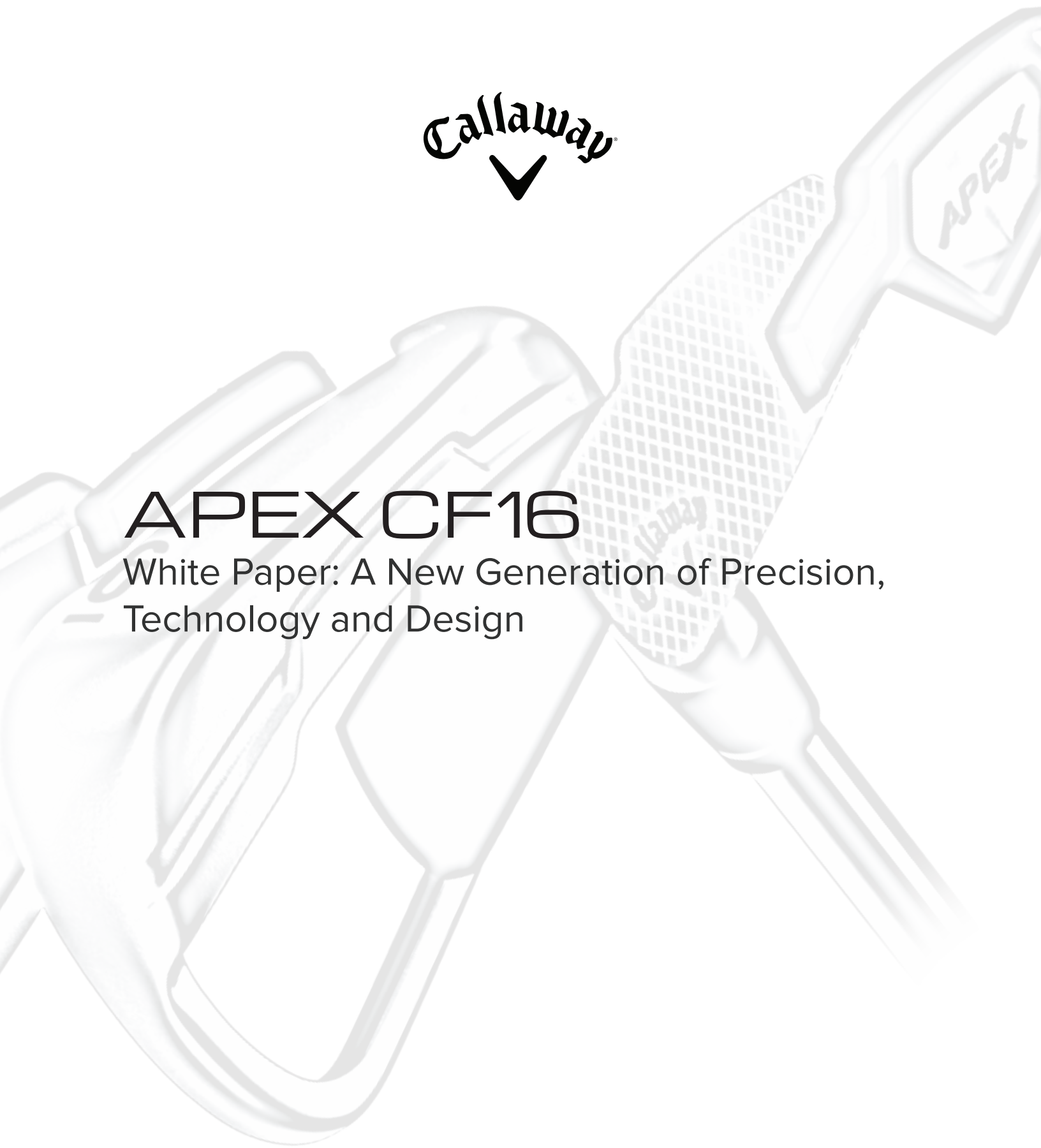




APEX CF16

White Paper: A New Generation of Precision,
Technology and Design



The Challenge:

Push the Limits of Forged Iron Design

The name “Apex” carries a legacy of uncompromising excellence in players irons. Our challenge is to create new products that not only live up to that legacy, but which move it forward. Developing effective performance technologies that don’t adversely affect the look, feel and workability expected of a forged iron is a tremendous challenge. It requires new ideas, new designs, new ways to produce parts and new ways to assemble those parts in order to create a distinctive, beautiful, high-functioning whole. This paper details the key technologies that we’ve incorporated into Apex to move players irons to a new level of sophistication and excellence for a wider audience of avid golfers.

Face Cup Technology in a Forged Iron

Players irons typically offer little in the way of performance-enhancing technologies, beyond a shallow cavity to increase MOI and possibly a vibration control feature. Our new Apex CF 16 breaks new ground by being our first forged iron to incorporate our industry leading Face Cup technology, an accomplishment many thought was impossible. To create the raised edge that runs around the face’s perimeter, which gives the face its cuplike structure, the face has to be created separately from the head, and then the two parts are welded together. At impact, the edges of the face act like a hinge, allowing the face to flex. To make that hinging action work, extremely subtle yet precise variations in widths have to be in place in order for the face to flex enough to make a difference, to make it flex uniformly to distribute the added speed evenly across the face, while still giving it the strength necessary to resist bending and breaking.

We also designed a forged head structure that could support and manage the impact stresses unique to a Face Cup. Specifically, the forged hosel and rear cavity support the face in a way that allows us to get the maximum ball speed enhancing benefit from the Face Cup without sacrificing feel or durability.

Developing Apex CF 16 irons required months of modeling, testing and, sometimes, failing, until we arrived at the right combination of dimensions and geometry for the face and head, and a process for forging them. Over 20 prototypes were bent, cracked and scrapped in the process. The big win came when we figured out how to make strategic areas of the face and body thinner than we ever have before, allowing for a higher level of precision in both parts that promotes great speed, feel and consistency. It was critical that our new Face Cup construction succeed at distributing added ball speed across a wide portion of the face. Too often, methods for increasing face flex in an iron result in isolated points of speed, usually high on the face. Not this time.

Laser Welding for Strength and Precision

We had to find a more effective and efficient way of joining the head and body together that would eliminate excess bulk and weight while still assuring a secure bond. For the first time, we employed a semi-automated welding process that makes use of a laser to heat the metal and which produces a minimal weld bead so precise and small that the eye can barely detect it, yet the strength fully meets the requirements necessary to keep the two pieces securely together, effectively allowing them behave as one piece. Laser welding is only possible if the two pieces being joined are made with a level of extreme precision not usually seen in golf club manufacturing. We're talking thousandths and tens of thousandths of an inch, similar to aerospace and military grade tolerances.

360° Face Cup construction is incorporated into the long and middle irons (3 through 7) to generate increased speed and distance where golfers need it most. The short irons 8 through AW feature a uniquely designed face that promotes spin control and distance control with enhanced feel. The long irons have COR readings of .820, versus .800 of the Apex '14 line (a typical iron is in the range of .770-.775 COR). That easily makes Apex CF 16 the longest forged irons Callaway has ever created, giving golfers the feel and control they expect from a forged iron, along with a higher degree of speed, power and distance.

Quadruple Net Forging

When forging a club head or club head component, additional milling and grinding has to be performed following the forging process to bring the part into its finished form. For Apex CF 16, we developed a new process called Quadruple Net Forging, which consists of four stages, each step refining the club towards its finished shape. This results in greater consistency from part-to-part and iron-to-iron.

Progressive Offset & CG Location to Optimize Launch

Offset in the Apex CF 16 set is progressive, starting with a minimal amount in wedges and gradually increasing in each club all the way up to the 3 iron. That gives the golfer the most offset in the longer irons, where they need it most, to help them square the face to the ball at impact for straighter flight. Center of Gravity (CG) location also moves progressively through the set, moving from low in the long irons and mid irons, where golfers need it to promote a high, long-carrying and fast-stopping flight; to higher in the short irons, to prevent ballooning and instead keep shots on a lower, highly controllable trajectory. The combination of these two design choices delivers a players iron that is workable yet forgiving enough for a higher handicapper.

In Search Of Apex

Many told us not to stray too far from the current Apex design, due to its popularity and performance. But that wouldn't match the Apex design ethos. By incorporating advanced technologies such as a 360° Face Cup, progressive offset and CG into a manufacturing process with the exacting standards of quadruple net forging and laser welding, we've pushed players irons forward without compromising the heritage of the name Apex.