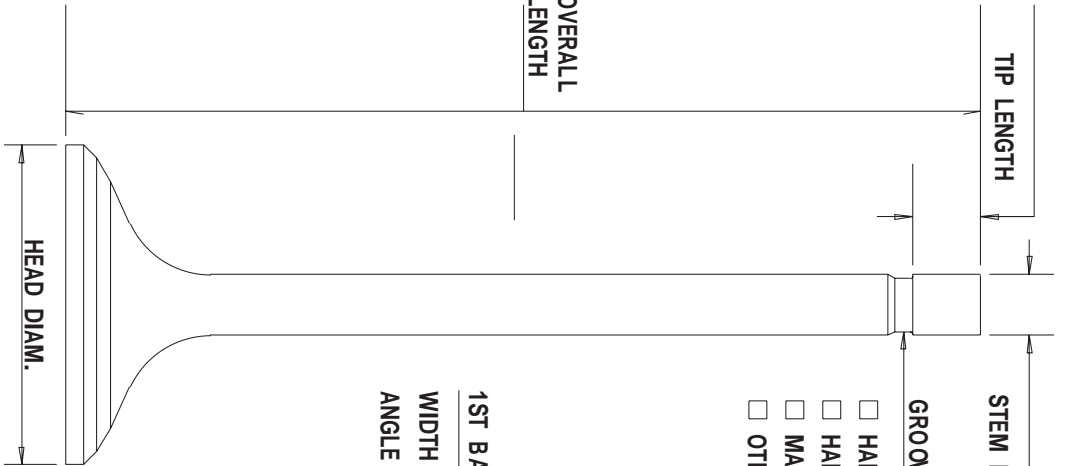
EDGE

- SHARP
- BREAK _____
- CORNER RADIUS _____

MARGIN _____

SEAT

WIDTH _____
 ANGLE _____



HEAD DIAM. _____

* Provided that the overall length is within the minimum length parameter of the Gen II blank that is machined.

MANLEY PERFORMANCE PROD.
 1960 SWARTHMORE AVE.
 LAKEWOOD, NJ 08701
 PHONE: 732-905-3366
 FAX: 732-905-3010

| ORDER INFO | |
|------------|-------|
| ACCT. NO. | _____ |
| NAME | _____ |
| DATE | _____ |
| P.O. # | _____ |
| QTY. | _____ |
| DUE DATE | _____ |
| SHIP VIA | _____ |



DECIMAL CONVERSION CHART

| | | | | | | |
|-----------------|-----------------|-------|-----------------|-----------------|-------|--------------|
| $\frac{1}{64}$ | _____ | .0156 | $\frac{33}{64}$ | _____ | .5156 | |
| | $\frac{1}{32}$ | _____ | .0312 | $\frac{17}{32}$ | _____ | .5312 |
| $\frac{3}{64}$ | _____ | .0468 | $\frac{35}{64}$ | _____ | .5468 | |
| | $\frac{1}{16}$ | _____ | .0625 | $\frac{9}{16}$ | _____ | .5625 |
| $\frac{5}{64}$ | _____ | .0781 | $\frac{37}{64}$ | _____ | .5781 | |
| | $\frac{3}{32}$ | _____ | .0937 | $\frac{19}{32}$ | _____ | .5937 |
| $\frac{7}{64}$ | _____ | .1093 | $\frac{39}{64}$ | _____ | .6093 | |
| | $\frac{1}{8}$ | _____ | .125 | $\frac{5}{8}$ | _____ | .625 |
| $\frac{9}{64}$ | _____ | .1406 | $\frac{41}{64}$ | _____ | .6406 | |
| | $\frac{5}{32}$ | _____ | .1562 | $\frac{21}{32}$ | _____ | .6562 |
| $\frac{11}{64}$ | _____ | .1718 | $\frac{43}{64}$ | _____ | .6718 | |
| | $\frac{3}{16}$ | _____ | .1875 | $\frac{11}{16}$ | _____ | .6875 |
| $\frac{13}{64}$ | _____ | .2031 | $\frac{45}{64}$ | _____ | .7031 | |
| | $\frac{7}{32}$ | _____ | .2187 | $\frac{23}{32}$ | _____ | .7187 |
| $\frac{15}{64}$ | _____ | .2343 | $\frac{47}{64}$ | _____ | .7343 | |
| | $\frac{1}{4}$ | _____ | .250 | $\frac{3}{4}$ | _____ | .750 |
| $\frac{17}{64}$ | _____ | .2656 | $\frac{49}{64}$ | _____ | .7656 | |
| | $\frac{9}{32}$ | _____ | .2812 | $\frac{25}{32}$ | _____ | .7812 |
| $\frac{19}{64}$ | _____ | .2968 | $\frac{51}{64}$ | _____ | .7968 | |
| | $\frac{5}{16}$ | _____ | .3125 | $\frac{13}{16}$ | _____ | .8125 |
| $\frac{21}{64}$ | _____ | .3281 | $\frac{53}{64}$ | _____ | .8281 | |
| | $\frac{11}{32}$ | _____ | .3437 | $\frac{27}{32}$ | _____ | .8437 |
| $\frac{23}{64}$ | _____ | .3593 | $\frac{55}{64}$ | _____ | .8593 | |
| | $\frac{3}{8}$ | _____ | .375 | $\frac{7}{8}$ | _____ | .875 |
| $\frac{25}{64}$ | _____ | .3906 | $\frac{57}{64}$ | _____ | .8906 | |
| | $\frac{13}{32}$ | _____ | .4062 | $\frac{29}{32}$ | _____ | .9062 |
| $\frac{27}{64}$ | _____ | .4218 | $\frac{59}{64}$ | _____ | .9218 | |
| | $\frac{7}{16}$ | _____ | .4375 | $\frac{15}{16}$ | _____ | .9375 |
| $\frac{29}{64}$ | _____ | .4531 | $\frac{61}{64}$ | _____ | .9531 | |
| | $\frac{15}{32}$ | _____ | .4687 | $\frac{31}{32}$ | _____ | .9687 |
| $\frac{31}{64}$ | _____ | .4843 | $\frac{63}{64}$ | _____ | .9843 | |
| | $\frac{1}{2}$ | _____ | .500 | 1 | _____ | 1.000 |

METRIC CONVERSION CHART

| | | |
|-------|---|----------|
| 0.1mm | = | 0.00394" |
| 0.2mm | = | 0.00787" |
| 0.3mm | = | 0.01181" |
| 0.4mm | = | 0.01575" |
| 0.5mm | = | 0.01969" |
| 0.6mm | = | 0.02362" |
| 0.7mm | = | 0.02756" |
| 0.8mm | = | 0.03150" |
| 0.9mm | = | 0.03543" |
| 1mm | = | 0.03937" |
| 2mm | = | 0.07874" |
| 3mm | = | 0.11811" |
| 4mm | = | 0.15748" |
| 5mm | = | 0.19685" |
| 6mm | = | 0.23622" |
| 7mm | = | 0.27559" |
| 8mm | = | 0.31496" |
| 9mm | = | 0.35433" |
| 10mm | = | 0.39370" |
| 20mm | = | 0.78740" |
| 30mm | = | 1.18110" |
| 40mm | = | 1.57480" |
| 50mm | = | 1.96850" |
| 60mm | = | 2.36220" |
| 70mm | = | 2.75590" |
| 80mm | = | 3.14960" |
| 90mm | = | 3.54330" |
| 100mm | = | 3.93700" |

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