METU EE7566
Electric Drives in Electric and Hybrid Electric Vehicles

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Office: C-107

Content

BMW i3

Jaguar I-Pace

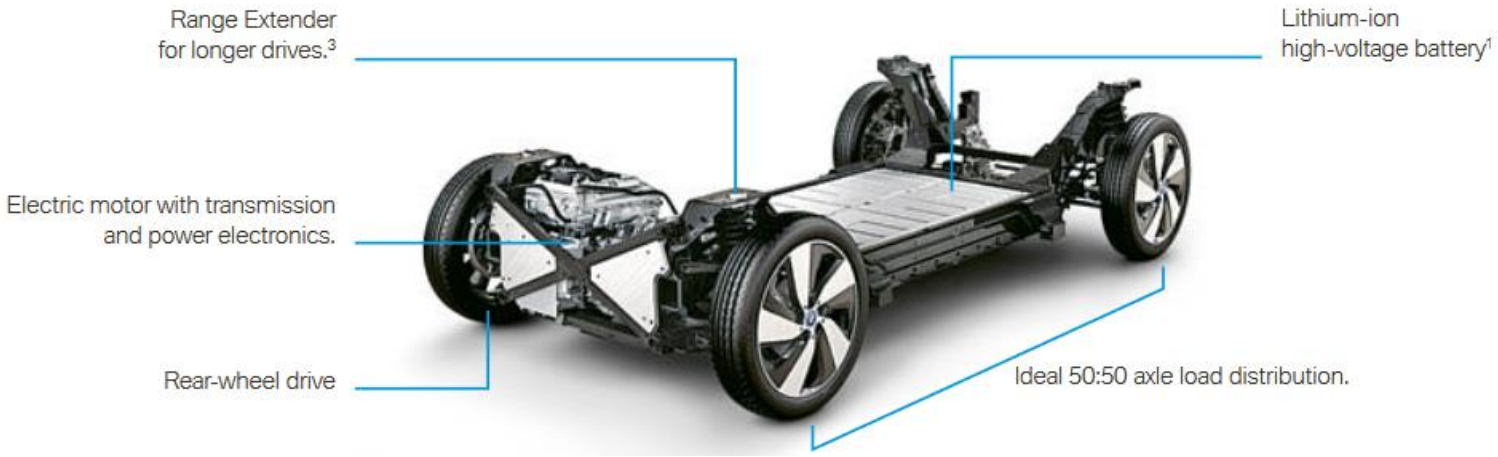
"HOW DOES THE LIFE-DRIVE ARCHITECTURE IMPROVE THE CAR'S HANDLING?"

1,340 KG

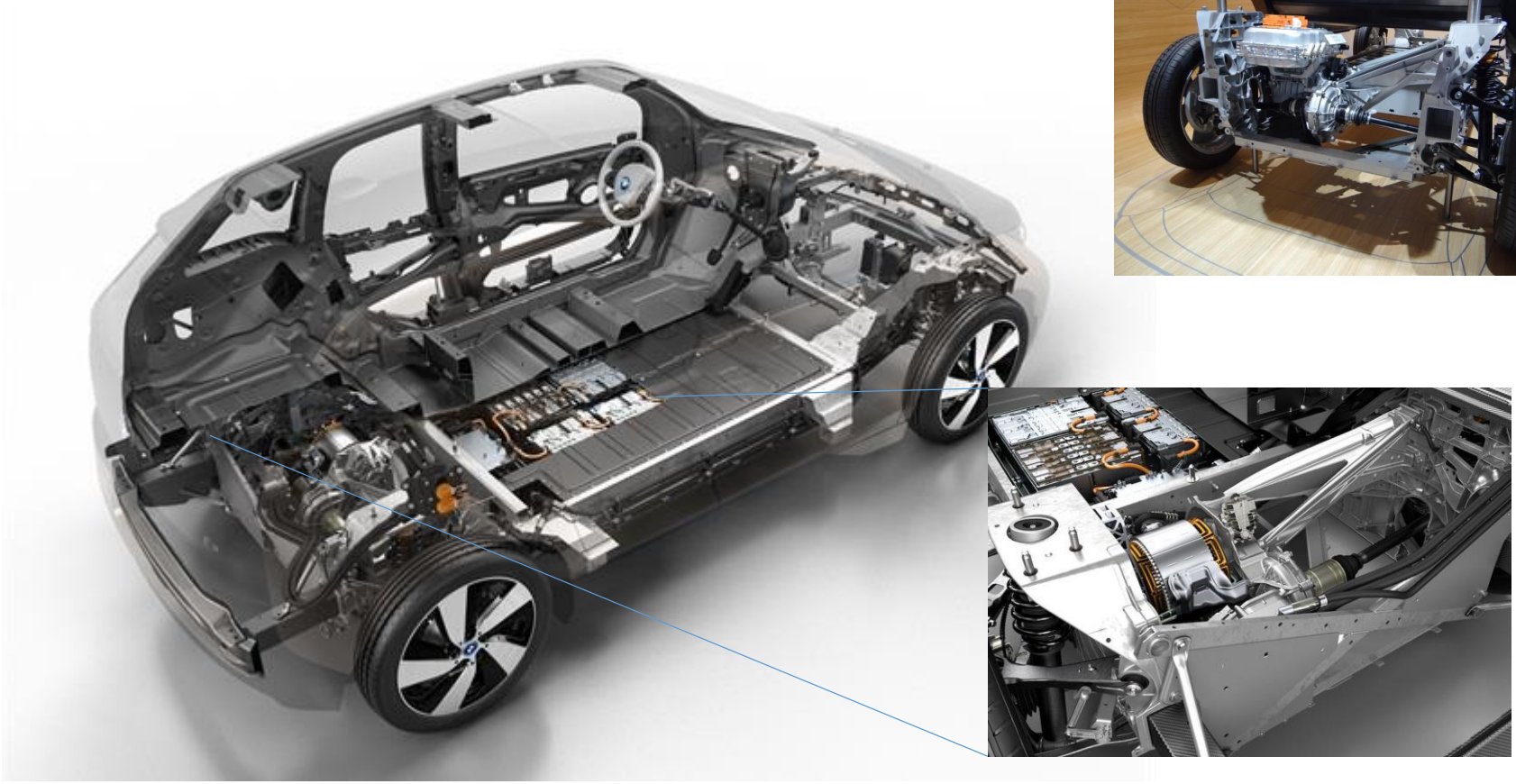
is the weight of the new BMW i3s in accordance with EC[2] directives, making it significantly lighter than comparable electric vehicles.

50 %

lighter than steel, carbon is also exceptionally strong.

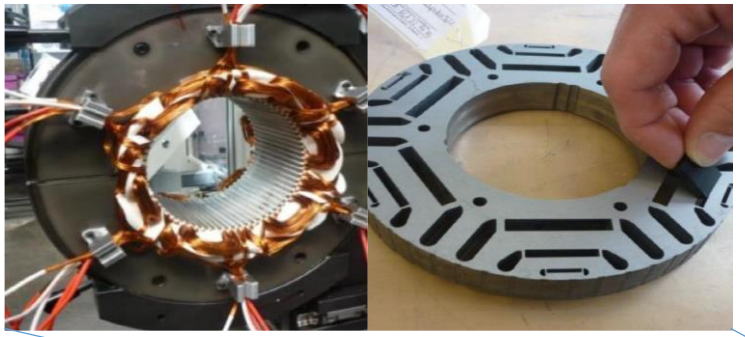


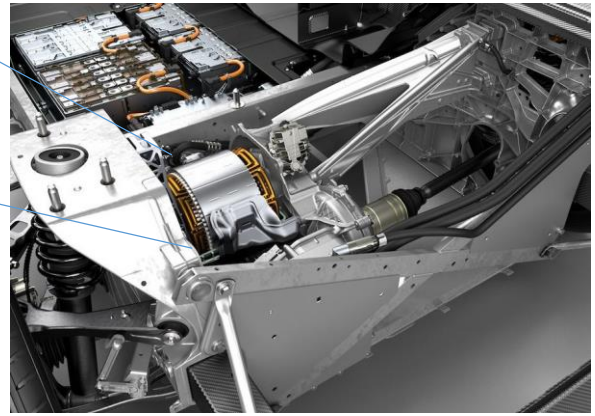
BMW i3 Characteristics



BMW i3 Characteristics

IPMSM Stator and Rotor





Electric machine production:
https://www.youtube.com/watch?v=3nJD6b8TL2M

BMW i3 Characteristics

i3 60 Ah: 22 (18.8 usable) kWh lithium-ion battery
i3 94 Ah: 33 (27.2 usable) kWh lithium-ion battery
i3 120 Ah 42.2 kWh lithium-ion battery

- BMW i3 will get its battery upgraded with NCM 622 cells and the capacity will increase from 94 to 120 Ah. With 120 Ah battery cells, the BMW i3 will have a total battery capacity around 42,62 kWh (96 x 120 Ah x 3,7 V).

https://pushevs.com/2018/04/05/samsung-sdi-94-ah-battery-cell-full-specifications/

	BMW i3 60 Ah	BMW i3 60 Ah with REX	BMW i3 94 Ah	BMW i3 94 Ah with REX
Max. Power in kW (PS)	125 (170)	125 (170)	125 (170)	125 (170)
Rated Power in kW (PS) at 1/min	75 (102) / 4800	75 (102) / 4800	75 (102) / 4800	75 (102) / 4800
Max. Torque EM in Nm	250	250	250	250
Rated Power of ICE in kW (PS) at 1/min	-	28 (38) / 5000	-	28 (38) / 5000
Max. Torque/Speed of ICE in Nm at 1/min	-	55 / 4300	-	55 / 4300
Acc. 0-100 km/h in s	7,2	7,9	7,3	8,1
Max. speed in km/h (limited)	150	150	150	150
Consumption (NEDC) in kWh/100km	12,9	13,5	12,6	13,3
Battery capacity (net) in kWh	18,8	18,8	27,2	27,2
Electric range (NEDC) in km	190	170	312	240
Practical electric range in km	130–160	120–150	200	180
Practical extended electric range in km	0	120–150	0	120–150
Practical total range in km	130–160	240–300	200	300–330
Charging time CCS (DC) in h	0,5	0,5	0,75	0,75
Charging time Typ2 (AC) in h	3–6	3–6	2,75 – 7,5	2,75 – 7,5
Empty weight in kg	1.270	1.390	1.320	1.440

https://de.wikipedia.org/wiki/BMW_i3

	BMW i3s 94 Ah	BMW i3s 94 Ah with REX	BMW i3 120 Ah	BMW i3s 120 Ah
Max. Power in kW (PS)	135 (183)	135 (183)	125 (170)	135 (183)
Rated Power in kW (PS) at 1/min	75 kW (102 PS) bei 4800/min			
Max. Torque EM in Nm	270	270	250	270
Rated Power of ICE in kW (PS) at 1/min	-	28 (38) / 5000		
Max. Torque/Speed of ICE in Nm at 1/min	-	55 / 4300		
Acc. 0-100 km/h in s	6,9 s	7,7 s	7,3 s	6,9 s
Max. speed in km/h (limited)	160	160	150	160
Consumption (NEDC) in kWh/100km	14,3	12,5	13,1	14,0 – 14,6
Battery capacity (net) in kWh	27,2	27,2	37,9 kWh	37,9 kWh
Electric range in km	280 (NEDC)	220 (NEDC)	285-310 (WLTP)	270-285 (WLTP)
Practical electric range in km	200	160	260	260
Practical extended electric range in km	-	120–150	-	-
Practical total range in km	200	300–330	260	260
Charging time CCS (DC) in min	45 min			
Charging time Typ2 (AC) in h	2:45 – 7:30 h		3:10 – 9:40 h	
Empty weight in kg	1460	1440	1345	1365

https://de.wikipedia.org/wiki/BMW_i3

Charging Rates

i3-Version	230-Volt-Schuko-Steckdose	230-Volt-Typ-1- oder Typ-2-Ladestation
60-Ah-Version	laden mit bis zu 2,7 kW[2]	laden mit bis zu 7,4 kW[1]
94-Ah-Version	laden mit bis zu 2,7 kW[2]	laden mit bis zu 7,4 kW[1]
120-Ah-Version	laden mit bis zu 2,7 kW[2]	laden mit bis zu 7,4 kW[1]

i3-Version	400-Volt-Typ-2-Ladestation	DC Combined Charging System
60-Ah-Version	laden mit bis zu 7,4 kW	laden mit bis zu 50 kW
94-Ah-Version	laden mit bis zu 11 kW	laden mit bis zu 50 kW
120-Ah-Version	laden mit bis zu 11 kW	laden mit bis zu 50 kW

https://de.wikipedia.org/wiki/BMW_i3

Sustainable Mobility

sustainability

/səsteɪnəˈbɪlɪti/

noun

the ability to be maintained at a certain rate or level.
"the sustainability of economic growth"

- avoidance of the depletion of natural resources in order to maintain an ecological balance.
  "the pursuit of global environmental sustainability"

sustainability terimini şu dile çevir: Türkçe

1. Sürdürülebilirlik

[THE BMW i3.OWNER'S MANUAL.]

[BMW i3 sustainability video]

Jaguar I-Pace

Range and charging

NEW ALL-ELECTRIC JAGUAR I-PAC E

JAGUAR I-PACE
ELECTRIC PERFORMANCE

90kWh
BATTERY
The battery is made up of 432 high energy density, Lithium-ion pouch cells, arranged in 36 modules of 12: the best technology to deliver maximum range, performance and efficiency

SINGLE-PEDAL DRIVING
The I-PACE's sophisticated braking system provides regenerative charging power to the battery in all driving modes – maximising range. And, by selecting the 'high' regenerative mode, it enables intuitive 'single pedal' driving in many conditions. Regenerative braking can produce up to 0.4G of braking force

480km
(298 miles)
RANGE ON THE WLTP TEST CYCLE

40 MINUTES
RAPID CHARGING
Time taken to charge from 0-80% (100kW DC)
15-MINUTES CHARGING AT 100kW DC GIVES UP TO 100km (62 miles) EXTRA RANGE

7kW AC
WALL BOX
Charges the battery from 0-80% in 10 hours – ideal for overnight charging at home

TWO ELECTRIC MOTORS
The Synchronous Permanent Magnet motors are light and extremely efficient. Packaging them concentrically with the single-speed transmissions makes them as compact as possible. Their position on each axle delivers all-wheel drive and, together with the underfloor battery, contribute to I-PACE's low centre of gravity to enhance control, handling and agility

36kNm/°
TORSIONAL RIGIDITY
The integral battery structure means I-PACE is the stiffest vehicle in the Jaguar range - optimising handling agility and safety

696Nm TORQUE | **4.5s** 0-60mph | **400PS** POWER

#IPACE

JAGUAR

POWER TO PERFORM

Designed and developed by Jaguar Land Rover, the battery pack and electric motors enable optimum performance, efficiency and range

> BATTERY PACK

The I-PACE Concept features a liquid-cooled, 90kWh battery comprising 36 modules enclosed within a structural aluminium housing.

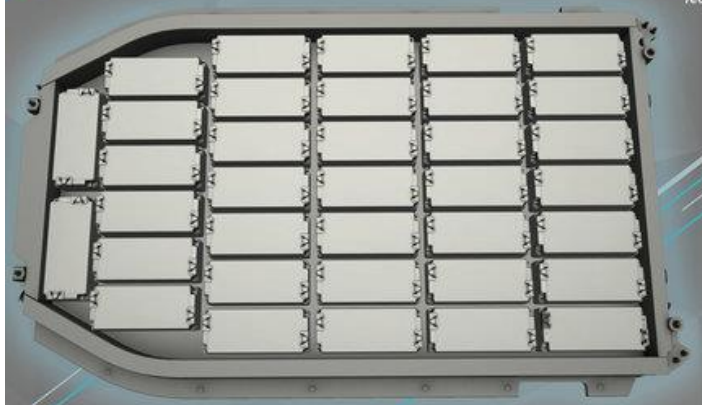
Each module contains the latest Lithium-ion pouch cells, which use Nickel-Cobalt-Manganese chemistry. These cells were selected for their combination of high energy density and because they can maintain a higher current for longer, which means that the battery can deliver both range and sustained performance. Compared to some other cell types, they also offer considerable future development potential.

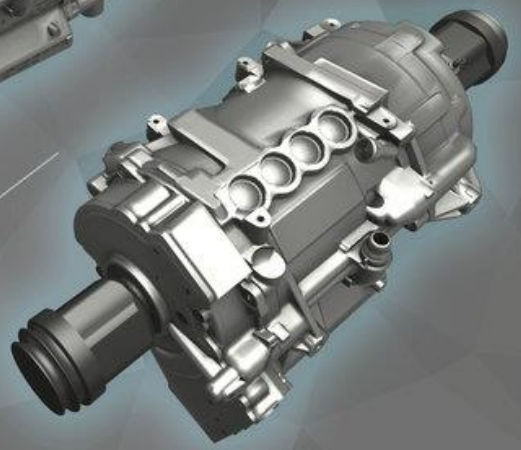
The state-of-the-art thermal management system ensures that the battery remains within its optimum operating temperature window for maximum efficiency and durability.

A heat pump is an integral part of this system: by scavenging heat from the outside air to help warm the vehicle's interior, the heat pump can deliver a double-digit increase in range – even in freezing winter conditions, when needed most.

"The electric motors are hollow permanent magnet machines which, together with the concentric transmission, offer the best power density and efficiency and the lowest weight: they give the I-PACE Concept sports car performance"

Dr Wolfgang Ziebart
Technical Design Director, Jaguar Land Rover





> ELECTRIC MOTORS

The I-PACE Concept is powered by two synchronous, permanent magnet electric motors integrated into the front and rear axles. Each generates 200PS and 350Nm of torque and is paired with a concentric, single-ratio transmission.

The driveshafts pass through the centre of the motors because this is the most space-efficient layout possible: the motors have an outer diameter of just 234mm and measure 500mm long. These compact dimensions deliver packaging benefits within the vehicle, contributing to the I-PACE Concept's impressive luggage compartment volume.

The motors are also light and extremely efficient, making them ideal for this high-performance electric vehicle. Response is immediate, and this instant torque delivery combined with all-wheel-drive traction enable the I-PACE Concept to accelerate from 0-60mph in around four seconds.

As soon as the driver lifts off the accelerator pedal, the motors provide regenerative braking, comfortably slowing the vehicle down and recharging the battery in the process. Using the Drive button within the transmission controls integrated into the centre console, the driver can increase the level of regenerative braking, if desired. The corresponding increase in deceleration means that, in stop and go traffic, for example, the driver can drive with just a single pedal, with no need to apply the brakes to halt the car.

Videos

Tesla Insane Mode Tesla Insane Mode- Slow Motion

Tesla vs BMW M4 Tesla vs Lamborghini Super Trofeo