

MATERIALS

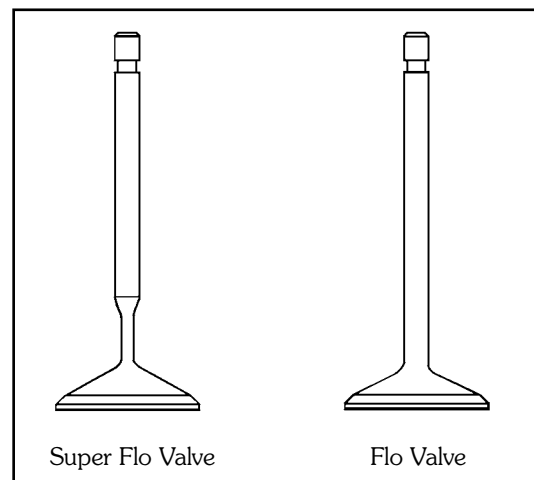
Proper material choice for the application is crucial to the valve performance and reliability. The extreme change of temperature to a valve in the combustion chamber area (in excess of 1600° F) and in the intake manifold area (up to -25° F), can cause “thermal fatigue”. The material’s ability to resist these drastic thermal variations is crucial to the valve life. This is why **Ferrea** is constantly testing and evaluating new materials and processes to provide the highest level of “fatigue resistance” in the industry. Here is the growing list of materials that we use in the production of our valves:

X3	Steel Alloy (Chromium/Silicon)	Intake Valves
Y6	Steel Alloy (Chromium/Silicon)	Heavy Duty Intake Valves
EV8	Stainless Steel (Chromium/Nickel)	Racing Intake & Exhaust Valves
EV8-Z18	Stainless Steel (Chromium/Nickel) + Tungsten	Racing Intake & Exhaust Valves
EV4-N12	Stainless Steel Hi-Temp	Turbo Intake & Exhaust Valves
VV54/EV16	Stainless Steel Hi-Temp	Racing Exhaust Valves
VV54/Nb/W	(Nickel Base + Niobium + Tungsten)	Racing Exhaust Valves
VV50	Stainless Steel Hi-Temp	Racing Exhaust Valves
IN-751	Inconel Alloy 1.800 °F	Turbo Intake & Exhaust Valves
NICKELVAC N80A	Super Alloy (Nickel Base) 1.850 °F	Racing Exhaust Valves
NIMONIC 90	Super Alloy (Nickel Base) 2.000 °F	Turbo Exhaust Valves
NICKELVAC 600	Super Alloy (Nickel/Chromium) 2.200 °F	Racing Exhaust Valves
NICKELVAC 800	Super Alloy (Nickel/Chromium) 2.400 °F	Racing Exhaust Valves (Funny Car/Top Fuel)
NIMONIC 263	Super Alloy (Nickel Base) 2600 °F	Turbo & Nitro Exhaust Valves
WASPALLOY	Super Alloy (Nickel Base) 2700 °F	Turbo & Nitro Exhaust Valves
ASTELLOY 75	Super Alloy (Nickel Base)	Turbo Exhaust Valves
PYROMET	Super Alloy (Nickel Base)	Turbo Exhaust Valves
PYROMET 31 V	Super Alloy (Nickel Base)	Turbo & Nitro Exhaust Valves
PYROMET CTX-909	Super Alloy (High Nickel-Low Expansion)	Heavy Duty Turbo Applications
PYROMET A286	Super Alloy (High Nickel)	Turbo Application - Sport Compact
NCF 3015	Super Alloy (Nickel+Chromium+Titanium)	Turbo Racing Exhaust Valves
STELLITE	(Chromium/Tungstem)	Seat & Tips Applications

SUPER FLO vs. FLO

This illustration shows our **Super-Flo** valves (often referred to as under-cut and/or neck down), that actually reduces the stem diameter in the port area. This increases flow over “straight” stem diameter (**Flo** valves) considerably without adverse effect on reliability.

To properly establish the amount of reduction in the stem, several factors have to be considered, such as: original stem diameter, valve head thickness and diameter, valve material, engine application, etc. There is also extensive testing conducted to reach the more efficient combination.



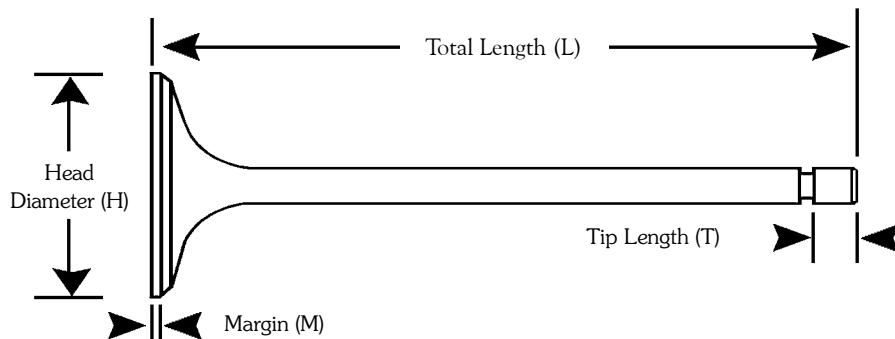
VALVE LENGTH CALCULATIONS

Valve lengths are calculated as overall length measurement. This is the length of the valve from the stem-end tip of the valve to the combustion chamber face. Many of the Cylinder Head Manufacturers use a system that calls for valves to be +100, +250, etc. This is an additional length added to a stock valve for that application. This can sometimes create confusion, since some stock lengths have changed over the years due to slight OEM changes. For the purposes of the Ferrea Racing Components catalog the following will be used as stock lengths for the most popular applications. Understand that as components manufactured for the Racing Industry, many times margins and other measurements will differ from stock, to create better flow characteristics, and to improve durability. As an engine builder or cylinder head assembler, it is your obligation to check this with your setup for that particular cylinder head and assure that proper geometry is obtained.

Many factors such as rocker arm choice and setup, seat machining and valve spring install height may create the need for a valve of different length than specified by either Ferrea Racing Components, or the cylinder head manufacturer.

Example

Engine	Intake Length	Exhaust Length
Small Block Chevrolet	4.910	4.910
Big Block Chevrolet	5.221	5.350
Chrysler	4.875	4.910
Ford 351C – 429 – 460	5.250	5.060
Ford 351W	5.030	5.030



PRODUCTION

One-Piece-Forged Valves

The manufacturing process of our one-piece forged valve begins as a simple steel rod which is formed under a **slow two-step electrical upsetting**; this ensures proper grain flow at critical temperatures. The formed upset ball is then placed into the die where the forging of the head takes place. The forged piece is then **CNC machined** entirely to eliminate any imperfections from the forging process.

Next, depending on the properties of the alloys and the specific application (intake or exhaust) the valve will undergo various stages of **heat treatments** and **stress relieving** to ensure proper molecular integrity and uniform grain structure throughout the entire piece.

After heat treatment, we use state-of-the-art **centerless grinding** machines in order to hold strict stem diameter tolerances. We then perform multiple **CNC machining** operations to the entire valve for consistent quality.

Next, we apply **hard chrome plating** to the valve stem to reduce guide wear and provide optimum antifriction performance. Finally, depending on which Ferrea Valve Series it is, the valve will either receive a personal touch of **micro-mirror polish, swirl polish, or CNC machine** finish.

During our final inspection **ultrasonic tests** and **x-rays** are performed, piece by piece, in order to give each part a certified quality assurance.

Bimetallic Forged Valves

Ferrea Bimetallic Valves offer advanced design solutions for those extreme valve train applications, which need to meet certain high **heat engine requirements, ultimate tensile strengths**, reduce **valve stem flex**, and also feature **induction hardened** grooves and valve stem tips providing additional fatigue strength through the keeper groove area.

The manufacturing process of our bimetallic forged valve utilizes an inertia-welded design. Two steel rods of different valve alloy materials are precisely fused together using state-of-the-art equipment that applies **inertia** and a **force** to weld the two pieces into **one solid component rod**. The stem weld length is critical such that its location remains inside the valve guide area at maximum valve lifts.

It is the only approved method for Aerospace valve applications.

Next, the complete steel rod is taken through the same upsetting and forging processes as our one-piece forged valve. Depending on the properties of the alloys and the specific application (intake or exhaust) the valve will undergo various stages of **stress relieving**, to ensure proper molecular integrity throughout the entire piece. After forging and stress relieving, the valves are finished in the same manner as our one piece forged valves.

Hard Chrome Plate

Ferrea utilizes **Hard Chrome Plate** on all high performance valves to provide the valve stem with a **low coefficient of friction** and a **hard wear-resistant** surface. Hard chrome offers the best choice for **extreme engine applications** by allowing **higher lubricity** properties and **maximum heat transfer** from the valve stem to the valve guide contact area. Widely used by racing industry manufacturers worldwide, Ferrea prides itself in providing continuous high quality consistency of hard chrome thicknesses for more the 30 years. Ferrea offers engine builders the quality they have become accustomed to by continuously improving manufacturing techniques such as investing in **automated equipment** and practicing **clean environmental solutions** for future generations.



Valve Forging Process

VALVES TECH

GENERAL GUIDELINE FOR FERREA VALVES APPLICATION

TITANIUM VALVES:

These valves are used in professionally built high rpm (above 8000) roller or flat tappet racing engines. Applications include Drag Racing, NASCAR, Oval & Sprint Car, Road Racing, and Motorcycle.

SUPER ALLOY:

Special extreme duty Hi-Temperature Exhaust Valves. For use in Top/Fuel, Funny/Car, Supercharged, Nitrous, NASCAR, Sport Compact, Off-Shore Marine, 9.0 to 1 compression restricted carburetor motors (extreme exhaust temperature present).

HOLLOW STEM and HOLLOW STEM SODIUM-FILL VALVES:

The latest addition to the Ferrea Series. These **Hollow Stem Lightweight Valves** are manufactured with a unique process that gun drill and micro polish the hollow stem. For the **Sodium-Fill Valves** we add a specially formulated sodium into the hollow stem. The use of these valves achieves a weight reduction (20 % compared with a conventional stainless steel solid-stem valve) and a higher rpm's with the hollow stem valves and also a better heat dissipation with the sodium fill valves. Applications for Domestic, Sport Compact and Motorcycle markets.

COMPETITION PLUS:

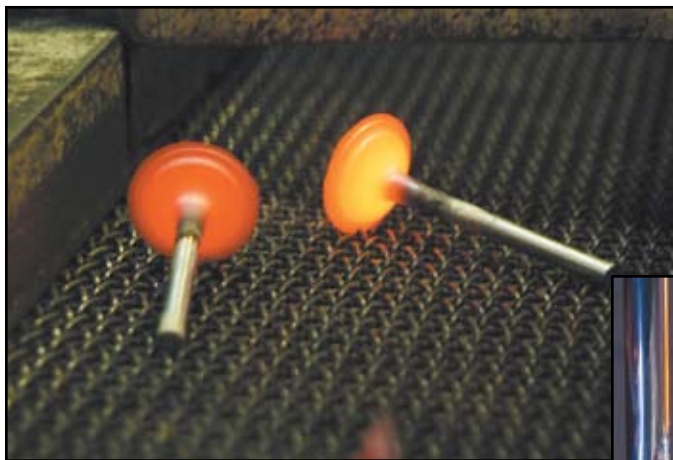
Extreme duty racing valves, engineered for high rpm, high horsepower racing engines. They have exclusive features, which makes them the best flowing valve on the market with unequalled performance and reliability. Drag Racing, NASCAR, Oval & Sprint Car, Road Racing, Sport Compact, Motorcycle and Off-Shore Marine.

6000 SERIES:

Competition valves with higher fatigue resistance and tensile strengths than our competitors' best offering. These valves are made to withstand high spring pressure, roller and flat tappet cams, Drag Racing, Oval Track, Road Racing and Sport Compact.

5000 SERIES:

Hi-Performance stainless steel one piece forged valves, fully machined, hard chrome, and hard tip. These valves are excellent for Hi-performance Street, mildly modified Drag Racing, and Oval Track applications.



Valves after the forging process.

Valves after completion of manufacturing process and ready for use.

