



**Model Series, Innovation and Technology Communications**

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**PRESS INFORMATION**

**Insight Design**

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**The equipment, data and prices specified in this document refer to the model range offered in Germany. Subject to change without notice; errors and omissions excepted.**



Condensed information

## **New design language, new design process, new Design Center: radical makeover for Audi design**

**2017 heralds in a new design era for Audi: The new Audi A7 Sportback is the brand's sporty face in the luxury class and fulfills the design pledge of the prologue studies. The four-door coupé is the classic example of Audi's new luxury class design language. At the same time, the brand with the four rings is establishing an innovative design process in the new Audi Design Center in Ingolstadt: digital design manufactory. It combines state-of-the-art CAD and 3-D visualization with traditional handcrafted modeling. The open concept of the new Design Center forms the basis for integrated, cross-disciplinary collaboration.**

**Consumption figures for the Audi A7 Sportback 55 TFSI quattro S tronic:  
Combined fuel consumption in l/100 km: 7.2 – 6.8\* (32.7 – 34.6 US mpg)  
Combined CO<sub>2</sub> emissions in g/km: 163 – 154\* (262.3 – 247.8 g/mi)**

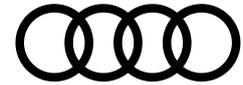
The new Audi A7 Sportback impresses with its athletic aesthetics and dynamic body line. The sweeping, taut roof line combines the sporty dimensions of a coupé with the generous space and everyday usability of the tried-and-trusted Sportback concept. "The four-door Gran Turismo with its sculptural design embodies Audi's progressiveness and dynamism," says Marc Lichte, Head of Design at AUDI AG.

The new design language uses large surfaces, sharp edges and minimal trim elements. As such, the Audi A7 uncompromisingly fulfills the design pledge of the prologue studies. Design and technology are fused much more in the automobile's overall design thanks to the new design language. The Audi A7 Sportback is a prime example of how to fulfill the brand pledge "Vorsprung durch Technik" even more intensely as part of the design.

For the design language of the future, Audi is establishing a new, innovative design process in the new Design Center in Ingolstadt: digital design manufactory. It combines the advantages of state-of-the-art 3-D visualization with the strengths of the classic modeler's handcrafted finish. Thanks to powerful computing clusters, the Audi design team can increasingly assess the design digitally. The use of 3-D visualization substantially enhances decision-making reliability when assessing the design.

The continual adjustments between digital CAD model and clay model thus ensure significantly greater process assurance. Design modifications can be visualized in real time and transferred rapidly to a physical 1:1 model.

\*Figures depend on the wheel/tire sets used



3-D visualization entails real-time representations where all physical characteristics (reflection, refraction, light and shade effects) can be displayed realistically. The result is coherent design concepts which are convincing thanks to their harmonious proportions and details.

The Audi design process is made up of five key steps: The portfolio phase kicks off the process, followed by the initial design phase. After the draft phase the particular vehicle design is set up fully digitally in the digital design phase and presented as a 1:1-scale clay reference model. In the last stage – the manufacture design phase – clay and CAD modelers create a physical handcrafted clay model with all the details of a possible series-production design.

Individual steps in detail: The design of a new model begins by specifying the portfolio. This represents a possible model family and range of variants for a model line as a scale model. The initial design phase follows where the designers coordinate early on and closely with colleagues from Technical Vehicle Development. Together they compare the technical requirements, such as the position of radar sensors, against the design requirements and check their feasibility. This development stage provides a sound foundation for all subsequent stages. The next work step, the digital design phase, lies at the heart of the new design process – here the designers use the very latest high-end visualization tools and milling machines for modern clay model making. Finally, in the manufacture design phase, the Audi modelers shape together the final surfaces and details of the future series-production design as part of precision analog and digital work.

In addition to wide-ranging visualization methods through to head-mounted displays (HMDs), other digital development tools will make inroads into Audi Design in future, thus further bolstering the knowledge sharing between designers, modelers and technical developers. At the same time, manual work on the model remains an indispensable skill, which lends the Audi design the final level of maturity and coherent overall impression.



The design of the new Audi A7 Sportback

## **The new Audi A7 Sportback: The sporty face of the luxury class**

**Consumption figures for the Audi A7 Sportback 55 TFSI quattro S tronic:**  
**Combined fuel consumption in l/100 km: 7.2 - 6.8\* (32.7 - 34.6 US mpg)**  
**Combined CO<sub>2</sub> emissions in g/km: 163 - 154\* (262.3 - 247.8 g/mi)**

**The second-generation Audi A7 embodies the new, progressive design language of the luxury segment. Athletic proportions and dynamic body line define its emotive character. With the innovative lighting design and the futuristic interior, design and technology fuse in a unique way in the four-door Gran Turismo.**

### **Proportions**

Audi made a bold statement with the first generation of the A7 Sportback, which appeared in 2010 – the four-door coupé combined elegance and dynamism in a wholly new way. In its second edition, Audi's four-door Gran Turismo is the next, impressive showcase of the new luxury class design language, which made its debut in series production with the new A8. The marked progressiveness of the new A7 comes from reducing the used design elements. The sculptural body defined by striking edges signals sporty elegance from all angles. The result is the consummate expression of the basic values of the brand with the four rings – progressiveness, sportiness and sophistication.

The Audi A7 Sportback is an athletic sculpture with a long engine hood, long wheelbase and short overhangs. Thanks to its clear design language, it conveys presence and an alluring appeal. Pronounced contours emphasize the large wheels and reference Audi's quattro genes. These genes determine the proportions of the vehicle's body. All volumes, surfaces and edges have been designed with the utmost precision. The silhouette is defined by the dynamic character of the greenhouse, which drops sharply toward the rear.

All of which combines into the athletic aesthetics that make the four-door Audi coupé so enthralling. Four figures encapsulate the sporty character and the muscular proportions of the large coupé: It is 4,969 millimeters (*16.3 ft*) long, has a wheelbase of 2,926 millimeters (*9.6 ft*), 1,908 millimeters (*6.3 ft*) wide, and stands only 1,422 millimeters (*4.7 ft*) high.

\*Figures depend on the wheel/tire sets used



## **Exterior design**

The hallmark design of each new Audi luxury class model is based on a characteristic leitmotif. While the Audi A8 embodies prestige in its design, the design language of the new A7 stands for pure progressiveness. This is implemented systematically, right down to the smallest detail.

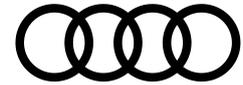
Even more so than on the outgoing model, the Singleframe grille dominates the front-end of the new Audi A7 Sportback. Positioned wider and lower, it expresses the sporty character of the four-door coupé at first glance. All the adjoining surfaces and lines radiate out from the grille, such as the contours on the engine hood and the flat headlights. The calm, horizontally aligned contour of the headlights provides space for a spectacular lighting design.

The outer edges of the vehicle front-end tilt forward, similar to the bow of a yacht. The three air inlets in the front apron – two large outside, one flat in the center – underscore the sporty character of the new Audi A7 Sportback. Strong contours, which are reminiscent of the front splitters on a racing touring car, form the bottom edge of the outside inlets. Two boomerang-shaped bars and a honeycomb grille structure their insides while also reinforcing the impression of three-dimensional depth. The outer edges of the air inlets are cut at an angle, creating presence and visually giving the Gran Turismo its firm stance on the road.

The side view is a dialog of taut lines and convex surfaces. The low-set shoulder line that runs around the entire car lowers the optical center of gravity of the A7 Sportback. Around a hand's width above is the shoulder line, which is hidden above the doors. It extends from the headlight, runs to the corner of the rear light and forms powerful muscles above the wheel arches with a taut edge. They pick up on the classic "blisters" of the Audi Ur-quattro and translate them into the design language of progressive elegance.

The transition of the D-pillar is a force focal point in the design of the new Audi A7 Sportback. The side window area incorporates a third side window that tapers upwards – a throwback to the Audi 100 Coupé S from 1970. The belt rail line that rises toward the rear lends the A7 even more dynamism.

The interplay of the sharp edges and soft lines is continued in the fillet, which adds a pronounced highlight to the lower section of the doors. It starts with a gentle downward sweep, then runs outward in a tight radius, forms a hard contour and is then once again drawn inside sharply. The sill theme is continued in the door design and forms a coherent link to the rear with its lines.



Like on a yacht, the rear of the Audi A7 Sportback tapers in. The classic boat stern motif from the outgoing model is even more pronounced in the new generation: The top rear edge is approximately three centimeters higher than on the predecessor. This measure creates a sportier look as well as enhanced aerodynamics. The tailgate features a spoiler, which extends electrically at high speeds.

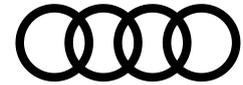
The strong play of light and shade underscores the highly contemporary rear section. The lights form part of the sculpture and lend even more width to the rear. In all areas the rear-end has a pronounced three-dimensional shape. The luggage compartment lid ends in a striking, stylishly curved contour, which shades the four Audi rings, the rear lights and the connecting light strip. Elegant chrome elements in the anthracite-colored diffuser also accentuate the rear's sensation of width.

The new Audi A7 Sportback is largely devoid of chrome. The six louvers in the Singleframe grille are painted in high-gloss black; its frame is extremely narrow. The optional S line exterior package hones the sporty look even further – with special solutions for the front bumper, the air inlets, the side sills and the diffuser insert.

The paint range offers a choice of 15 colors, including eight new tones. The “colors-in-between” – mixtures of several colors whose appearance varies depending on how the light strikes them – lend the new Audi A7 Sportback an elegant aura. The two solid paint finishes are ibis white and brilliant black. The metallic and pearl effect colors are Daytona gray, floret silver, glacier white, carat beige, mythos black. New additions to the color palette include Avalon green, firmament blue, Navarra blue, Seville red, Soho brown, typhoon gray, Triton blue and Vesuvius gray. The new Audi A7 Sportback, which comes off the production line in the Audi Neckarsulm plant, is also available optionally with a customized paint finish – here the customer can select the color of their choice.

## **Lighting design**

For Audi, the lighting design is more than just styling, it is the aesthetic expression of the brand values of progressiveness, sophistication and sportiness, in short: “Vorsprung durch Technik.” Audi once again underscores its leading role in lighting technology with the striking light signature of the new A7.



The headlights are available in three versions – in LED technology, as HD Matrix LED and as HD Matrix LED with laser high beam. The two Matrix headlight variants stand out with a distinctive horizontal structure. The top section forms the focal point and is character-forming with its innovative daytime running lights and the dipped beam modules as the pupil. The lower section houses other lighting functions, such as the cornering and turning light. With the top-of-the-line version this zone features a laser spot.

An X-shaped, optically focusing metal shutter and a blue-illuminated light guide characterize this laser technology at Audi. With the high-end and HD Matrix LED versions, the daytime running light signature is digital in character: 12 light segments are positioned vertically next to each other here, separated by narrow spaces – conjuring up an association with the symbolic “0” and “1” of the digital world. It is the digital eye of the A7.

At the same time the A7 also heralds a new language in the daytime running light design – from the graphics to the segmented volume. This provides the lighting function with a three-dimensional character and acts as the link between the body shape and state-of-the-art lighting technology. It creates a focused look and unique character.

The principle of segmentation also allows the light to be staged spectacularly: Like a digital awakening, the dynamic turn signal springs to life as soon as the driver unlocks the doors of the new Audi A7 Sportback. This turn signal, which corresponds with the daytime running light signature in a dual function, lights up sequentially twice. Immediately a light point runs quickly from the inside to the outside and back again, which opens the daytime running lights signature in a third movement, like the front curtain on stage. Finally the dipped beam comes on, which also dim up from the inside to the outside. Once the journey is complete and the vehicle door closed, the same light presentation is played out only in reverse order. The Audi A7 thus impressively symbolizes the new era of the Audi lighting design: the aesthetics of movement. Digital. Individual. These striking leaving home and coming home functions are available from the mid headlight version.

The generous taillight on the coupé also appears digital; it is made up of 13 vertical segments on each side. The precise LED lighting strip – typical feature of an Audi top-of-the-line model and at the same time an homage to the Ur-quattro – interconnects them. As on a racing car, the rear fog light is positioned in the center. The leaving home function works with similar semantics and dynamics as at the front-end, however across the entire width of the rear: first with the light strip, then via the light segments.



The interior lighting concept is equally unique: It visualizes and underscores in the dark the interior architecture and emphasizes the interior's clear design language through the longitudinal arrangement of the lighting elements. Audi offers two lighting packages in the new A7 Sportback: the contour and the contour ambient lighting package. Both present the space, the volume and the materials in a subtle, special way. The ambient light in the dashboard and center console makes the architecture volumes "float"; this creates a greater sense of space in the door. Precise contour lights run across the center console and adorn the door trim; the quattro badge in the instrument panel is also illuminated.

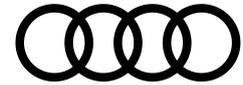
The tight and precise fit of the light guides trace the entire architecture of the interior, thus underscoring decisively the entire interior concept.

The contour lighting can be adjusted in 30 colors and follows the color profiles in the Audi drive select dynamic handling system. If the Bang & Olufsen 3D Advanced Sound System is installed, white light accents on the woofers in the door also add to the light show. Illuminated door sill trims (standard for the design selection and the S line sport package) round off the interior lighting lineup. The interior lighting design ensures a high level of customization, while also reducing the driver's workload and enhancing the passengers' sense of well-being.

## **Interior design**

The interior of the new Audi A7 Sportback fascinates with its futuristic lounge atmosphere and transfers the show-car design of the prologue studies to volume production. Four key values characterize the interior concept: progressiveness, sportiness, intuitiveness and sophistication. The defining design theme, which transfers the show car DNA into the interior of the A7, is reduction – reduction as a design tool.

Its reduced, clean design language combines muscular taut surfaces with clear, almost crystalline contours. The pronounced driver orientation underscores the Gran Turismo's sporty character. All the design motifs are logically connected. Driver and front passenger experience a large space in which the architecture fuses seamlessly with the new operating concept. Two large touch displays replace the numerous buttons and controls. The result is a digital driving experiential space.



With its strictly horizontal orientation, the instrument panel appears light and sleek. Its strong three-dimensional structure reinforces this impression and is based on a logical structure of various elements; the low upright section houses the air vents, with extensive decorative surfaces constituting the flat surface underneath. The focus is on the “black-panel architecture” which faces the driver and into which the top MMI touch response display is integrated fully and almost seamlessly. A narrow decorative trim together with the quattro badge lends structure. This corporeal sculpture is surrounded by an aluminum-look frame. As a result, form and function fuse in the interior of the new Audi A7 in a unique way, the kind of marriage you would otherwise usually only find on show cars.

To the left of the steering wheel is a second, smaller operating panel which includes all the controls for the lighting functions. Optionally, Audi can supply an entirely black area; it provides the user with tactile and acoustic feedback, just like a conventional switch. The asymmetrically shaped console in the center tunnel also stands out with its black-panel look; this is home to a second MMI touch response display with 8.6-inch screen diagonal. The adjacent row of buttons can also be finished as an option with the same black look and sensory features.

On the center console, all the other buttons have been arranged with meticulous attention to detail into logical control units, such as the standard-fit shift-by-wire lever. This arrangement emphasizes the interior’s sportiness. The head-up display, which Audi supplies as an option, is fitted almost invisibly into the surface of the instrument panel.

The door trim surrounds the instrument panel with a large gesture and appears to literally support it. This progressive reinterpretation of the hallmark Audi wrap around visually creates a self-conscious connection to the hood’s swept lines. The doors also feature pronounced three-dimensional styling. The armrest and the pull handle flow into an elongated, three-dimensionally shaped aluminum panel, which gives the entire area the feel of a wing.

A wide range of seat options is available, aimed at the very sporty and the comfortable side of the Gran Turismo spectrum. The sleekly styled, contoured seats stand out with their superb workmanship. One innovation is the laser-controlled perforation of the seat leather – a powerful example of how Audi harmonizes technology and aesthetics.



## **Color and trim**

In the new A7 Sportback, Audi provides a wide range of upholstery materials, inlays and interior colors to choose from. They underscore the futuristic technology atmosphere in the four-door coupé and stand for a new, contemporary type of sporty luxury. With the fine wood inlays, the natural open-pore finish contrasts enticingly with the interior's reduced, cool look.

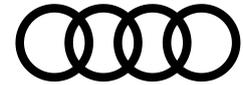
The range is structured in various levels of equipment: standard, design selection and S line sport package. The standard equipment includes five interior colors: black, okapi brown, granite gray/pearl beige and metropolis gray. They represent an elegant, sporty or technical look. The design selection comes with a two-tier structure; the top level provides the colors sard brown and juniper gray. The likewise two-tier S line sport package features the color rotor gray in the top-of-the-line version. With the top levels, contrasting stitching adds highlights, while the design selection includes piping.

Effect cloth in combination with artificial leather is the basic upholstery; upscale options include a combination of leather and artificial leather as well as Milano leather. The two most sophisticated upholstery materials – pearl Nappa/Alcantara and Valcona leather – are reserved for the optional sport seats and S sport seats with their rhombus patterns.

The customized contour seats are exclusively available with Valcona leather (optionally with perforation), a high-quality leather that is not embossed mechanically. A minimal lacquer coat is applied to the hide structure, allowing the leather to breathe. In addition, Audi offers several equipment packages with artificial and full leather.

The large inlays in the new Audi A7 Sportback on the instrument panel, on the center-tunnel console and in the door panels come as standard with a graphite gray fine paint finish. Optional inlays also come in aluminum fragment and in fine grain ash, natural gray brown and walnut natural veneers. The design selection also includes fine grain birch, natural agate gray, while the S line sport package offers the option of matt brushed aluminum, dark. The Audi exclusive range provides a wide range of options for customers looking to add an even more customized look to their car.

The finish in the new Audi A7 Sportback is consummate precision. The materials have been selected with the utmost care, with a handmade quality finish. The joints are even and tight, just a few tenths of a millimeter wide in certain areas.



## **GUI design: digital user interfaces**

The two MMI touch response displays transport Audi's uncompromising quality aspirations into the digital age: Whenever the driver activates a function, they feel a pulsation on their finger. The pulsation is generated by an electromagnet moving the display to the side by roughly the width of a human hair. At the same time, a small loudspeaker emits a click sound. The tactile and acoustic feedback ensures high operating reliability and at the same time transfers Audi's quality aspirations with the firmly engaging switches and the "Audi click" to a fully digital operating system.

Both displays present the images and information on a black background. The graphical user interface (GUI) on the displays and in the Audi virtual cockpit is consciously reduced so that information can be assimilated very quickly. All pictograms are proportioned precisely, some are subtly animated to visualize certain technical highlights and to enable the customer to experience them.



The Audi design process – digital design manufactory

## **From idea to finished car: High tech and handmade finish in the Audi design**

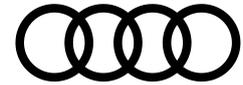
**At the start you have a brilliant idea, at the end a harmonious, fascinating product. The design process reflects the connection between idea and product. Audi brings together the best of both worlds in its cars: The digital design manufactory combines state-of-the-art digital visualization techniques with superb handmade precision. The C3 process is the core element in the new design workflow. Thanks to photorealistic visualization in real time, the designers can already assess the design on the screen.**

Audi is constantly rolling out new models and new technologies. So the designers' challenge is to turn more and more design concepts into series-production models in less and less time. With more than 400 employees, Audi Design now has more than twice as many employees as in 2000. At the same time the team is processing five times more projects and is dealing with increasing technical requirements in vehicle projects. Design presentations and technical package specifications must be coordinated across the various disciplines. For this reason the Audi Design team has developed a new design process, which combines CAD (computer-aided design), 3-D visualization and traditional design model making as well as clay modeling. The result is high process reliability, a coherent design concept and greater flexibility for creative design ideas.

### **Portfolio and initial phase**

Normally the design process at Audi starts around five years before the launch of a new model. At the start the designers create the basic design language and design characteristics of an entire model family. A joint technology matrix tends to form the basis for the design decisions in the basic portfolio phase. Here the designers together with colleagues from Sales and Technical Development are heavily involved in the company's strategic product planning.

How well does a new compact SUV fit in with an existing midsize model? What derivations are conceivable and which make sense? This matrix of different requirements – segment, configuration, design, customer and market requirements – initially gives rise to several portfolio models. With these 1:10-scale models the subsequent package still plays a secondary role. These models primarily provide a first impression of a design theme in various vehicle segments, such as with a sedan, an SUV and a coupé. The models evolve on the basis of CAD data by milling Ureol plastic or with a 3-D printer by means of rapid prototyping.



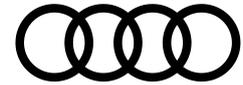
The design process of a series-production model starts with the initial design phase. This phase lasts between three and four months. Here the Audi designers work in close coordination with the studio engineers, the engineers from concept development and the Sales experts. As a result they translate the rough technical layout into a 1:1 architecture model. The focus is on those variables which determine the volume and the proportion, for instance the wheelbase and the height of the engine hood or basic technology package and components, such as the position of vehicle sensors.

The 1:1-scale architecture model is milled from a dense polyurethane foam and then painted. The final exterior design does not play a role with this model. It provides designers with an initial comparison of their design ideas with the future product. The model also allows modifications to be evaluated which become necessary due to technical requirements.

Insights from the architecture model provide designers with a reliable basis for the subsequent sketch phase. As such, the exact technical specifications do not restrict the designers' creativity, but rather guide the designers in the direction of what is technically feasible. Once the technical requirements have been clarified, the designers can give free rein to their creativity. Thanks to the precise technical specifications, the designers can produce suitable concept designs from the outset. The design they are working on comes to life faster than before; the design quality is even higher.

## **Draft phase**

In the subsequent design briefing, designers and Sales experts develop a joint leitmotif in words and images. This entails fine-tuning the package information and the basic knowledge acquired thus far. Teams from Audi Sales, which analyze the market, competition and the customer expectations, provide important input. In the sketch phase, which lasts around two months, the designers traditionally work with pen and paper and digitally with electronic drawing boards. Several exterior designers work with each other in a spirit of friendly competition, normally seven for the interior, and eight or nine for the exterior. The best exterior idea makes it into the next process phase, the C3 process.



## Digital design phase

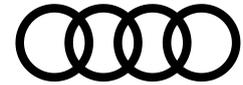
The digital design phase is tailored to the concept of the new Audi Design Center. It consists of three components: CAD, concept, clay milling – or “C3 process” for short. The process delineates a new form of collaboration between CAD modelers and exterior designers. The CAD architecture model from the initial design phase provides the basis for the new design concepts. The CAD concepts appear in real time on the 1:1 LED screen in photorealistic quality and can be checked for their consistency and rapidly transferred to a physical 1:1 reference model.

“With the high-end visualization of the C3 process, I am confident I can already assess a design digitally,” says Marc Lichte. The high computing power of a computing cluster enables the latest design versions to be computed and presented photorealistically in a matter of seconds. The direct transfer of the digital design image to a physical reference model enables the photorealistic representation in the digital model and physical 1:1 volume model to be compared continuously. The clay reference model also serves as a physical basis for discussion between designer and CAD modeler and as a “three-dimensional sketchpad.”

The connection of digital modeling and clay milling in the C3 process facilitates faster development of the final design concept without compromising the quality of detail or decision-making reliability. The process also provides flexible, rapid reactions to change requests. As such, the new design process is an important contribution to the corporate strategy in terms of digitalization and sustainability.

The current computing power makes photorealistic representations possible in real time and allows design concepts to be assessed digitally. The new Audi Design Center offers the optimum conditions: Five LED walls with presentation areas of 5.5 meters (*18.0 ft*) up to 11 meters (*36.1 ft*) wide and very high resolution show new models accurately in every detail. The computing cluster is used jointly by Audi Design, Surfaces Development, in other words the interface between Design and Construction, and the data control model (DCM), and enables visual simulations of the design data in real time. This cluster consists of 480 interconnected nodes and its computing power is equivalent to the performance of around 4,300 notebooks.

The visualization software for the representation on the LED wall works in accordance with the ray-tracing principle. Using this vector-based ray process, optical effects such as light, shade, reflection and refraction are computed and displayed correctly from a physical perspective. Whether Barcelona on a sunny September day at 7 p.m. or Cape Town in January around midday with a cloudy sky – the software shows the new Audi models in every required lighting situation and in any possible backdrop. It reproduces precisely the depth of the paintwork and the degree of sheen of the surfaces.



The computing power enables virtual models to be viewed photorealistically in real time or also enables them to be rotated in various views or driven in various scenarios after a short animation time.

Thanks to the computing cluster, the designers can digitally add a wider side sill for a new model and immediately see the effect on the digital model: Changes in terms of proportions, overhangs and shadows can be visualized virtually instantly; any discrepancies are discovered well before the physical clay model is put together. Process reliability increases substantially as a result.

The 3-D visualization also provides dynamic driving shots and driving simulations. vDEV models (**v**irtual **D**esign **E**xperience **V**ehicle) are created for this purpose. Thanks to their level of detail, these animated driving models already provide a virtual impression of whether a design concept is coherent and how it behaves dynamically in a virtual driving scenario. The vDEV models can, for instance, complete their laps on the Audi test track in Neuburg. All the physical circumstances are incorporated into the simulation, such as bumps in the road and body movements. In this way, all the design details can be checked for coherency on the driving model – from the shadow through to light reflection with different driving and weather conditions.

In the interior too, increased visual simulations enable the even more precise use of materials such as paints, leather and cloths. The further enhanced display quality will also allow final assessments on the digital model in future.

Audi's C3 process combines the best of two worlds: The CAD milling machine is faster than its human counterpart, it works with accuracy down to a tenth of a millimeter, and it does not need any breaks. A CAD modeler develops the data model on the computer; the milling machine transfers their specifications to the clay model. The new Design Center houses 20 of these machines with swiveling milling heads.

In accordance with the C3 process, the eyes and hands of the designers and modelers are responsible for the final finish, the decisive quantum of emotion. Their craftsmanship is indispensable for Audi in the manufacture design phase.



## **Manufacture design phase**

The permanent comparison between data and clay model helps the handmade manufacture create a more solid foundation. Above and beyond all change steps, the clay model serves as a physical reference, also for the discussion between modelers and designers. Thus it is possible to discuss new design versions in the team at short notice on the digital model and on the physical model and to incorporate changes quickly. Conversely, change requests can be transferred rapidly from the clay model to the CAD model.

Audi's clay and CAD modelers transform the design confirmed in the C3 process into a handcrafted model in the next stage. The invisible frame of the clay models consists of a steel frame with height-adjustable suspension, wooden panels and a body made out of rigid foam. The overlying layer of industrial plasticine is around 30 to 40 millimeters (*1.2-1.6 in*) thick. As long as this clay is stored in the laboratory furnace it is as soft as warm butter. It hardens so quickly in the air of the modeling hall that the modeler can work it using various modeling tools. Attachments – from the Singleframe grille, the wheels, to the light module – are created using stereolithography from liquid synthetic resin.

The workflow is designed as an iterative process between CAD modeling and classic clay modeling and perfectly combines the advantages of both worlds. The synthesis of manual modeling and CAD modeling is also embraced when training the employees. Modelers at Audi learn both on the physical model and on the computer, acquiring the skills necessary for CAD tools and manual model making.

## **Interior and packaging**

The interior is a special calling card of Audi Design. The synthesis of design, design language and material in the interior is one of the key reasons for buying for Audi customers worldwide. So the combination of characteristic interior design, fine material selection and innovative operating concepts underscores the quality aspirations of the brand with the four rings.

Inside an Audi the entire design of the interior follows a central design theme. This defining narrative is reiterated throughout the interior – from basic shaping to the design of individual details. This leitmotif extends right through from the dashboard architecture to the individual chrome highlights.



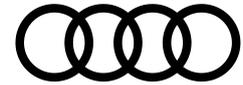
The Audi design process plays a key role in the coherent interior concept. Here, Audi Design boasts a unique selling proposition in the automotive sector: The interior designers accompany the development of the interior from the ideas phase on the drawing board through to series production. This ensures the high quality of the design concept from the key sketch through into production. The interior designers work on a cross-disciplinary and cross-technical team basis throughout the entire development cycle. They liaise in vehicle project teams – say with colleagues from Technical Development, from Quality Assurance or with toolmakers in Production.

After the joint design briefing with the Exterior, Lighting and GUI design teams, three 1:1-scale mock-ups are initially made from foam. On the basis of these forward-structure models with no roof, Design and Technical Development check the proportions, the ergonomics and the package. From the air conditioning, the airbags to the LED light guide, the aim is to house numerous components in the interior. Up to 50 specialist departments are involved in the design process.

At the start of the design phase, seven designers – as competitors and team players at one and the same time – make a start on the key sketches to draw the interior with a couple of lines. Here the clearest ideas make the running: Concepts with an interior made from a single mold, which logically link all the elements in relation to volume and proportion. From the sketches the next stage produces differentiated renderings. Using these, the designers develop the main theme for the individual elements, such as the styling of the door trim.

The design tapes are used in the next work step. These adhesive strips are attached to 1:1 drawings and map the key lines. At the same time the interior is built up in CAD. Once the data model is finished, work begins on milling the clay models. Designers, CAD specialists and modelers jointly develop the final sculpture, from the large volumes to the small details. The harmonious overall image of an Audi interior emerges from the sum of the coherent details, all of which follow a systematically implemented idea. The last 20 percent of the design finish accounts for 80 percent of the work.

Many Audi interior designers are specialists, for example for seats, for all the control elements or for interior lighting. A separate 1:1 model is developed to assess the lighting. Here too, the digitalization of the design process will offer a great deal of potential for transferring design concepts from the draft even faster into series production. As with the exterior design, milestones are used to consolidate and select a final model. The designers agree on the associated packaging in the feasibility check with the final exterior model.



Colleagues from the Feasibility department create a congruence model on the basis of the particular exterior and interior design. They confirm feasibility in relation to production, service, safety and long-term quality. The Design Freeze (DF) for exterior and interior takes place a good two years before the start of production. From this point in time, the design is in the implementation phase and receives its finishing touches in conjunction with the Surfaces department. The latter forms a quasi-bridge between Design and Construction department and is also based in the new Design Center. In the final convergence process, its specialists present all the surfaces in a digital geometric representation accurate down to a hundredth of a millimeter

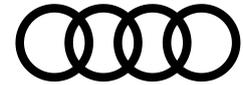
## **GUI design**

One special area in the Audi interior design is the GUI design (graphical user interface). In the new Audi A7 Sportback and in the new A8, the design of the graphical user interface has become far more important due to the concept of the two MMI touch response displays. This applies to the integration of the screens into the instrument panel and for the operating concept. With the advent of fully digital operating systems, the graphic design of menu levels and operating icons is acquiring an integrated importance between exterior and interior design. First, the graphic design must fit tone-in-tone with the interior's design language and choice of materials. The menu and icon design must also be configured in such a way that the operating logic and operating reliability are ensured. With ever-increasing complexity, the visualization of vehicle functions such as assistance systems is also becoming increasingly important. In this way, the GUI design also supports the customer's technology experience.

The Audi GUI designers work together closely with colleagues from Technical Development – both sides develop the basic operating concept in a purpose-built project house. Here they clarify basic questions: How will we structure the menu tree? What function needs to be placed where? What is the right size for an icon so it can be activated reliably and at the same time fits in with the design concept?

The basic layout of the menu structure is developed on the basis of a wireframe wallpaper. This overview representation is similar to a family tree, and the GUI designers define in this representation the entire menu structure of the operating system, from the startup screen down to the last operating level together with the electronics developers.

The Audi designers then design on the computer hundreds of widgets, buttons, labels and screens accurate to a single pixel. All in all they design and program up to 500 individual modules.



The new look of the GUI design is flat, distinctive and, at the same time, with meticulous attention to small details which convey the joy of use. In the main menu, for instance, all icons are subtly animated, the radio wave symbol oscillates slightly. Audi has also gone for a simple design language with a high-quality feel for the graphics design: The clearly arranged ghost design in the MMI displays to the user disparate vehicle functions and convenience features with clear animations. The vehicle animations, say on the menu for Audi drive select, have deliberately been reduced to the key contour lines and illustrate to the customer clearly the selected vehicle functions, for instance when adjusting the seat.

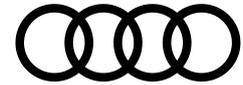
Audi has transferred its exacting quality aspirations from the old world of switches and buttons to the new digital universe. Together with the two-stage tactile feedback – an initial click when touching the user interface, the second tactile feedback when executing the operating command – high-quality, simply designed operating icons generate the brand’s familiar high quality aspirations.

## **Colors and materials**

Once the first foam models of the exterior and interior have been put together, the designers from Color and Trim embark on a new project and start work on the color and materials concepts. What degree of sheen best suits which equipment line for the bars of the Singleframe? Do the decorative trim, trim strips and leather upholstery create an overall harmonious feel? Is there a harmonious overall image in areas such as the door where many elements come together?

Color and Trim also produce 1:1 models for larger components such as instrument panel, center console and seats. Particularly with the seats this involves seam details, pattern and perforation as well as the color schemes. The new Audi high-end visualization tools also make it easier to put together these elements. The most important tools remain, however, the highly sensitive fingertips and an eye that can appreciate the smallest color nuances in terms of sheen and depth. It takes years to train these skills fully.

The Color and Trim models run through the usual Audi Design project gates and milestones. The final definition emerges around two years before the start of production. It constitutes the starting point for the intense collaboration with Quality Assurance and the suppliers. The latter are retrained with each project so that the interiors always meet Audi’s exacting demands in terms of precision and quality.



## **Virtual reality**

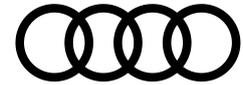
In the Audi design process the high-end visualization on the LED wall is the present; virtual reality (VR) is the next step. The method developers in the Design department develop specialist tools and methods for using VR glasses, so-called head-mounted displays (HMDs), which fully transport the observer visually into the depicted setting. The interior designers in particular can use the technology right from the concept phase to experience proportions and spatial concepts, and assess these reliably. With the commissioning of the new Design Center these HMDs visualize spatial concepts and proportions in the interior design. To this end, the VR developers have their own VR lab where the team coordinates the new tools together with the designers.

The design places exacting demands on the representation quality. Do the reflections, the reflections in the paintwork, the shadow of the VR coincide with the reality? The computer cluster also provides this quality in the VR glasses. It delivers rapidly precalculated, high-resolution image content, which is then displayed in three dimensions by powerful HMDs. This also enables the user to move around the virtual space and point at objects. The lifelike representation of design models is thus even more realistic. Over the next three to five years, VR applications will become the standard tool in the design process. Virtual-reality tools will augment today's digital design manufacture with other virtual applications.

The further steps are already emerging: Tools that enable the observer to add markers in the simulation, and differentiated tools to virtually touch and move individual elements. Augmented reality places the computer-generated representations over the real world and paves the way for the new approach of eye scanning: Only those objects the user focuses on are displayed sharply, everything else is blurred, reflecting the way the eye behaves naturally.

In the foreseeable future, VR glasses will also facilitate design meetings across continents and substantially support the design process even further. Then Audi designers, for instance, from Ingolstadt, Beijing and Los Angeles will get together in a virtual studio to discuss and assess a digital model. This eliminates cumbersome model transport or travel time. Each participant sees in real time the same virtual model and also perceives the other discussion participants as avatars. Avatars are assigned to the individual participants in the VR meeting as individual virtual representatives.

Data gloves are also in the pipeline and will permit "digital touching" of virtual models using tactile feedback. VR meetings will replace video conferences and offer entirely new opportunities.



The new Audi Design Center

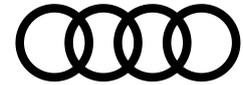
## **Openness, transparency and interaction: spaces for fascinating car design**

**A transparent building flooded with light, which brings together the world of Audi Design under a single roof – Audi has moved into its new Design Center at its headquarters in Ingolstadt. The Design headquarters is home to around 600 employees and promotes networked collaboration with new technologies and integrated space design.**

### **Layout**

The new Design Center is situated in the north-west corner of the Ingolstadt plant site and sets an architectonic accent with its classic, calm glass facade. Its site area of 107 x 71 meters (*351.0 x 232.9 ft*) is the size of a soccer pitch. The five stories and the basement partially below ground level due to the slight slope provide a total 37,180 square meters (*400,202.2 sq ft*) of gross floor space. The Audi Design Center took three years to build. Around 600 people work in the building, also including colleagues from Concept Design, which were previously based in Munich, and the Surfaces department, the interface to Technical Development.

Across all floors, the building is split up into three areas, depending on the length: Sector A is the largest measuring around 10,000 m<sup>2</sup> (*107,639.1 sq ft*) and is home to the offices. It is particularly bright with the exterior glazing running right around the area and three atria broken by staircases. The model studios in sector B are where the physical models are developed on measurement and milling plates. The ground floor and the fourth floor – daylight illuminates both – are home to two large presentation areas with a total of 1,300 m<sup>2</sup> (*13,993.1 sq ft*) of space. Sector C is clad with metal panels on the outside and houses the workshops, storage and assembly areas. In addition to the atria, several staircases and passenger elevators as well as two car elevators connect the floors. The entrance area is designed to be an exhibit area for art and design with rotating themes, and it is accessible to all Audi employees.



## **Building concept**

The new Audi Design Center facilitates rapid, integrated design and work processes between designers, modelers and engineers. In the new Design headquarters the building concept and the integrated design processes thus complement each other. LED screens and modeling workstations with milling machines are situated right next to one another, thus enabling the 3-D model and the reference model made out of clay to be compared directly.

In addition to the CAD graphic designers, which transfer the vehicle design from the sketch to a 3-D model, the designers also have a direct line of sight to the digital and physical models. The model plates of the clay models thus become the meeting point for modelers, CAD graphic designers and designers. With its wide, open design, the new Audi Design Center promotes networking and communication. Glass walls provide unimpeded views between the office and model areas. In these project areas, discussion islands promote debate and create the ideal conditions for the C3 process between designers, CAD experts and modelers. The large office area has no partition walls; the workstations are grouped in four zones along the glazed exterior facade.

The cubes are extraordinary rooms in the new Audi Design Center. These 24 large, open boxes made out of wood, aluminum and expanded metal are reminiscent of industrial containers and form islands in the daily routine. The cubes have a modular structure, are configured in two sizes and distributed freely within the space across all floors. They play an important role in the design process by providing the design team with the necessary freedom and sanctuary to come up with creative designs.