

E-BIKE DRIVE SYSTEMS

A Comparative White Paper on Twelve Mid-Drive Motors for the US & European Markets

Weight · Battery Capacity · Support Ratio · Torque · Power Output · Sound

Prepared for TGI Cycling

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1. Executive Summary

This white paper compares twelve mid-drive electric-bicycle (e-bike) motor systems currently specified for production e-mountain bikes and light e-bikes sold in the United States and Europe. The field spans three broad performance tiers: light-assist drives built for weight and discretion (TQ HPR60, Fazua Ride 60, Bosch SX); established full-power systems (Bosch Performance Line CX in its fourth and fifth generations, Shimano EP801, Specialized 3.1, Maxon Air S); and a new class of hyper-power units led by the DJI-derived Avinox platform (M1 and M2S).

The comparison focuses on six measurable attributes requested for evaluation: drive-unit weight, paired battery capacity, maximum support ratio, maximum torque, maximum power output, and motor noise. The central finding is that the market has bifurcated. A cluster of light-assist motors now delivers 55–90 Nm of torque at roughly two kilograms, narrowing the historical gap to full-power systems, while the Avinox units have pushed peak output to 1,000–1,500 W and 120–150 Nm, figures that were unthinkable in a trail-legal package only two model years ago.

Crucially, raw output no longer maps cleanly to on-trail quality. Independent testing consistently rewards controllability, quiet operation, and ecosystem integration over headline numbers. The quietest and most 'natural' motors in this field (TQ HPR60, Fazua Ride 60) are among the least powerful, while the most powerful (Avinox) win praise chiefly for how manageably they deliver that power. For a retailer, the implication is that motor selection should be guided by the intended rider and use case rather than by a spec sheet ranking.

2. Scope & Methodology

Figures in this paper are compiled from manufacturer technical specifications and independent laboratory and field testing. The most consistent dataset is the E-MOUNTAINBIKE 2026 group test conducted with DEKRA in Stuttgart, which measured nine of these motors under identical protocols, including standardized noise capture and a fixed 2.47 km / 8.5% vertical-range loop. For motors not included in that test, notably the Avinox M2S and the Bosch fourth-generation units, values are drawn from manufacturer data and comparable published reviews.

Several caveats apply and should be communicated to customers:

- **Peak vs. continuous:** Torque and power figures are peak (boost) values unless otherwise noted. The Avinox M2S 1,500 W / 150 Nm ceiling requires a specific high-discharge battery (FP700 or RS800); with standard packs, the M2S is capped at 1,300 W.
- **Bosch software updates:** The fifth-generation CX and CX-R launched at 85 Nm / 600 W / 340%, were raised to 100 Nm / 750 W / 400% via a free 2025 update, and then to 120 Nm / 750 W / 600% via the free Performance Update 2.0 (May 2026). The latest post-update figures are used here, which is why the Gen 5 exceeds the Gen 4 on paper. Note that peak power remained at 750 W throughout, and the 600% support and 120 Nm torque are situational (available below ~15 km/h, in select modes, and only after a rider actively enables them in the app).
- **Support ratio:** Expressed as the maximum assistance relative to rider input. It reflects motor character (how eagerly assistance ramps up) as much as capability; a low ratio, as on the TQ HPR60 (200%), is a deliberate design choice for a natural feel, not a deficiency.
- **Sound:** Decibel values are approximate and drawn from a mix of sources and testing conditions. They are useful only for relative ranking, not as certified absolute measurements. Perceived tonal quality (whine, rattle, clack) often matters more to riders than raw dB.
- **Regulatory figures:** Peak power and torque do not determine legal class. Both the EU pedelec and US Class 1 frameworks regulate continuous rated power and the assistance speed cutoff. Section 6 covers this in full, and the charts in Section 4 include the relevant reference lines.

3. Specification Summary

The table below consolidates the six comparison attributes for all twelve motors. Class labels indicate the market segment each drive primarily targets.

Motor	Class	Weight (kg)	Battery (Wh)	Support (%)	Torque (Nm)	Power (W)	Sound (dB)*
Avinox M1	Hyper-power	2.56	800	800	120	1,000	~55
Avinox M2S	Hyper-power	2.59	700–800	800	150	1,500	≤45
Bosch CX Gen 4	Full-power	2.90	750	340	85	600	~65
Bosch CX-R Gen 4	Full-power (race)	2.75	750	400	85	600	~65
Bosch CX Gen 5	Full-power	2.82	600–800	600+	120	750	~60
Bosch CX-R Gen 5	Full-power (race)	2.73	800	600+	120	750	~62
Bosch SX	Light-assist	2.06	400	400	60	600	~64
Maxon Air S	Light / full	2.03	400	400	90	620	~58
Fazua Ride 60	Light-assist	2.04	430	388	60	350–450	~52
TQ HPR60	Light-assist	1.94	580	200	60	350	~48
Specialized 3.1	Full-power	3.15	840	~400‡	111	720	~58
Shimano EP801	Full-power	2.68	626	410	85	600	~60

*Sound figures are approximate/relative, drawn from mixed testing sources; treat as indicative rankings, not certified measurements. Battery capacities are representative pairings; several systems offer multiple pack options. †Bosch CX/CX-R Gen 5 reach 600% support (and up to 120 Nm) only after the free Performance Update 2.0 (May 2026), and only below ~15 km/h in select modes (Race, Turbo, eMTB+, Cargo, Auto); the default/standard tune remains lower. ‡Specialized does not publish a simple support-ratio figure — ~400% is an approximation for comparison only.

4. Comparative Analysis

4.1 Motor Weight

Drive-unit weights cluster tightly. Lighter assist motors (TQ HPR60 at 1.94 kg, Maxon Air S at 2.03 kg, Fazua Ride 60 at 2.04 kg, Bosch SX at 2.06 kg) sit at the low end, while full-power units are heavier, with the Specialized 3.1 topping the list at 3.09 kg. The notable outlier is Avinox: at roughly 2.56–2.59 kg, it delivers hyper-power output while weighing less than several conventional full-power motors. As independent testers repeatedly stress, drive-unit weight in isolation is a weak proxy for how a bike rides; total system weight (motor plus battery plus mounts) and its distribution in the frame matter far more.

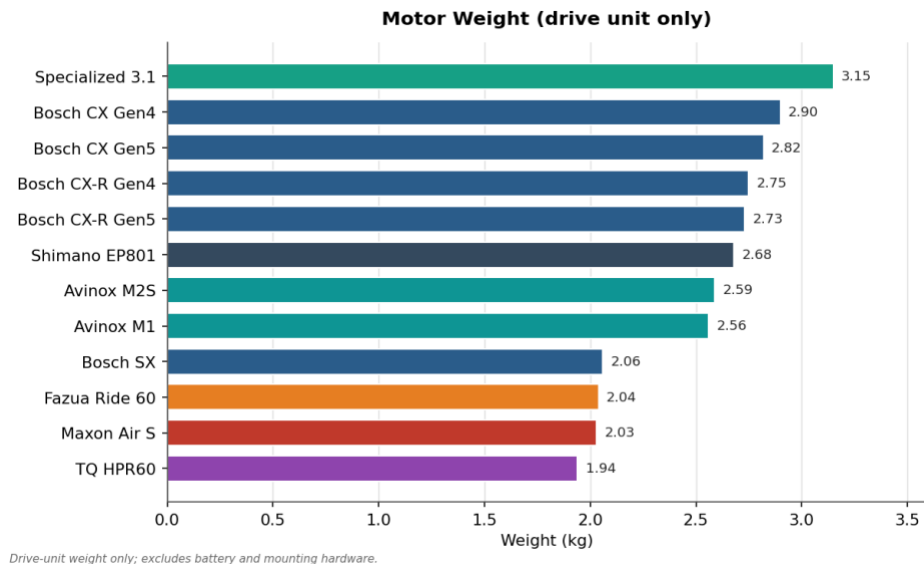


Figure 1. Drive-unit weight (kg), lightest to heaviest. Battery and mounting hardware excluded.

4.2 Battery Capacity

Battery capacity generally aligns with class. Light e-bikes pair smaller packs (Bosch SX and Maxon Air S at 400 Wh, Fazua at 430 Wh) to preserve weight and silhouette, though TQ offers up to 580 Wh. Full-power and hyper-power systems reach 750–840 Wh, with Specialized (840 Wh) and Avinox (800 Wh, plus 700 Wh high-output and removable options) at the top. Capacity alone does not determine range: efficiency and support strategy can let a smaller pack out-climb a larger one, which is why usable vertical range is the more meaningful real-world metric.

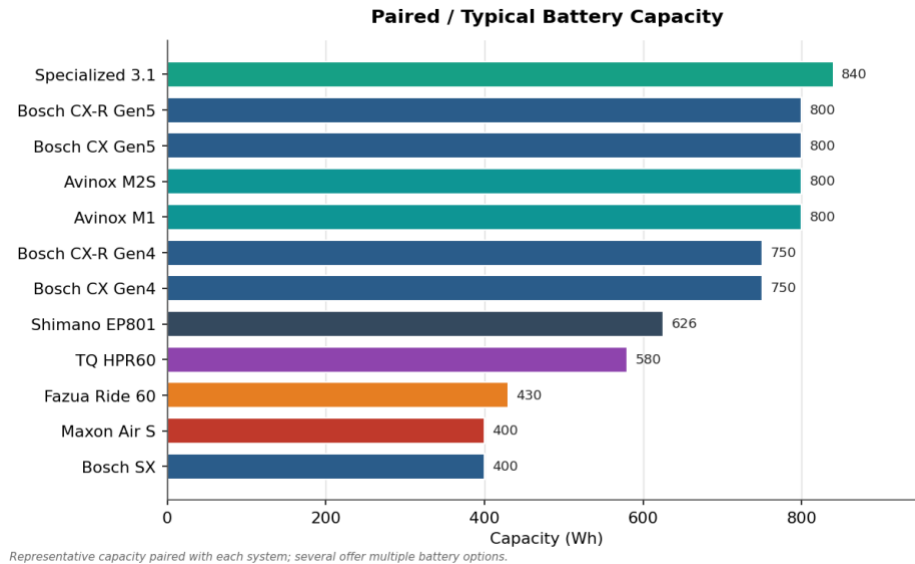


Figure 2. Representative paired battery capacity (Wh). Many systems offer multiple pack sizes.

4.3 Support Ratio

Support ratio separates the field by philosophy more than by power. The Avinox platform's up-to-800% assistance lets riders 'shuttle' uphill with minimal input, whereas the TQ HPR60's 200% ceiling deliberately keeps the rider engaged for a natural, analog-like feel. After Bosch's May 2026 update, the CX/CX-R can reach 600%, but only at speeds below ~15 km/h in select modes, so it functions as a low-speed climbing boost rather than a blanket rating. Shimano (410%), Bosch SX (400%), Maxon (400%), and Specialized (approx. 400%, not an officially published figure) sit in a broad middle band. A higher ratio is not universally better; it trades a lower-effort ride for battery drain and a less 'earned' riding sensation.

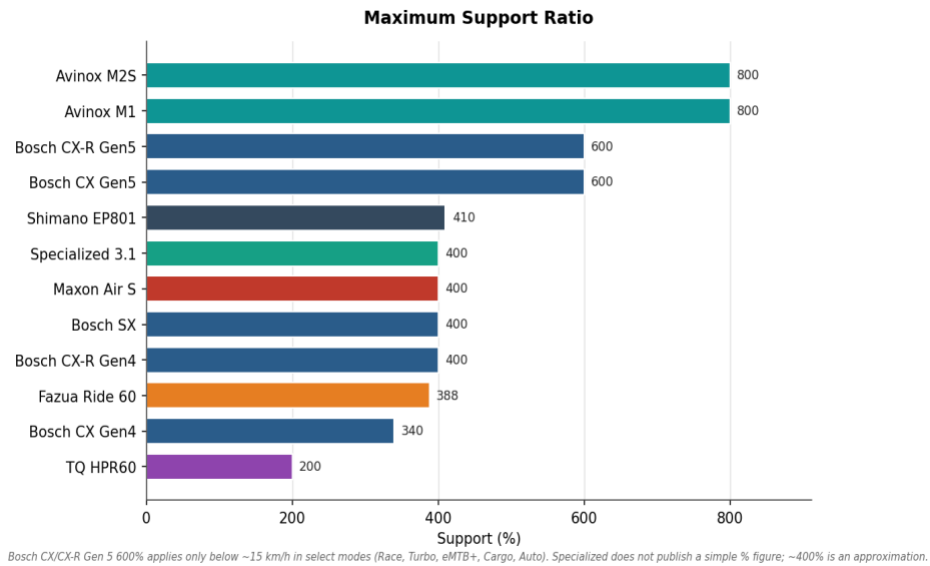


Figure 3. Maximum support ratio (% of rider input). Reflects motor character as much as capability.

4.4 Maximum Torque

Torque governs low-speed climbing pull. The Avinox M2S leads the field at 150 Nm (boost), with the M1 and the post-update Bosch CX/CX-R Gen 5 tied at 120 Nm, and the Specialized 3.1 at 111 Nm. The long-dominant 85 Nm standard (Bosch Gen 4, Shimano EP801) has been eclipsed, Bosch's May 2026 Performance Update 2.0 lifted CX/CX-R from 100 Nm to 120 Nm, and even the compact Maxon Air S reaches 90 Nm. Light-assist motors deliver 60 Nm, enough for most terrain when paired with an active riding style, but short of the effortless grunt of the full-power tier.

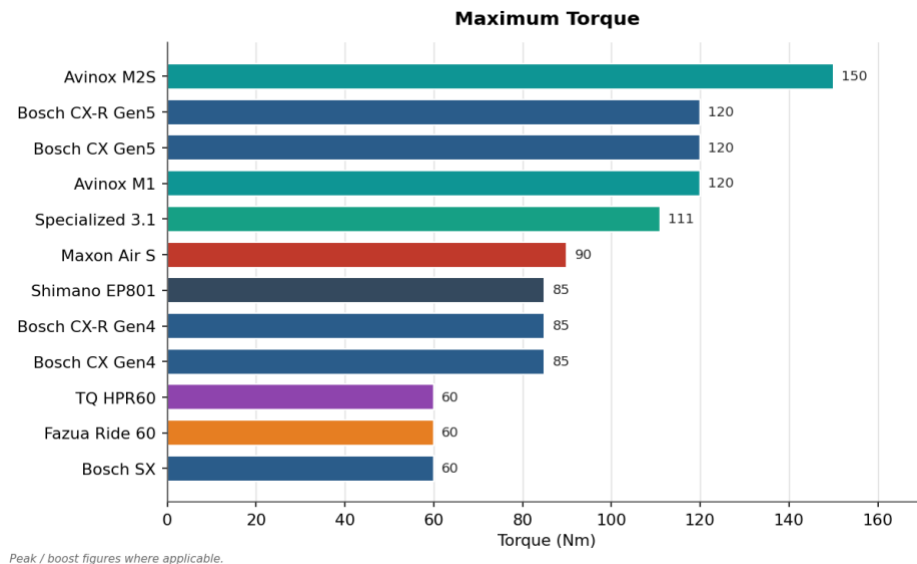


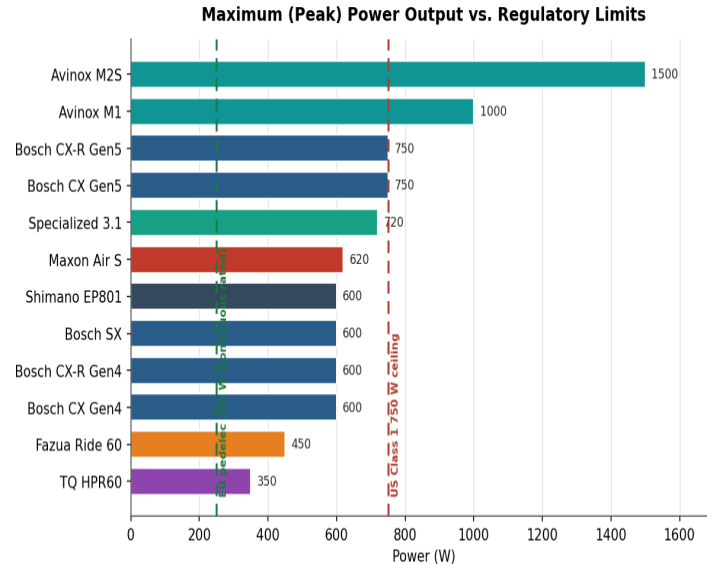
Figure 4. Maximum torque (Nm). Peak / boost figures where applicable.

4.5 Maximum Power Output

Power output shows the widest spread and most clearly reveals the market's new stratification. The Avinox M2S (up to 1,500 W) and M1 (1,000 W) stand out. Post-update Bosch CX/CX-R (750 W) and Specialized 3.1 (720 W) lead the conventional full-power group, ahead of Maxon (620 W) and the 600 W cohort (Bosch SX, Shimano EP801). Light-

assist TQ (350 W) and Fazua (350 W nominal, 450 W boost) round out the field. Note that the Bosch SX reaches its 600 W peak only at high cadence, so its on-trail feel is milder than the number suggests.

The dashed reference lines mark the EU pedelec ceiling (250 W) and the US Class 1 ceiling (750 W). One caveat is essential: those limits govern continuous rated power and the assistance speed cutoff, not the peak figures plotted here. A bar crossing a line does not, by itself, indicate non-compliance. The regulatory logic is unpacked in Section 6.

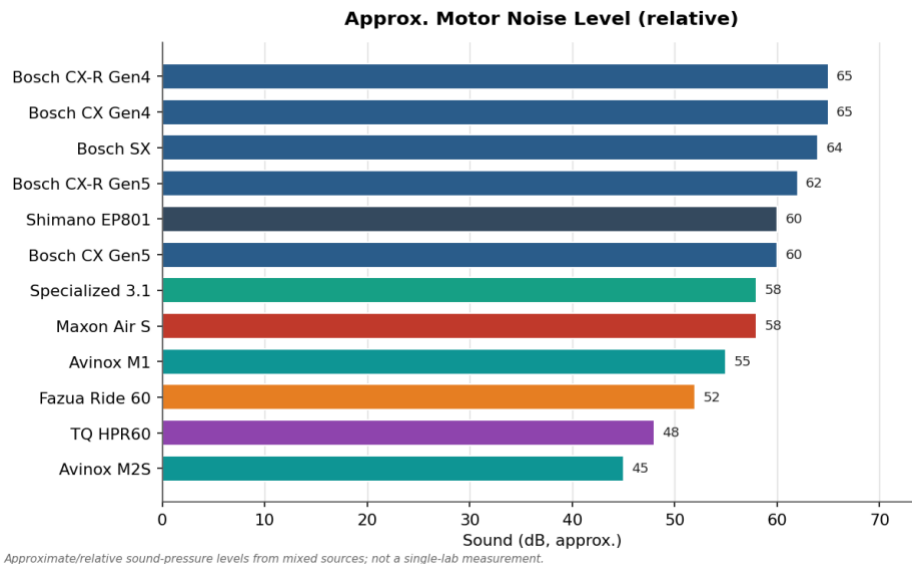


Bars show PEAK output. EU (EN 15194) and US Class 1 limits apply to CONTINUOUS RATED power and speed cutoff, not peak — so peak bars exceeding these lines do NOT indicate non-compliance. See Section 6.

Figure 5. Peak power output (W) against EU pedelec and US Class 1 reference lines. Bars show peak output; both regimes regulate continuous rated power and speed, not peak (see Section 6).

4.6 Motor Noise

Noise is where light-assist motors shine. The TQ HPR60 is widely regarded as the quietest drive on the market, with the Fazua Ride 60 close behind; both benefit from low tonal character, not just low volume. The Avinox M2S, despite its power, is claimed to be ≤ 45 dB thanks to helical dual-engagement gearing, a dramatic improvement over the audibly whiny M1. Older full-power units and the Bosch SX (with its coasting 'clack') sit at the noisier end. Because these figures come from mixed sources, they should be read as an approximate ranking rather than certified data.



Approximate/relative sound-pressure levels from mixed sources; not a single-lab measurement.

Figure 6. Approximate motor noise (dB). Relative ranking from mixed sources; not a single certified measurement.

4.7 Power-to-Weight Positioning

Plotting power against weight maps the competitive landscape at a glance. Three bands emerge: light-assist drives (bottom), the full-power cluster (middle), and the Avinox units alone in the hyper-power zone, delivering four-figure wattage at a weight comparable to conventional motors. Maxon Air S is the standout disruptor, landing near full-power output at the lightest weight in the field, which is precisely why it has drawn Editor's Choice recognition despite an immature software rollout.

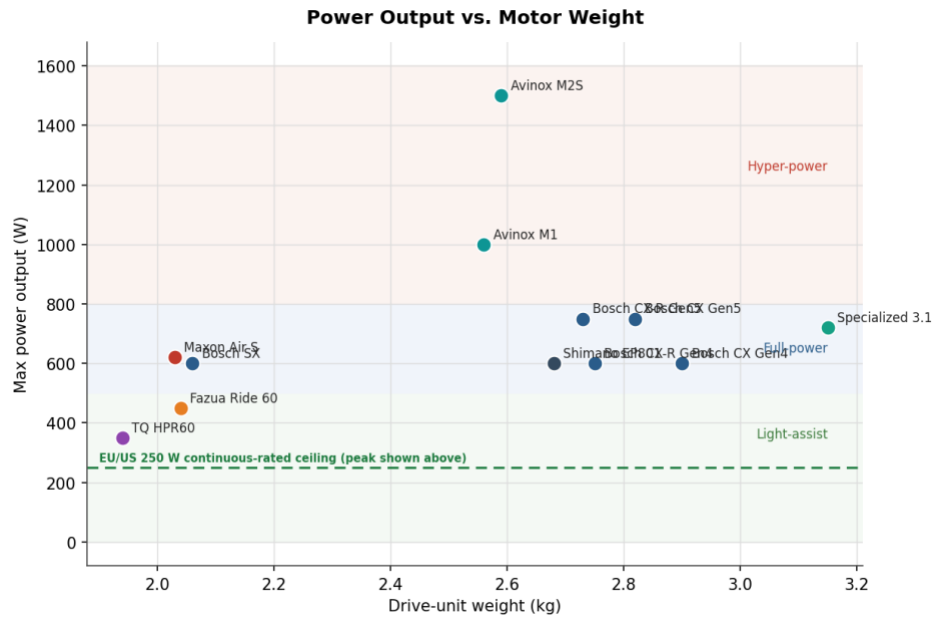


Figure 7. Peak power vs. drive-unit weight, with market tiers shaded and the 250 W continuous-rated ceiling marked. Points above the line are peak values; the regulated rated figure sits at the line for every motor shown.

5. Motor-by-Motor Notes

Avinox M1

The motor that reset expectations in 2025. 120 Nm and 1,000 W with up to 800% support in a 2.56 kg unit, wrapped in a touch-display ecosystem with fast charging and app tuning. Independent testing named it best-in-test not for peak numbers but for how controllably it deploys them, plus class-leading traction and integration.

Avinox M2S

The 2026 flagship. Flat-wire windings push continuous output to 130 Nm / 1,300 W and boost to 150 Nm / 1,500 W (with the FP700 or RS800 battery), while helical dual-engagement gears cut noise to a claimed ≤ 45 dB. Weight barely rises to ~ 2.59 kg. It represents the current ceiling of trail-legal e-bike performance.

Bosch Performance Line CX (Gen 4)

The workhorse that defined the full-power category: 85 Nm, 600 W, up to 340% (later software raised some units toward 400%). Reliable and universally supported, but heavier (~ 2.9 kg) and burdened by a well-documented coasting rattle that the Gen 5 addresses.

Bosch Performance Line CX-R (Gen 4)

A lighter, race-focused limited edition of the Gen 4 platform with up to 400% support and a more aggressive delivery. Same 85 Nm / 600 W core, aimed at competition use.

Bosch Performance Line CX (Gen 5)

A ground-up redesign: magnesium housing, two mounting points, smarter inertial sensors, a quieter gearbox, ~ 2.82 kg. Launched at 85 Nm / 600 W / 340%, raised to 100 Nm / 750 W / 400% via a free 2025 update, then to 120 Nm / 750 W and up to 600% support via the free Performance Update 2.0 (May 2026). Peak power is held at 750 W throughout, Bosch's deliberate ceiling, while the 600% support is situational (below ~ 15 km/h, select modes).

Bosch Performance Line CX-R (Gen 5)

The race variant of the Gen 5 platform weighs ~ 2.73 kg and shares the same post-update ceiling (120 Nm / 750 W / up to 600%) as the standard CX, with a dedicated Race mode. Testers found the mode so aggressive that it is hard to control on technical terrain, leaving Turbo and eMTB+, also available on the standard CX, as the practical modes, which narrows the CX-R's real-world advantage.

Bosch Performance Line SX

Bosch's light-assist entry: ~ 2.06 kg, 60 Nm and up to 400% support (both raised from 55 Nm / 340% in the autumn 2025 update, which also added eMTB+ mode), with a 600 W peak reached only at high cadence. Strong for sporty, high-cadence riders and backed by the full Smart System, but it struggles on steep technical starts and is among the louder light motors, with a coasting clack.

Maxon Air S

A Swiss disruptor: near-full-power output (90 Nm, 620 W, 400%) at just 2.03 kg with discreet integration. Efficient and compact enough to rival a Bosch CX while still riding like a light e-bike. Held back at launch mainly by an unfinished app and limited bike availability.

Fazua Ride 60

A mature light-assist system at ~ 2.04 kg: 60 Nm, 350 W nominal with a 450 W / 12-second overboost, up to 388% support, and a 430 Wh removable pack. Among the quietest motors, with low tonal character; recent software has addressed earlier reliability and responsiveness complaints. The weakest point is dated display/remote hardware. Fazua announced the division's closure in spring 2026.

TQ HPR60

The quietness and integration benchmark. Its concentric Harmonic Pin-Ring design is the most compact in the field at 1.94 kg, delivering 60 Nm / 350 W with a deliberately low 200% support ratio for the most natural ride feel tested. Ideal for riders who want assistance that feels invisible.

Specialized 3.1

Specialized's full-power flagship in its S-Works form: a claimed 111 Nm and 720 W from an 840 Wh pack, inside a tightly controlled ecosystem (motor, battery, remote, app). Praised for adaptability, traction and the best companion app in independent testing; the trade-off is the heaviest drive unit here at ~3.15 kg (the switch to all-metal gears added weight over the belt-drive predecessor). Note that the February 2026 firmware pushed measured output above the 720 W claim; one lab recorded roughly 810 W at optimal cadence, which puts the S-Works over the UCI's 750 W limit and makes it ineligible for sanctioned e-bike races, even though it remains a legal EU pedelec / US Class 1 unit (see Section 6).

Shimano EP801

A seasoned, dependable full-power motor: 85 Nm, 600 W, ~410% support, 2.68 kg, with Auto Shift and Free Shift when paired with Di2 drivetrains. Still well-rounded, but testers increasingly view its control, display and traction as trailing newer competition, signaling a need for a next-generation update.

6. Regulatory Context: EU Pedelec & US Class 1

For a retailer selling in both the United States and Europe, the single most important point to understand about these motors is that none of the peak power or torque figures in Sections 3–5 determines legal status. Both regimes regulate continuous rated power and the speed at which motor assistance cuts off, not peak output. Every motor in this comparison is sold in Europe as a 250-watt-rated pedelec, and the same hardware, with firmware set to the appropriate speed cutoff, complies with US Class 1 rules. The compliance question is therefore about configuration, not hardware choice.

6.1 EU Pedelec (EPAC) — EN 15194 & Regulation (EU) 168/2013

Under Regulation (EU) No 168/2013, a pedal-assisted cycle is excluded from motor-vehicle type approval, and therefore treated as an ordinary bicycle requiring no license, registration, or insurance when it meets three conditions: the motor's maximum continuous rated power does not exceed 250 W; assistance progressively decreases and cuts off at 25 km/h (about 15.5 mph); and the motor assists only while the rider pedals (a start-up/walk-assist throttle up to 6 km/h is permitted). EN 15194 is the harmonized technical standard that manufacturers self-certify against to demonstrate this, and the product carries a CE mark. Anything assisting beyond 25 km/h is classified as a speed-pedelec (S-pedelec), which is reclassified as an L1e-B moped and requires registration, insurance, plates, and an approved helmet.

Crucially, EN 15194 regulates the continuous rated figure, not the peak. A motor advertised at, say, 600 W or even 1,500 W peak remains a compliant 250 W-rated pedelec provided its rated output is 250 W and assistance cuts at 25 km/h. This is exactly how full-power and hyper-power motors are sold legally throughout Europe.

6.2 US Class 1 — Federal Definition & the Three-Class System

US federal law (15 U.S.C. § 2085, administered by the Consumer Product Safety Commission) defines a low-speed electric bicycle as a two- or three-wheeled cycle with fully operable pedals and a motor of less than 750 W whose motor-only assistance does not exceed 20 mph. On top of that federal product floor, most states have adopted the PeopleForBikes three-class model. A Class 1 e-bike is pedal-assist only, with motor assistance cutting off at 20 mph and no throttle, making it the most bicycle-like class and the most widely welcomed on shared-use paths and natural-surface trails. Class 2 adds a throttle (still 20 mph); Class 3 assists to 28 mph and typically requires a speedometer, a minimum rider age of 16, and often a helmet.

As in the EU, the US 750 W figure is generally compared to continuous or rated output, with firmware capping assisted speed; short peak bursts above 750 W are not what the classification turns on. Class 1 is the natural target configuration for the e-MTBs in this paper because it maximizes trail access.

6.3 What This Means for the Motors Compared

Because compliance rests on rated power and speed cutoff rather than peak, all twelve motors here can be and in their European trim already are configured to satisfy both EU pedelec and US Class 1 requirements. The figure below makes the point directly: peak output ranges from 350 W to 1,500 W, but the regulated continuous-rated value sits at 250 W across the board, and each system's controller enforces the speed cutoff (25 km/h in the EU, 20 mph for US Class 1).

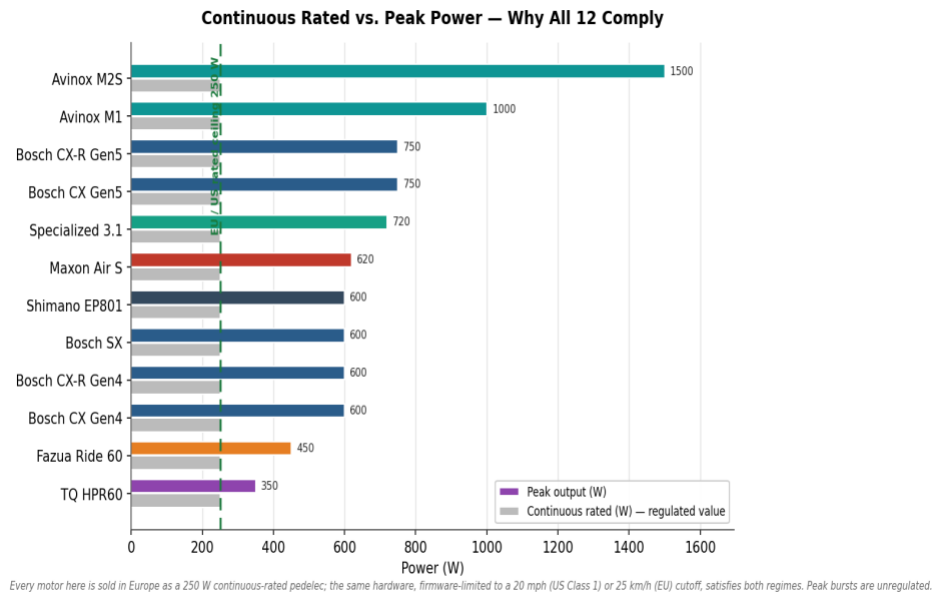


Figure 8. Continuous rated power (the regulated value, grey) versus peak output (colored) for all twelve motors. Every unit is rated at 250 W and complies with EU pedelec and US Class 1 rules when firmware-limited to the applicable speed cutoff.

Two practical retail points follow. First, the compliance line that matters is not on the spec sheet a customer reads; it is in the firmware and the shipped configuration. Always confirm the bike is delivered in a Class 1 / EN 15194 setting for the customer's market. Second, the same motor can leave the factory in different trims (for example, a 20 mph Class 1 US build versus a 25 km/h EU pedelec build, or an off-road 'unlocked' mode that is road-illegal). Selling into both markets means matching the shipped configuration and label to the destination and cautioning customers that de-restricting a pedelec to exceed the cutoff legally converts it into a moped or an out-of-class vehicle. This is the one area where a retail shop's guidance directly protects the customer from fines, insurance gaps, and trail bans.

This section summarizes general regulatory frameworks as of mid-2026 and is not legal advice. State and municipal rules vary and change frequently; for example, several US states diverge from the three-class model or set different wattage ceilings, and EU member states differ on helmet and age rules. Verify against the applicable statute for each market before point-of-sale use.

6.4 Industry Positions on Power Limits

The rules above are unsettled; the arrival of 1,000–1,500 W motors has sparked an active, sometimes bitter debate over whether e-bike power should be capped, and participants do not agree. The disagreement matters at the point of sale, because a customer cross-shopping a Bosch against an Avinox is walking straight into it. Below is a map of where the major voices stand: motor makers, sponsored athletes, trade associations, land-access advocates, and the cycling press.

Motor manufacturers are split along the lines of their own hardware.

Bosch is the most vocal proponent of a cap. It has publicly called for a ceiling on e-bike power, and its product decisions align: when Bosch released Performance Update 2.0 in May 2026, a direct response to the Avinox M2S, it raised torque to 120 Nm and support to 600% to stay competitive on climbing feel, but it pointedly held peak power at 750 W, the very figure it wants written into law. In other words, Bosch competes hard on torque and assistance while holding the exact power line it is lobbying to make legal. Shimano takes a quieter but adjacent line, competing on refinement rather than numbers. Its North American MTB product manager, Nick Murdick, has argued that torque and power figures 'are not really the end all, be all,' noting that Shimano wins UCI E-EDR World Cup climbing stages without having the highest output, a 'the number doesn't matter' stance rather than a call to legislate one.

On the other side, Avinox (DJI) has explicitly defended high power. In a public statement, it argued that power and speed are different: its systems fully respect the 25 km/h / 20 mph assistance cutoffs, and the extra output serves low-speed needs, steep technical climbs, clearing obstacles, heavier riders, cargo, and riders with disabilities, rather than making bikes go faster. It warns that a 'rigid, one-size-fits-all power limit' would exclude the riders who benefit most and has pointed out that US law never clarified whether its 750 W figure means rated or peak power. Specialized sits in the same camp by default: its S-Works motor (around 850 W) would also fall foul of a 750 W cap.

Trade associations are openly at war over it.

The German industry association ZIV (of which Bosch is a member) has floated proposals to tighten the definition of e-bikes. LEVA-EU, the European trade body for light electric vehicles, has attacked that position in unusually blunt terms. Its manager, Annick Roetynck, called it 'protectionism... I'm gobsmacked,' and accused Bosch of 'trying to stop anything which would mean competition.' Industry figure Hannes Neupert similarly charged that Bosch, having 'fallen behind in the innovation of e-bike motors,' is using its influence to slow rivals. It is fair to state this plainly: Bosch's motors top out at 750 W, so a 750 W cap would disadvantage precisely the competitors now taking its market share. The UK's Bicycle Association takes yet another view, not pro-power, but anti-reopening: it cautions that formally legislating a peak-power limit would reopen well-established e-bike regulations, risking other, less welcome changes from 'over-anxious regulators.'

Land-access advocates are the most consequential voice, and they are worried.

This is the dimension most relevant to whether these bikes can actually be ridden. The International Mountain Bicycling Association (IMBA) supports Class 1 e-MTB access to non-motorized trails only where local land managers approve it and treats e-MTBs as a motorized category to be managed carefully. Its European leadership has warned that the power race directly threatens access: they note that Norway proposed banning e-MTBs from soft-surface trails, citing the industry's push for more powerful motors, and that IMBA had to lobby to get the provision removed. In IMBA's own member survey, 44% of respondents said they see modern e-MTBs as a threat to trail access. Their central fear is precise and worth quoting in substance: if high-power bikes keep their bicycle status, land managers left with no nuanced tool may simply ban all bikes, the outcome most damaging to the whole sport. US federal land agencies (National Park Service, Forest Service, BLM) already treat e-MTBs as motorized and permit them on non-motorized trails only by specific written decision, so the access baseline is more fragile than many buyers assume.

The cycling press is divided and vocal.

Editorial teams have staked out positions too. E-MOUNTAINBIKE's 2026 group test concluded that the best motor is the one that gives the rider what they need, 'power when you want it, silence when you need it,' and argued that the leaders are those who have stopped 'chasing numbers that no longer matter.' Singletrack magazine's editorial team ran a lengthy debate, airing concerns that the power arms race is chasing market growth by attracting less-experienced, less-trail-savvy riders on heavier, faster machines, which they fear feeds NIMBY arguments for access loss. Others in the press take the opposite view, that as long as bikes meet the speed cutoff, peak output is irrelevant and access will be lost to rider behavior, not wattage. Provocative stunt content (such as a widely shared sub-27-minute Avinox ascent of Snowdon by past hikers on a peak packed with foot traffic) has become a flashpoint in this coverage.

The underlying ambiguity and its implications for Retailers

Beneath the whole dispute is a definitional gap. EU pedelec rules regulate continuous rated power, and modern motors can hold a 250 W continuous rating while producing large peak bursts, which is why the Avinox is fully EN 15194-compliant. The United States is murkier: neither federal law nor most states clarify whether 750 W refers to rated or peak power, and California's SB 1271 removed an early 'continuous rated mechanical power' reference from its final text, leaving the ceiling open to interpretation. Bosch's proposed peak-power cap is, in effect, an attempt to resolve that ambiguity in a direction that suits its own hardware.

The extent of this ambiguity is already evident in Specialized's flagship. Its S-Works 3.1 is marketed at 720 W, but after the February 2026 firmware update, independent lab testing measured roughly 810 W at optimal cadence, enough to exceed the UCI's 750 W competition limit and render the motor ineligible for sanctioned e-bike races, even though it remains a fully legal EU pedelec and US Class 1 unit. In other words, a mainstream, dealer-sold motor already crosses the exact 750 W line Bosch wants written into consumer law and does so on measured (not just peak-marketing) output, a concrete illustration of why the rated-versus-peak question is not academic.

For a retailer, the value is in explaining this landscape neutrally rather than picking a side. A customer drawn to Avinox's power is buying a fully legal bike today, but one at the center of an unresolved debate whose loudest critics are the very trail-access groups that keep singletrack open. A customer on a Bosch or Shimano is buying a deliberately conservative platform hedged to stay compliant whichever way the rules break and better positioned for federal-land and shared-trail access if enforcement tightens. Neither choice is wrong, but the shop that can walk a rider through the trade-off power today versus access certainty tomorrow is exactly the trusted advisor.

7. Conclusions & Retail Guidance

The 2026 motor landscape rewards matching the drive to the rider, not chasing the top of a spec sheet. Three practical customer profiles map cleanly onto this field:

- The rider who wants a bike that still feels like a bike: TQ HPR60 or Fazua Ride 60, quiet, light, and natural, with support that stays out of the way. Maxon Air S suits this rider if they occasionally want full-power punch without the weight.
- The all-terrain rider who wants proven, do-anything assistance: Bosch Performance Line CX Gen 5 or Specialized 3.1, mature ecosystems, strong traction, deep service and app support. Shimano EP801 remains a safe, familiar choice at a likely value advantage.
- The rider who wants the absolute cutting edge: Avinox M2S, with segment-leading power and torque, now genuinely quiet and in a surprisingly light package, provided the customer accepts a newer, DJI-derived ecosystem.

Regardless of tier, each of these motors can be sold as a compliant EU pedelec or US Class 1 e-bike because legality depends on continuous rated power and the speed cutoff, not the headline peak numbers (Section 6). But the power race has sparked a genuine debate pitting Bosch and Shimano against Avinox and Specialized, trade bodies against each other, and, most importantly, prompting warnings from land-access advocates like IMBA, who fear that ever-higher output could cost mountain bikers trail access altogether. The retailer's job is to confirm that each bike ships in the correct configuration for its market and to help riders weigh raw power today against the certainty of access tomorrow, rather than simply selling the highest number.

For a retail operation, the strategic takeaway is that headline wattage is the easiest thing to sell and the least reliable predictor of satisfaction. Control, noise, integration, and reliability drive repeat business and referrals. Steering customers toward the right tier and being candid that a 350 W TQ can produce a better ride than a 1,500 W Avinox for many riders builds the kind of trust a boutique brand depends on.

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Note: This document is an internal comparative analysis compiled from publicly available manufacturer and editorial sources. Specifications change frequently via software updates and new model releases; verify current figures before publication or point-of-sale use.