

Cylindrical vs Prismatic vs Pouch: Matching Cell Format to Your Assembly Line

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Table 1. Line implications by cell format. Cylindrical is throughput-limited by winding; prismatic and pouch are throughput-limited by stacking.

Dimension	Cylindrical (4680)	Prismatic (314 Ah)	Pouch (50 Ah NCM)
Cell example	Tesla 4680 (46×80 mm)	EVE LF314 (71×174×207 mm)	50 Ah NCM aluminum laminate
Welding	Laser tab-to-busbar; 2 tabs/cell	Laser stud-to-busbar; 2 M6 studs	Ultrasonic or laser tab; thin tabs
Stacking / winding	Winding on cylindrical winder	Stacking of cut electrodes	Stacking of cut electrodes
Module assembly	Cylindrical holders, 4–6s×p arrangement	Stack + clamp + busbar; coolant plate	Stack + frame + compression foam
Formation	Per-cell holders, 4.2±0.05 V	Per-cell holders, 4.2±0.05 V	Per-cell compression frames
EOL testing	Cell OCV + IR + visual	Cell OCV + IR + visual + busbar torque	Cell OCV + IR + visual + thickness
Throughput driver	Winder speed (cells/min)	Stacker speed (electrodes/min)	Stacker speed & handling
Format flexibility	Low (hard-tooled winding)	Medium (stack tooling changeover)	High (stack & frame flexible)

Cell format is the earliest decision in a battery assembly line, and the hardest one to reverse. Choose wrong and the line's welding stations, formation cabinets, and EOL testing fixtures are all wrong with it. The 2026 market is split between three formats — **cylindrical, prismatic and pouch** — and the data is now clear enough to make a defensible choice for a given application and volume.

The 2026 Market Split

BloombergNEF and SNE Research put the 2026 global cell-format split at roughly:

- **Prismatic** — **~63.2% of 2026 shipments by capacity**, dominated by LFP 314 Ah and 560 Ah cells for EVs and grid storage.
- **Pouch** — **~21.5%**, concentrated in NCM 50–100 Ah cells for premium mobility and specialty applications.
- **Cylindrical** — **~15.3%**, dominated by 21700 and 4680 cells. The 46xx series (4680, 46105) grew to **~98.7 GWh in 2025, up 71.3% year-on-year**, driven by Tesla, BMW and Korean cell suppliers.

What Each Format Demands of the Line

How to Choose, by Application

The format decision flows from the application and volume, not from cell preference. Three cases from 2026:

- **Grid-scale BESS, 5 MWh containers, >10 GWh/year:** Prismatic 314 Ah LFP is the de-facto choice. The cell is large, the welding is stud-based, the module assembly is straightforward, and the line throughput is dominated by the stacker, not the welder. Anything else is a custom-engineering premium you do not need to pay.
- **Premium passenger EV, 50–100 kWh packs, 1–5 GWh/year:** Cylindrical 4680 or large prismatic. 4680 wins on volumetric energy density and on Tesla's manufacturing playbook (dry electrode, structural pack). Large prismatic wins on cost and on welding/assembly flexibility. The choice is largely about which OEM supply chain you are aligning with.
- **Specialty / aerospace / high-rate discharge:** Pouch 50 Ah NCM remains the choice. Pouch cells have the best gravimetric energy density and the best high-rate discharge behavior; the cost is the complexity of the module-level compression and the more demanding EOL testing (per-cell thickness measurement).

The Line-Design Implications

Five line-design consequences that follow from the format choice:

- **Welding is the most format-specific step.** Stud laser welding for prismatic; tab laser welding for cylindrical and pouch. A line that tries to handle all three with a single welding station gives up throughput on two of the three.
- **Formation is the most capital-intensive step.** All three formats need per-cell formation, but pouch cells add a compression frame per cell that prismatic and cylindrical do not. Pouch formation is roughly 30–40% more expensive per cell than the equivalent prismatic.
- **Stacking throughput is the new bottleneck.** For prismatic and pouch, electrode stacker speed (electrodes per minute) sets the line throughput. A 2026 high-end stacker runs at roughly 0.3–0.5 seconds per electrode, and a 100–200-electrode cell needs that stacker to run continuously. The line layout must absorb the stacker's footprint and the stacker's electrode feed.
- **EOL testing differs at the cell level.** All three formats do OCV, IR and visual. Pouch adds cell-thickness measurement; prismatic adds busbar-torque verification. A 2026 line that skips these gets a 5–8% yield penalty in field reliability.
- **Format flexibility has a 15–20% throughput cost.** A line designed to switch between formats gives up 15–20% throughput versus a single-format line, but protects the investment if a buyer's roadmap changes. For 2026, this is the most common compromise.

Bottom Line

Cell format is the earliest and most consequential decision. For 2026, prismatic LFP is the volume default for grid storage and most commercial EVs; cylindrical 4680 is the right choice where volumetric energy density or Tesla-alignment matters; pouch remains the right choice for premium mobility, aerospace and high-rate discharge. The line you build around the format matters more than the format itself — a well-specified prismatic line at a reliable supplier beats a poorly specified 4680 line at a cheap supplier, every time.