



POWERSKIN CARBON-ULTRA



**THE POWER IS
ON THE INSIDE**

In four short years, global water instinct brand arena has built a growing and lasting legacy with its groundbreaking family of Powerskin Carbon racing suits.

Now in 2016, the company has once again thrown down the gauntlet in an important year with a new product that takes swimsuit technology to yet another level – the POWERSKIN CARBON-ULTRA.





In 2012 the Powerskin Carbon-Pro revolutionized the design and manufacture of racing swimwear by integrating a carbon fibre cage into the suit's woven fabric, adding a whole new dimension to the concept of compression by maximizing support and control **when and where it's needed**. This concept of **Intelligent Compression** was the bedrock on which the new Powerskin Carbon series was built, and subsequent releases retained it as a fundamental feature, adapting the technology to the needs of every swimmer with the Carbon-Flex (2014), and the fabric and carbon configuration in the case of the Carbon-Air (2015).

Following unparalleled success of the carbon suits at swimming's biggest competitions, arena's R&D team – along with its international scientific network – decided it was time to pursue another quantum leap in swimsuit design. To do so they turned their attention from external to internal considerations, to the core of carbon technology, analyzing how the makeup of the inner components of the suit could maximize the effectiveness of the swimmer's actions in the water, over and above the existing benefits of Intelligent Compression.

The result of these efforts is the Powerskin Carbon-Ultra, which incorporates a new level of support and movement management with an internal structure – the **ULTRA-LINK SYSTEM** – designed to optimise the athlete's physiology. By connecting key muscle groups and isolating upper and lower body movements, this revolutionary system increases the swimmer's efficiency and improves their body position in the water. And by targeting specific compression zones, it further supports and streamlines the body to reduce turbulence and drag.

In addition, the suit's outer shell integrates an **ULTRA-CAGE** with three times more carbon than before, enhancing the range's trademark intelligent compression without compromising reach and freedom of movement.

ULTRA-LINK SYSTEM

The Ultra-Link System is housed in the inner layer of the suit, and effectively operates as its “engine room”. Its primary benefits are delivered by three essential features: the Infinity-Loop, the X-Pivot, and Ultra-Compression Panels.



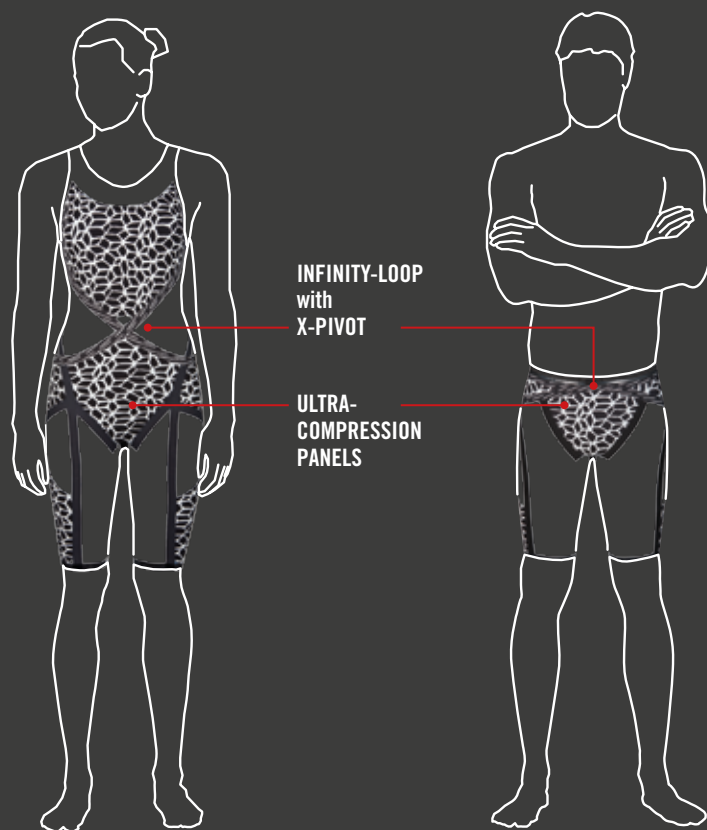
The **Infinity-Loop** design is based on a deep knowledge of the key muscle chains that help in keeping a streamlined body position.

It employs a continuous tape that:

- anchors on the muscle chain in the upper body for extra support
- links the ribs to the hips while still allowing freedom to rotate, and
- connects to the *gluteus maximus*, keeping the hips high and helping to reduce body tilt in the water.

Together these features provide for the perfect distribution of tension, and enable them to maintain an optimal body position in the water, thereby increasing stroke efficiency.

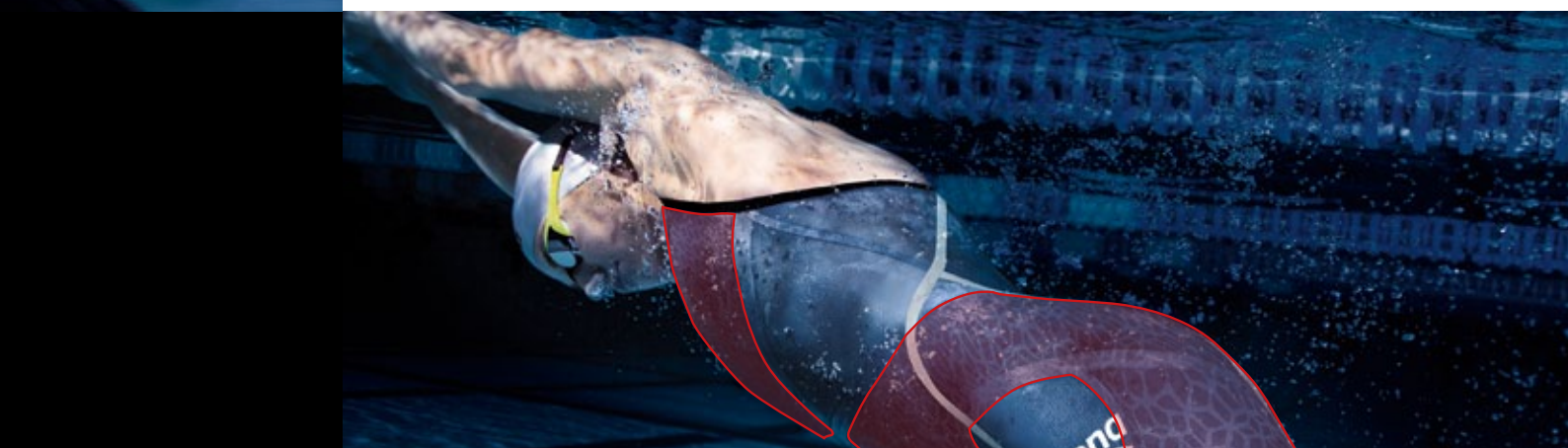
INNER CONSTRUCTION





The **X-Pivot** feature delivers intelligent compression and anatomical support without limiting freedom of movement. Its design draws on a fundamental grasp of body mechanics to isolate movement in the upper and lower body – strategically-placed tapes create a brace which keeps the lower body and core muscles firm and supported while still allowing the upper body to rotate freely.

This movement isolation increases athlete efficiency by allowing them to pivot mid-stroke with minimal additional rotation or loss of body position in the water. As a result, the core body position remains stable even as the upper body rotates and flexes during the stroke.



Ultra-Compression Panels are designed to work with the external Ultra-Cage fabric to deliver targeted areas of additional compression on the inside of the suit, supporting key muscles and aligning them with the direction of movement.

The multi-layer panels also streamline body shape, keeping it stable and high in the water, which in turn reduces drag and minimizes water resistance, particularly in areas normally prone to turbulence. These factors all contribute to maximizing the swimmer's efficiency.





ULTRA-CAGE

The Carbon-Ultra uses a new outer shell fabric, which delivers intelligent compression of the body, the hallmark of the carbon family of suits.



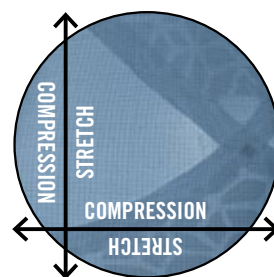
EXTERNAL SHELL FABRIC



The Carbon-Ultra uses a new outer shell fabric, which delivers intelligent compression of the body, the hallmark of the carbon family of suits.

Containing three times more carbon than before, the fabric is woven more tightly, which means it is able to more accurately conform to the athlete's shape, distributing pressure uniformly to streamline the body. Intelligent compression is enabled by the anisotropic stretch of the fabric, which allows differential stretch in the horizontal and vertical directions, resulting in effective compressing of the body without restricting reach and freedom of movement.

When these technological design features are combined, the benefits for the swimmer are profound – they are able to channel their energy more efficiently by reducing any nonessential effort and movement. Simply stated: greater output (performance) for each unit of input (energy).

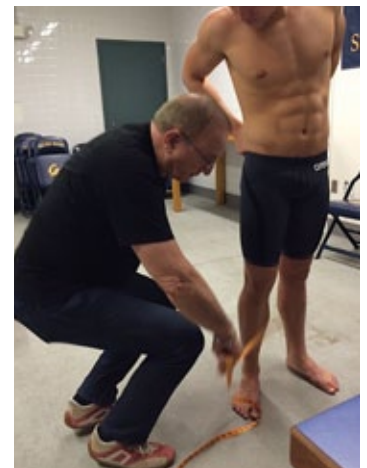
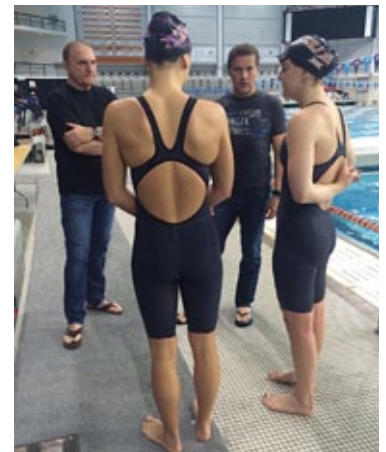


**ANISOTROPIC
STRETCH**

TESTING

The Carbon-Ultra underwent several rounds of testing from leading European and US swimmers. Among them were Swedish and Dutch federation swimmers – including Olympic champion Ranomi Kromowidjojo and world champion Sarah Sjöström – and a number of top US college swim teams.

Feedback was unilaterally positive, with enthusiastic comments on numerous aspects of the suit, including: compression level, comfort, body position (legs high in the water), kicks and turns.





ARENA SCIENTIFIC NETWORK

For many years, arena's R&D department has been working closely with a scientific network of international experts in their respective fields.

These include:



INNOVIA TECHNOLOGY

Established in 1999 and based in Cambridge, England, Innovia Technology works at the front end of innovation, integrating the best thinking in technology, design, consumer insight and manufacturing to create exciting new concepts that can be brought to market efficiently.

The company first started working with arena in 2008 on the Powerskin X-Glide, and have been integrally involved in the development of the carbon range of racing suits.

Innovia Technology

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KINETECH LABS

A division of Tessitura Taiana, Kinotech Labs produces high-performance technical fabrics that help the human body perform at its best when engaged in high-level sports activities. The Lab's modus operandi is based on a culture of research, constant experimentation, and above all, physical tests to offer athletes a tool that can optimize sporting performance.

Lab chief Matteo Taiana has personally been working with arena for over nine years, collaborating on numerous generations of the Powerskin family, including on the carbon range since the outset.

Kinotech Labs

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ALMA MATER STUDIORUM
UNIVERSITA DI BOLOGNA

UNIVERSITY OF BOLOGNA FACULTY OF EXERCISE AND SPORT SCIENCES

Professor Giorgio Gatta first started collaborating with arena after the Beijing Olympics, working primarily on the effects of water resistance and the drag that a swimmer experiences in the water.

Using the impressive facilities at Bologna's extensive Record Sports Centre, special software analyzes films of swimmers in motion in order to determine the effect of drag on body position, while muscular effects are assessed through the measurement of electric currents from active muscles, lactic acid production, and oxygen consumption.

In this way the performance levels of different swimsuits can be compared, and the effects of Arena's technological developments determined.

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UNIVERSITÉ
DE REIMS
CHAMPAGNE-ARDENNE

UNIVERSITY OF REIMS CHAMPAGNE-ARDENNE

Biomechanics Professor Redha Taiar first started working with arena and textile maestro Michel Joseph in 1994, at a time when the company was sponsoring legendary Russian swimmer Alexander Popov.

Now in its 22nd year, Professor Taiar's continuing work with arena has travelled the full gamut of swimsuit technology developments over that period, and there is arguably no-one outside the company that knows its technology and products as well as he does.

Professor Taiar's most focused work takes place at the Berlin High Performance Olympic Centre's Flume, a specially constructed facility that directs water through a narrow channel. Here data taken from athletes swimming in the Flume is analyzed and interpreted, providing important information on the influence that different swimsuits have on key data such as body position, stability, and drag.

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THE INNER STRENGTH OF A CHAMPION



Just as The Power is on the Inside of a Powerskin Carbon-Ultra suit, so too it takes an inner strength to make a champion.

It's a strength that goes beyond the hours of training and skill development and sacrifice that are a fundamental prerequisite to make it to the top.

This inner strength is something of an intangible, something that a champion may be born with, or perhaps develop from their life experiences as they grow and mature.

But there's one thing certain – it's the quality that stands them apart, it's the substance that makes them a champion.

arena asked a number of champions from their Elite Team to try and capture in words the essence of this inner strength, along with someone else close enough to them to describe it from the outside.

Those that have had the opportunity to try out the new Carbon-Ultra were also asked to describe the experience.



JAMES MAGNUSSEN

Australia, 24

Double World Champion: 100m freestyle (2011, 2013)

My inner strength:

I believe I have a very strong will to set myself big challenges and goals and then each day work hard to achieve them – this is the source of much of my power in and out of the pool. In the good times and also the challenging times, this is what I draw upon from inside of myself to keep always moving forward, striving for my very best.

My inner strength in action:

Coming into the 2013 FINA World Championships in Barcelona I felt quite a bit of pressure to defend my 2011 title. We had a disappointing relay performance at the start of the meet and it would have been easy for doubts to come into my mind and performance. Instead of allowing this to happen I looked inside of myself, to my will and determination. The final was a tough race against outstanding competitors but I was able to prevail and achieve a significant career goal of mine for back to back 100 freestyle world titles.

Carbon-Ultra:

I have tried the Carbon Ultra and it is a fantastic looking and feeling suit. The construction and feel of this suit is one of absolutely stability, stability on my body and stability in the water. For me as a sprint freestyler this is such an important feeling and concept.



JOHN NOVAK (James' Long-Time Mind Coach)

James' inner strength:

Great athletes need specific qualities to consistently do what they do at a world class level. James epitomizes these qualities, namely: will power, inner resolve, deep self-belief, a determined and systematic mind game, a positive ethos, and an ability to look broadly and deeply into macro & micro issues that may at first glance appear negative. Most importantly he is a master of bouncing back! His resilience equips him to weather any storm and respond with zeal & inimitable passion.

James' inner strength in action:

Firstly, winning back-to-back World Championships in 2013 despite enduring countless challenges after returning from the 2012 London Olympics. Secondly, in 2014 swimming more sub-48sec 100's consistently than anyone in the history of the sport. Both examples epitomize James' deep belief, trust and faith in his limitless capacity.



ADAM PEATY

Great Britain, 21

Double World Champion: 50m & 100m breaststroke (2015)

Current LC World Records: 50m & 100m breaststroke (2015)

My inner strength:

In my training I can always find a way to push through no matter what has happened the day or week before. I love getting into a hard set and digging deep as I know it'll give me the best possible chance when I race the best in the world. I suppose my best inner strength is determination and graft. This gives me the best confidence behind the blocks when I race.

My inner strength in action:

I remember in Kazan, I was behind by quite a bit at the first 50 and remember doing all I could to get the meters back one stroke at a time and there was a part where I was really struggling to claw it back but I remembered how much it hurt in training and how many times I didn't give in and I think it helped me become the athlete that won that race.



Carbon-Ultra:

I really like the double carbon cage with the additional compression that it offers.

MELANIE MARSHALL (Adam's Coach)

Adam's inner strength:

Adam has an amazing ability to push himself beyond the normal parameters.

His workload capacities are huge and I have never seen anyone be able to do the work he can.

Adam's inner strength in action:

When we did a charity bike ride in Africa together, Adam was just 17 and he completed a cycle that was 500km in 4 days, and we cycled in 40-degree heat some days.

Adam was not on a road bike but on a mountain bike making the challenge more difficult.



RŪTA MEILUTYTĖ

Lithuania, 18

Olympic Champion: 100m breaststroke (2012)

World Champion: 100m breaststroke (2013)

Current LC World Records: 50m & 100m breaststroke (2013)

My inner strength:

For me I think the inner strength that can help you be your best is confidence that comes with all the hard work and long hours in the pool and in the gym.

If I am able to set my mind to overcome challenges and push to the limits in training then that confidence will help me to perform my best. That's why the strength on the inside is crucial.

My inner strength in action:

Once I had really bad flu and fever during a competition. I just managed to make the final, but I decided to race and give it my best.

I just had one goal, to get to the wall first, no matter what it takes. I won the race with one of my best times ever.

Carbon-Ultra:

I feel great in the suit. My movement isn't restricted at all and at the same time there's compression and stability in the places where it matters the most.

And on top of it all, the suit looks outstanding.



JON RUDD (Rūta's Coach)

Rūta's inner strength:

Rūta's primary physical strength comes from overcoming adversity. Her life has never been a simple or an easy one, and to achieve all that she has shows an inner resilience that cannot be learnt and only comes through life experience and overcoming challenges along the way.

Rūta's inner strength in action:

No more so than in London for the Olympic Games; 15 years of age, fastest into the semi-finals, fastest into the final and then the starting system failed. The finalists had to wait 3-4 minutes before it was fixed and I think it freaked a lot of them out. Not Rūta. She was ice cold, from the inside out.



SARAH SJÖSTRÖM

Sweden, 22

Four-time World Champion: 50m butterfly (2015), 100m butterfly (2009, 2013, 2015)

Current LC World Records: 50m butterfly (2014), 100m butterfly (2015)

My inner strength:

When I win I just want to win even more. When I lose I get even more motivated to train harder, so what I'm trying to say is that adversity isn't always a bad thing.

My inner strength in action:

When I won the gold in Barcelona in 2013 in the 100m butterfly, I had come from a time of struggle.

I had finished in fourth place over and over again but was able to dig deep from within myself.

Carbon-Ultra:

The key strength of the new Carbon-Ultra suit is that I feel I have greater movement in the water.



JENNY SJÖSTRÖM (Sarah's mother)

Sarah's inner strength:

Sarah has always been very stubborn and has always wanted to do things herself.

To never give up despite adversity has always been one of Sarah's strengths.

Sarah's inner strength in action:

When she learned to ride a bicycle at 3-4 years old, she fell over and over again and just dusted herself off and got right back up on the bicycle until she could ride it without falling.

With some kids it's the opposite, they fall and they get sad when it hurts.

Sarah was never afraid of falling, she always said: "There is always band-aid".

She was born with some kind of winner instinct that pushed her to always win, and if she didn't win she would do it over and over again until she won.



CHAD LE CLOS

South Africa, 23

Olympic Champion: 200m butterfly (2012)

Three-time World Champion: 100m butterfly (2013, 2015), 200m butterfly (2013)

My inner strength:

My inner strength comes from my competitive nature, love of racing and will to win. From a young age, I think that marked me out as different from other swimmers, even in my very first swimming galas at school, and it has got me to where I am today.

I have to remember every day in training that my competitors are out there, training for the same thing that I want, so I have to push myself harder and be better. Before I dive into the pool, my competitors are my final thought and I race to win.

My inner strength in action:

My coach Graham and I always thought that I could win the 200m butterfly Gold at the London 2012 Olympics, I had trained and prepared just right, but no-one else would have believed us. When I lined up for that final, I had that self-belief, that inner confidence that I could beat everyone else in the field. Coming down that final 50m was almost in slow motion and like a dream, but I knew in my heart that I could win and that drove me forward to touch first.

Carbon-Ultra:

arena is always at the cutting edge of technology in suits and they design based on our feedback as swimmers, so I'm excited that their new suit has made more progress again.

This will be the biggest year of my career to date and knowing that I'm wearing the fastest suit gives me confidence that I can be at my best. The racing this year will be tough but it feels great to have the best swimwear manufacturer behind me.



BERT LE CLOS (Chad's Father)

Chad's inner strength:

I always say that my boy is a lion; he has the heart of a lion and that is what he uses when he swims – his heart. Coming from South Africa, we don't have the facilities or the technology to create a great sportsman – we've got the attitude, the desire and the heart.

To be a true and humble champion you need to have heart, and Chad has that.

Chad's inner strength in action:

As a family, we haven't always had it easy and we've had challenges to overcome, such as when my wife Geraldine had breast cancer back in 2010. We take strength from our family – I know that when Chad races he does it as much for us as he does for himself, and I am so proud of him for that.



RANOMI KROMOWIDJOJO

Netherlands, 25

Three-time Olympic Champion: 50m & 100m freestyle (2012), 4x100m freestyle (2008)

Three-time World Champion: 50m freestyle (2013), 4x100m freestyle (2009, 2011)

My inner strength:

My inner peace. I always trust my inner peace, I know I can stay calm in crises and that gives me a lot of confidence.

My inner strength in action:

When other people have doubts about my swimming performances, I always stay focused and trust my inner peace.

Carbon-Ultra:

Ultra compression in combination with flexibility.



OMA PIA (Ranomi's Grandmother)

Ranomi's inner strength:

Her determination to succeed.

Ranomi's inner strength in action:

Having overcome meningitis in 2010, Ranomi went on to have a very successful European Short Course Championships off limited preparation.

Her determination to perform well and win during these Championships was extraordinary.





THE CARBON CONCEPT

In 2012, arena introduced a new term into the realm of contemporary swimming – **Intelligent Compression**. Using the company's breakthrough technology, not only is compression of the swimmer's muscles optimized, it kicks in **when and where it is needed**.

The secret behind this revolutionary concept is **carbon fibre**, with its intrinsic strength and stiffness, and highly favourable strength-to-weight ratio. By incorporating a carbon fibre cage into the weave of the swimsuit, the fibres lock down like a seatbelt as critical stretch levels kick in, giving maximum compression on over-extended zones, increasing support and control when and where it's needed. At the same time, the stretch fabric retains its elasticity, remaining comfortable without affecting freedom of movement. For the swimmer, the result is a reduction in drag, improved efficiency, and an increase in power at the very moment they are drawing on the extreme reserves of their body's energy.

Moreover, the strength of the carbon fibers also improves the suit's surface integrity, which means there is less chance of tearing or damage that can result from extreme stretching when putting the suit on.

Intelligent Compression was a watershed in racing swimwear technology, and marked the birth of a legacy. In four short years, arena's Powerskin carbon series of racing swimsuits has grown to include five leading-edge options: Carbon-Pro, Carbon-Flex, Carbon-Flex WCE, Carbon-Air, and now in 2016, the Carbon-Ultra.





(2012) | POWERSKIN CARBON-PRO



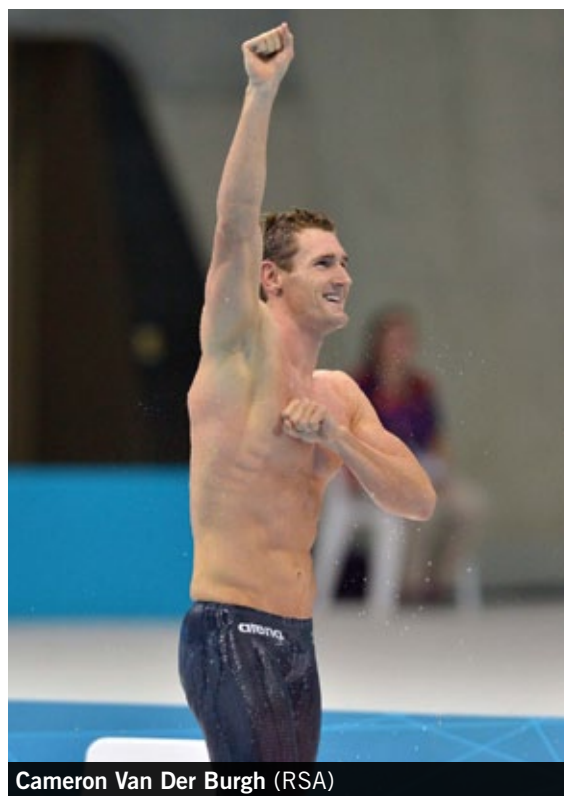
Launched in 2012, the arena Powerskin Carbon-Pro was the first swimsuit to integrate the carbon cage into the weave of its lightweight elastane-nylon fabric.

In doing so, it became the first racing suit to truly address the traditional trade-off between compression and freedom of movement, delivering power and comfort simultaneously, without compromising either. Compression without constriction is the result, giving the swimmer both support and control, reducing muscle stress during the race, and improving glide thanks to the lightweight fabric with its inherent durability and strength.

But the Carbon-Pro, however, is not only about carbon and compression. Its **Power Return System**, comprising strategically-placed low profile bonded seams and elasticized tapes, is designed to store potential energy which is released during dives, kicks and turns, thereby contributing to maximum efficiency, power, and speed.

The new suit made its first profound statement at the 2012 Olympics in London, where arena swimmers won 35 medals, including 10 golds with four world records.

A year later at the 2013 World Championships in Barcelona, arena athletes garnered more than half of all the swimming medals, including 23 golds with three new world records.

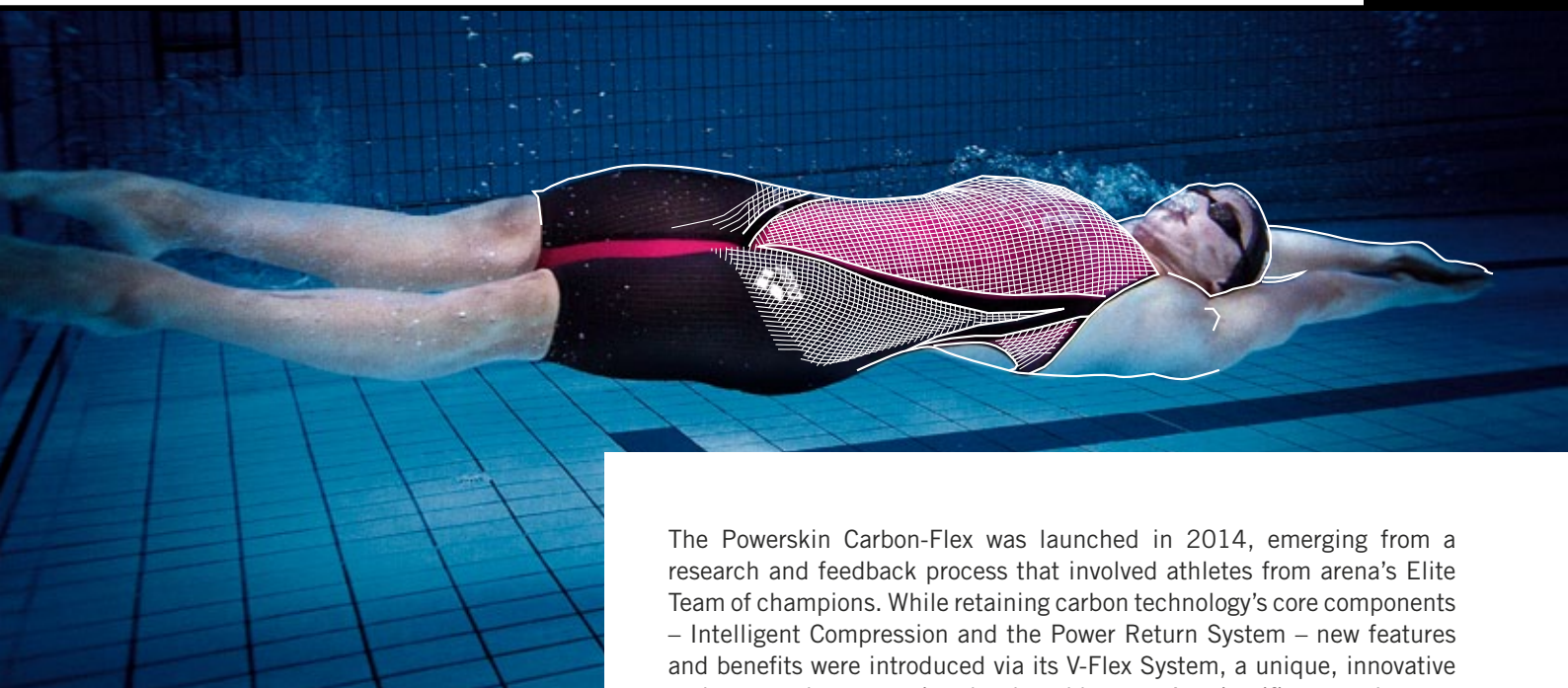


Cameron Van Der Burgh (RSA)





(2014) | POWERSKIN CARBON-FLEX



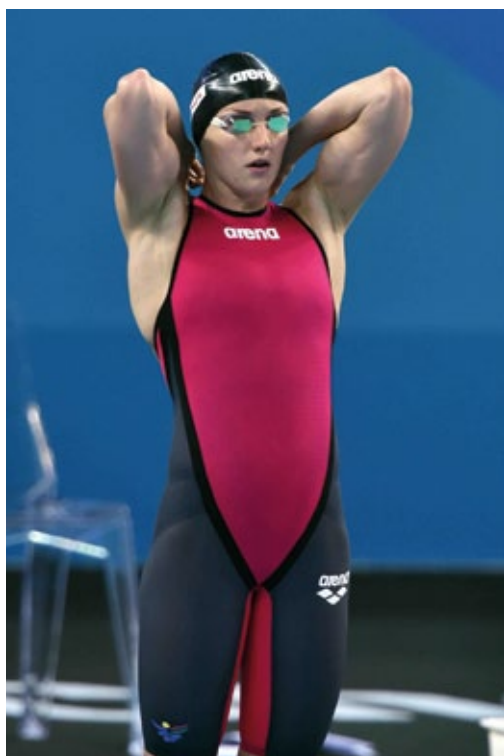
The Powerskin Carbon-Flex was launched in 2014, emerging from a research and feedback process that involved athletes from arena's Elite Team of champions. While retaining carbon technology's core components – Intelligent Compression and the Power Return System – new features and benefits were introduced via its V-Flex System, a unique, innovative and patented construction developed by arena's scientific network.

In the **V-Flex system**, seams were moved from the side of both men's and women's suits – on women's suits, the front seam runs from the crotch to under the arm, and the rear seam runs from the centre of the hamstring to under the arm; for men's jammers, the seams align with the quadriceps and the hamstrings. This strategic placement of seams creates tension lines that deliver three primary benefits:

- Greater hip flexion and complete freedom of movement around the hips, glutes, and shoulders, along with perfect fit and comfort;
- A lifting effect on the back of the legs, helping to keep the legs high in the water during freestyle, and keeping the knees from dropping during breaststroke and butterfly;
- Improved pushing off the wall.

In addition, the lengthening of the suit also provides greater body coverage, reinforcing the effects of Intelligent Compression.

The effectiveness of the Carbon-Flex was immediately translated into results, and at the 2014 World Short Course Championships in Doha, athletes wearing arena's carbon technology suits once again excelled, winning more than half of all medals, including 23 golds and 7 new world records.





(2015)

POWERSKIN CARBON-FLEX WORLD CHAMPIONSHIP EDITION



2015 saw the launch of the Carbon-Flex World Championship Edition, an exclusive production line created to showcase arena's carbon range against the backdrop of the World Championships in Kazan, Russia.

From a design perspective, the Carbon-Flex WCE incorporated updates to the blueprint of the original Carbon-Flex based on athlete feedback, with the aim of optimizing the suit's unique features, and ultimately its overall performance.

By moving the rear seam on women's suits to finish at a point along the front seam, tension is anchored at the centre of the back, creating a perfect link between the lower and upper halves of the suit.

This link provides the ideal torsional platform off which the swimmer can leverage their strokes and kicks.

Modifications to men's jammers followed the same construction concept, with the result that there are no taped seams along the waistline, thereby eliminating disturbances and stress points along the waist, and giving the suit exceptional fit and feel.

These changes will be incorporated permanently into the Carbon-Flex design in 2016, from which time the suit will be marketed as the Carbon-Flex VX.



Sarah Sjöström (SWE)





(2015) | POWERSKIN CARBON-AIR



Also launched in 2015, the Powerskin Carbon-Air was designed with a specific focus on offering the athlete unbeatable comfort: the suit's fabric is incredibly light – 30% lighter than that used in Carbon-Pro – making the swimmer feel as if they are wearing a second skin. From a performance standpoint, the integration of horizontal Carbon Bands – which lock down when a critical stretch point is reached – provide lateral support and control when and where it's needed. This lighter form of Comfortable Compression helps to improve swimmer performance without compromising the suit's unbeatable comfort.

In addition, *SmartStretch* shoulder straps in women's styles are made using carefully selected materials and a special manufacturing process to reduce tension on the shoulders, offering a unique form of “intelligent stretching”, and enhancing comfort. Finally, the smart simplicity of the design gives the suit a sleek construction, which allows the swimmer complete freedom of movement, and makes it exceptionally easy to put on. The result is a cutting edge racing suit that is unmatched for sheer comfort.



Marco Koch (GER)





(2016) | POWERSKIN CARBON-ULTRA



With four years of experience behind them, arena has taken carbon technology a step further into the future with a whole new level of support and movement management based on an innovative internal structure designed to optimise the athlete's physiology.

The arrival of the Carbon-Ultra in 2016 communicates the strongest of messages – the carbon family is in robust health, and the arena DNA will continue to spawn swimwear at the leading edge of swimming technology.

