

SF90 Spider: lifting the roof on Ferrari's most powerful series-production supercar



The first hybrid with retractable hard top in the Ferrari range is set to deliver unparalleled *en plein air* exhilaration

Maranello, 12 November 2020 – The spider version of the SF90 Stradale, the SF90 Spider, was unveiled today during a dedicated digital event. This special online event provided Ferraristi from all over the world with an exclusive introduction to the car's innovative features and in-depth information on its development.

As the Prancing Horse's first production plug-in hybrid spider, the SF90 Spider sets new performance and innovation benchmarks not only for the marque's range, but for the entire sports car sector. The new convertible has the same extreme supercar specification and record-breaking performance as the SF90 Stradale yet also adds further driving pleasure and versatility to the mix, thanks to latest iteration of Ferrari's signature retractable hard top architecture. This makes the SF90 Spider the ideal car for owners that demand the very pinnacle of Ferrari technology, but still want the thrill of open-top driving.

The retractable hard top (RHT) was again adopted because it guarantees optimal noise insulation and protection from the elements when raised, does not deform at high speeds and provides exceptional occupant space and comfort. The RHT is so compact, simple and light it can be actioned in just 14 seconds and can be deployed when the car is on the move. The key to the success of the Ferrari RHT, which premiered on the 458 Spider in 2011, and which has been constantly evolved in the intervening years, is that it takes up just 100 litres of space rather than the 150-200 litres required by a traditional system. The use of aluminium in its construction also means that it is around 40 kg lighter than a conventional retractable hard top. An adjustable electric rear window guarantees superb occupant comfort even at high speeds when the RHT is lowered.

As is the case with the SF90 Stradale, the SF90 Spider is also available with an additional specification option for owners that want to push its track car vocation to the extreme. The Assetto Fiorano pack includes a list of exclusive upgrades that set it apart from the standard car, not least Multimatic shock absorbers derived from the Ferrari's GT racing experience and optimised for track use. Others include the adoption of high performance materials (such as carbon-fibre and titanium) that have shaved 21 kg off the car's weight, a carbon-fibre rear spoiler and road-homologated Michelin Pilot Sport Cup 2 tyres designed to improve track performance in the dry, thanks to a softer compound and fewer



grooves. Lastly, the Assetto Fiorano offers an optional two-tone livery that further underscores the car's racing vocation.

POWERTRAIN

In a first for a Ferrari production spider, the SF90 Spider has plug-in hybrid architecture in which the internal combustion engine is integrated with two electric motors at the front, which comprise the RAC-e (Cornering Angle Regulator, Electric) system, and one at the rear derived from and named after a Prancing Horse Formula 1 innovation, the MGUK (Motor Generator Unit, Kinetic). The synergy between the internal combustion engine and the electric motors allow the car to unleash a maximum of 1,000 cv and put the SF90 Spider not only at the very top of the Ferrari range of road cars, but also its category, .

The SF90 Spider's powertrain architecture features the V8 turbo ICE, an 8-speed DCT with E-diff, the RAC-e electric front axle with two independent electric motors that also provide all-electric propulsion, the MGUK electric motor located at the rear between the engine and the gearbox, the high voltage battery and electric motor control system ((inverter).

In addition to a massive 780 cv (and 195 cv/l specific power output), the V8 also unleashes 60 cv more than any other V8 turbo ever built by Ferrari. To deliver this extraordinary result, Ferrari's engineers completely redesigned the intake and exhaust systems. To improve internal fluid dynamics, the ducts are now all horizontally lined up at engine head height, the turbo charger assembly has been lowered, and the exhaust line is higher. This rationalisation also produced both a lower centre of gravity and a reduction in overall weight thanks to the use of Inconel instead of steel for the exhaust manifold.

The SF90 Spider sports the completely redesigned 8-speed, oil-bath, dual-clutch gearbox launched on the SF90 Stradale. An optimised layout, achieved through the adoption of a dry sump and a significantly more compact clutch assembly with a 20% smaller exterior diameter than the one in the 7-speed gearbox, has shaved 15 mm off the installed height in the car. This, in turn, lowers the centre of gravity of the running gear by the same amount. Despite the addition of an eighth gear and the need to transmit a maximum torque of 900 Nm (an increase of more than 20% on the current 7-speed), the gearbox's overall weight is actually 10 kg lower than its predecessor. The clutch's performance is 35% higher than the 7-speed, transmitting up to 1,200 Nm in dynamic torque during gear shifts. Thanks to new-generation actuation hydraulics, clutch fill times are now 30% faster and total gear shift times have been slashed to 200 ms, an improvement of 30% on the previous 7-speed DTC.

Meticulous attention was lavished on sound quality when redesigning the exhaust system as the soundtrack is one of the pivotal factors in the exhilarating pleasure



of driving a Ferrari. The introduction of a "hot tube system", which transfers sound more directly to the cockpit, has produced fuller, richer harmonics across the entire frequency range, improving both in-car sound quality and intensity as rev rise compared to previous Ferrari V8s.

The power flow of the SF90 Spider's hybrid system can be divided into two main areas:

1. **Power delivery**, based on driver input via the accelerator pedal, processed by the engine control system and the hybrid control system, and constantly monitored by the electronic control systems. The power delivery modes can be divided up as follows:
 - **Electric mode**, entrusted to front axle (FWD mode)
 - **Hybrid mode**, entrusted to the ICE and the MGUK (RWD configuration)
 - **4WD hybrid mode**, with electric front axle available on-demand for traction requirements exiting corners and energy recovery in lift-off/ braking
2. **Energy recovery** (battery charging), managed entirely by the hybrid system's control logic using three strategies:
 - Regenerative braking, available on both axles both under standard braking and when ABS is active
 - Overbraking, active on both axles when accelerator pedal is lifted, managed independently on right and left front wheels
 - ICE recharge: battery-charging function achieved by load point shifting between the ICE and the rear MGUK electric motor.

Under normal braking conditions, energy recovery using the electric motors is the priority: the hydraulic braking system intervenes to support the electric one in all sharp deceleration conditions. At high speeds and in high gears, the combined contribution of the electric motors in high grip conditions helps lower the ICE's response times, thus significantly improving longitudinal acceleration and thus performance.

Because of the pivotal role hybrid system power management plays in the SF90 Spider driving experience, the traditional Manettino is now flanked by an additional steering wheel-mounted selector, dubbed the eManettino, which manages the power flows from and to the high voltage battery and the wheels (traction). It offers the driver a choice of four modes:

- **eDrive**: the internal combustion engine remains off and traction is entrusted entirely to the electric front axle. Starting with a fully charged battery (with a capacity of 7.9 kWh), the car can cover up to 25 km in this mode which is ideal for city-centre driving or any other situation in which the driver wishes to eliminate the sound of the Ferrari V8. The 135 km/h speed limit means the car can also be used on out-of-town roads;



- **Hybrid:** this setting optimises the system's overall efficiency. The control logic autonomously decides whether to keep the internal combustion engine running or turn it off. Power flow from the electric motors is limited to conserve battery power;
- **Performance:** this mode keeps the ICE running because the priority is more on charging the battery than on efficiency. This guarantees that power is instantly and fully available when required. This mode is best suited to situations in which driving pleasure and fun behind the wheel are the main focus.
- **Qualify:** this mode allows the system to achieve maximum power output by letting the electric motors work at their maximum potential (162kW). The control logic prioritises maximum performance over battery charging.

VEHICLE DYNAMICS

To make full use of the powertrain unit's power, the engineers developed vehicle dynamics systems that guarantee improvement not just in terms of pure performance and lap times, but also simultaneously ensure that drivers of all kinds can fully enjoy the car's potential and have fun behind the wheel. The new hybrid architecture required extensive integration work on the car's many different control logics, including the high-voltage system controls (battery, RAC-e, MGUK, inverter), the powertrain, and vehicle dynamics controls (traction, braking, Torque Vectoring).

Integrating these areas with the existing vehicle control logics led to the development of the new eSSC (electronic Side Slip Control) vehicle dynamics control system. Its principle new features are three innovative dynamic regulation and distribution strategies for engine torque to all four wheels:

- **Electronic Traction Control (eTC):** optimally manages the availability of the torque – both ICE and electric - distributing it to the individual wheels to suit driving conditions and grip requirements
- **Torque Vectoring:** available on the front axle to manage electric traction on outside and inside wheel in cornering to maximise traction exiting the corner and help ensure easy, confident, high-performance driving
- **Brake-by-wire control with ABS/EBD:** splits braking torque between the hydraulic system and the electric motors (brake torque blending), allowing regenerative recovery under braking which boosts performance and brake feel.

The hybrid architecture proved a challenge in terms of weight management: while the extra 270 kg of the hybrid system was amply compensated for by the extra power delivered (220 cv, with a weight/power ratio of the system alone of 1.23 kg/cv), extensive optimisation and weight reduction work was also required on the rest of the car to keep overall weight down to 1,670 kg and thus guarantee a



weight/power ratio of 1.67 kg/cv. The RAC-e electric axle also further mitigates the feeling of weight as, by significantly improving stability and traction in cornering, it helps drivers to drive confidently on the limit and delivers an “equivalent weight reduction” of around 200 kg.

The chassis was completely redesigned to deal with the extra stresses associated with the new power unit and the introduction of AWD. A number of leading-edge technologies and innovations have been introduced, not least an all-carbon-fibre bulkhead between the cabin and the engine. The SF90 Spider chassis also boasts 30% higher torsional rigidity than previous platforms without any increase in weight, a fact that has significantly influences the car’s dynamic prowess.

AERODYNAMICS

Just as the SF90 Stradale redefined the aerodynamic performance levels of the Ferrari range, the SF90 Spider is pushing the limits of the results delivered still further. The goals that drove the aerodynamic development of the car from the very earliest stages of the platform design were threefold: maintaining the SF90 Stradale’s performance levels with the RHT deployed, minimising aerodynamic turbulence and noise with the RHT retracted, and optimising flows in the engine bay.

The synergic relationship between the aerodynamics department and Ferrari Design produced downforce and efficiency figures unmatched by any other car in the category. Once again, they were achieved in typical Ferrari fashion: by sculpting the car’s forms into an effortless embodiment of sportiness. The main features in the SF90 Spider’s aero design include the shut-off Gurney at the rear, an active control system that varies downforce over the rear axle, the front underbody with vortex generator strakes, and forged wheels with wing profiles (blown geometry). The results in terms of performance are impressive indeed: a massive 390 kg of downforce generated in cornering at 250 km/h with the special Assetto Fiorano specification.

To ensure that SF90 Spider drivers enjoy the massive 1,000 cv available to them, efficiently and uncompromisingly without any negative impacts on aerodynamic drag and downforce coefficients, it was essential to focus on the effective management of hot air flows coming from the engine, gearbox, turbochargers, battery pack, electric motors, inverter, charging system, and, of course, brakes.

The engine bay, for example, houses both the usual internal combustion engine that generates temperatures of nearly 900°C, and highly temperature-sensitive electronic components. The RHT compartment radically changes the management of the heat flows in the engine bay: it is essential therefore that the



hot air channelled upwards is correctly evacuated, and that the route it takes does not interfere with the temperature-sensitive electronic components.

Given that the RHT compartment would have impeded the functioning of the vents located immediately behind the roof in the SF90 Stradale, transverse louvres have been inserted in the SF90 Spider's rear screen. These have been very precisely dimensioned to act as an efficient 'chimney' without interfering with the car's aerodynamics at speed.

The internal combustion engine and the gearbox are cooled by two radiators located ahead of the front wheels. The hot air flow coming off those radiators is channelled into the side areas of the underbody rather than along the car's flanks. This means that the air flow along the flanks is cooler when it enters the air intakes ahead of the rear wheels, thereby boosting the efficiency of the intercooler radiators. The electric motors and the inverters are cooled by a separate circuit with its own radiator at the front of the car with a central intake on the front bumper.

Lastly, the cooling circuit for the brakes was completely redesigned to meet the demands of the SF90 Spider's additional performance. A new brake calliper was developed for the front and has an integrated aerodynamic appendage that more efficiently distributes the highly charged airflow from the special air intake directly under the headlights on the front bumpers, to the brake pads and disc. The rear brakes are cooled by the flow from two air intakes on the underbody near the rear wheels.

The downforce generated by the SF90 Spider is largely determined by the patented aero device on the car's tail: the shut-off Gurney. In order to guarantee the same performance as the coupé, the Ferrari team had to work on the volumes and surfaces of the roof to manage the direction of the aerodynamic flow towards the car's tail. The shut-off Gurney is a suspended element comprising two sections: one fixed and one mobile with a wedge-shaped front area. The system is controlled by a sophisticated logic that controls parameters such as speed, acceleration, steering wheel angle and pressure on the brake pedal, hundreds of times a second in order to identify dynamic conditions requiring more downforce and then promptly activates the system, which can adopt either of two configurations:

- **Low Drag:** the two sections are aligned and suspended above the engine cover, with the mobile wedge acting as an efficient fairing to the fixed element, allowing the air to flow both above and beneath the shut-off Gurney which has almost no effect on the flow



- **High Downforce:** the mobile element lowers and closes the lower blown area, which in low drag conditions allowed air to pass through. The mobile and fixed elements now create an aerodynamic profile capable of deflecting the flows striking it and generating a significant amount of extra downforce.

Rear downforce is balanced at the front of the car by a complex and optimised system of vortex generator strakes. The system has been honed to new extremes on the SF90 Spider: the front section of the chassis is 15 mm higher than the central section of the chassis at the point where the vortex generator strakes are located, thus increasing the amount of air channelled towards them and boosting their effect. In fact, the SF90 Spider's underbody generates more downforce than any other ever made by Ferrari. The two diffusers ahead of the front wheels and the bonnet shape also contribute to generating downforce over the front axle.

Specific aerodynamic research went into the geometry of the forged wheels that are made using a construction technology that allows greater freedom when it comes to aerodynamic solutions. The wheels incorporate radial elements on the outer channel, which are equally spaced between the spokes and designed to act as wing profiles. The geometry of these profiles mean that the wheel works like a rotor blade, very efficiently boosting air evacuation from the wheelarch, creating suction that also benefits the flow that passes through the front diffusers. Furthermore, the flow exiting the wheel rim is lined up with the longitudinal flow running along the sides, thereby reducing deviations caused by the air mass exiting at an angle to the direction of movement, thus reducing the car's Cd.

Specific to the SF90 Spider are two aerodynamic elements in the cockpit to guarantee an excellent level of protection from air flows with the roof down. There is a central trim section between the driver and passenger seats that channels the air flow away from the head and shoulders and into a double layer of trim on the upper part of the tunnel. Both of these solutions are essentially drag neutral and guarantee the same level of comfort as Ferrari's other mid-rear-engined spiders.

DESIGN

EXTERIOR

The crafting of the SF90 Spider's exterior forms was inspired by same principle as influenced the development of the SF90 Stradale: to create a futuristic, innovative design that communicates both the car's racing vocation and the series production supercar concept.



When the RHT is deployed, the sides, front and tail of the SF90 Spider have the same distinctive styling as the SF90Stradale. This is no small achievement given that the architecture incorporates stowage for the RHT, which is moved by a complex lever system, but also that it was vital to maintain the same chassis rigidity levels. This was achieved by re-sculpting the car's surfaces so that the tonneau cover seamlessly integrates with the B-pillars of the coupé, preserving the original styling theme. Even the buttresses behind the passengers' head rests, which are a signature of all Ferrari spiders, integrate harmoniously as if they were emerging from a structure beneath the car's skin.

The result is that the proportions of the SF90 Stradale transfer easily to the SF90 Spider even when the RHT is stowed and without any formal concessions. This is even more surprising given that the engine is just as visible through the rear window despite the bulk of the roof. As the jewel in the car's crown, the V8 is clearly visible both when the RHT is deployed and retracted. Seen from above, it is clear that the buttresses also line up with the seats, which improves rear visibility when the RHT is stowed, in addition to further underscoring the car's two-seater configuration.

The greenhouse area and roof feature stylistic solutions from the coupé that reduce drag and underscore its fiery temperament without impacting on on-board comfort. The cockpit has been shifted forwards, the roof is 20 mm lower, the A-posts are more slender and the windscreen is more raked.

Aside from having the same silhouette as the SF90 Stradale, the SF90 Spider has a unique dynamic allure when its top is down: the absence of the roof seems to visually lower the car's centre of gravity, an impression further strengthened by the difference in colour of the trim on the roll-hoops that give rise to the buttresses.

The front of the car is dominated by a very pronounced profile which underscores its extremely aggressive character. The three air intakes in this area cool the electric motors (front) and the internal combustion engine (sides). The SF90 Spider also uses matrix LED headlight technology to improve visibility in all driving conditions thanks to active beam control.

The rear of the car is dominated by high exhaust pipes, which are the result of optimisation of the exhaust line layout. Their competition car vibe has been cleverly exploited to underscore the SF90 Spider's track-inspired personality. This effect is further enhanced by the low tail area. More elongated luminous rings create a more horizontal perception of the tail lights, which are a radical break from the iconic round shape normally used on Ferrari's mid-rear-engined berlinettas.



INTERIOR

The look and feel of the cabin was driven in large part by the complete redesign of the HMI, which marked such a major leap forward on the SF90 Stradale. The instrumentation is now predominantly digital with all the screens going completely black when the car is not running, lending the cabin a very minimalist look. However, once the Engine Start button on the steering wheel is pushed, a “ceremony” of sorts begins that sees all the digital components in the driver cockpit gradually springing to life until the whole cockpit is aglow.

The central instrument cluster comprises a single 16” HD screen, which is curved towards the driver to make it easier to read and emphasise the wraparound cockpit effect. In the default screen, everything is dominated by a large circular rev counter, framed by the battery charge indicator. The navigation screen is on one side of the rev counter with the audio controls on the other. The screen’s large dimensions mean that there is huge flexibility in terms of personalising the displays, which are also very easy to navigate using the steering wheel controls. It is, for example, possible to select a full-screen version of the navigation map.

Thanks to the introduction of the head-up display, the main information can be projected onto the section of windscreen within the driver’s field of vision. This means less distraction in line with the “Eyes on the road, hands on the wheel” philosophy that has always driven the development of the HMI used on every Ferrari Formula 1 car and that has gradually been transferred to our road-going sports cars.

The SF90 Spider’s steering wheel completes that transfer process from the competition world and also ushers in a new era by introducing a series of touch commands that allow the driver to control virtually every aspect of the car without ever taking their hands off the wheel. The traditional controls include the now iconic Manettino, steering-wheel mounted headlight control, windscreen wipers, indicators. Of the new touch controls, the pad on the right-hand spoke allows the driver to navigate the central cluster screens, while voice and cruise controls are on the left-hand spoke. In the bottom left section of the central area, there are four buttons the driver uses to select the power unit mode.

The F1 bridge, a signature on the previous models, has now disappeared from the central tunnel and been replaced by a modern take on the gearshift gate, an iconic feature of Ferrari’s manual gearboxes. In the new gate, however, the gearshift grille is digital as befits an automatic transmission. At the bottom of the tunnel is the compartment for stowing the new ignition key, which is an exact replica of the Ferrari Prancing Horse badge found on the bonnet, adding an authentic finishing touch to the cabin’s styling. The key works in full keyless mode



so that the driver can not only start the ignition but also open the doors without taking it out of their pocket.

7-YEARS MAINTENANCE

Ferrari's unparalleled quality standards and increasing focus on client service underpin the extended seven-year maintenance programme offered with the SF90 Spider. Available across the entire range, the programme covers all regular maintenance for the first seven years of the car's life.

This scheduled maintenance programme for Ferraris is an exclusive service that allows clients the certainty that their car is being kept at peak performance and safety over the years. This very special service is also available to owners of pre-owned Ferraris.

Regular maintenance (at intervals of either 20,000 km or once a year with no mileage restrictions), original spares and meticulous checks by staff trained directly at the Ferrari Training Centre in Maranello using the most modern diagnostic tools are just some of the advantages of the Genuine Maintenance Programme. The service is available on all markets worldwide and from all Dealerships on the Official Dealership Network.

The Genuine Maintenance Programme further extends the wide range of after-sales services offered by Ferrari to meet the needs of clients wishing to preserve the performance and excellence that are the signatures of all cars built in Maranello.

Images of and the official video for the SF90 Spider can be downloaded from the Ferrari media site: www.media.ferrari.com



SF90 Spider – technical specifications

INTERNAL COMBUSTION ENGINE

Type	V8 – 90° – turbo – dry sump
Overall displacement	3990 cc
Bore and stroke	88 mm x 82 mm
Max. power output*	780 cv at 7500 rpm
Max. torque	800 Nm at 6000 rpm
Max. engine speed	8000 rpm
Compression ratio	9.4:1

ELECTRIC MOTORS

eDrive max. power output	162 kW
eDrive max. range	25 km
Battery capacity	7.9 kWh

DIMENSIONS AND WEIGHT

Length	4704 mm
Width	1973 mm
Height	1191 mm
Wheelbase	2649 mm
Front track	1679 mm
Rear track	1652 mm
Dry weight**	1670 kg
Dry weight/power	1.67 kg/cv
Weight distribution	45% front / 55% rear
Boot capacity	74 litres
Fuel tank capacity	68 litres (11 reserve)

TYRES AND WHEELS

Front	255/35 ZR 20 J9.5
Rear	315/30 ZR 20 J11.5

BRAKES

Front	398 x 223 x 38 mm
Rear	360 x 233 x 32 mm

TRANSMISSION AND GEARBOX

- F1 eight-speed dual-clutch gearbox, AWD, electric front axle
- Electronic controls: eSSC: E4WD (eTC, e-Diff3), SCME-Frs, FDE 2.0, EPS; high performance ABS/EBD with energy recovery

PERFORMANCE

Max. combined power output***	1000 cv (735 kW)
0-100 km/h	2.5 s
0-200 km/h	7.0 s
100-0 km/h	< 29.5 m
Max. speed	340 km/h
Lap time at Fiorano	79.5 s

FUEL CONSUMPTION AND CO₂ EMISSIONS – under homologation (WLTC cycle)

* With 98 octane petrol

** With optional content

*** In eManettino Qualify mode