



C&K® Switches for Two-Wheelers & Recreational vehicles



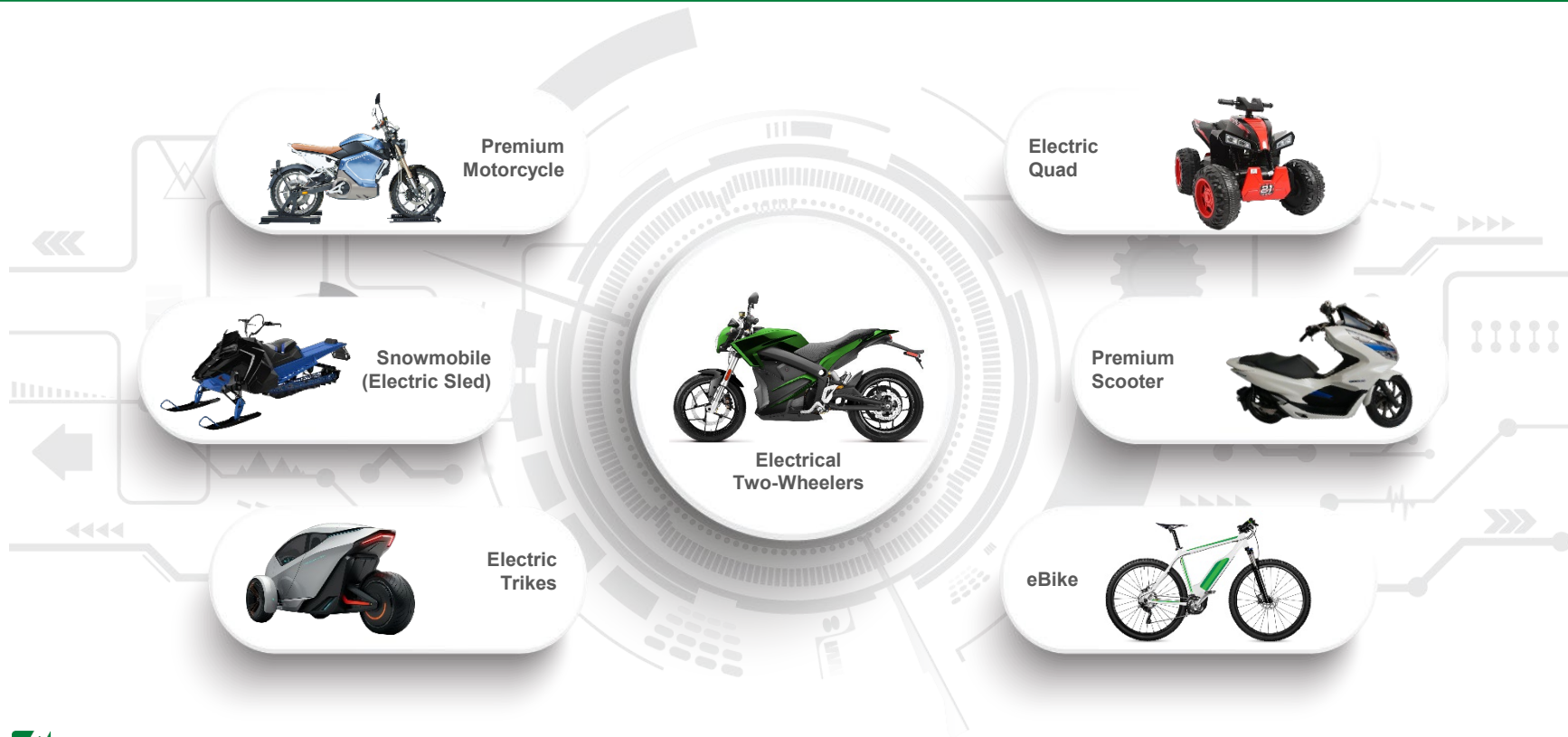
Transportation



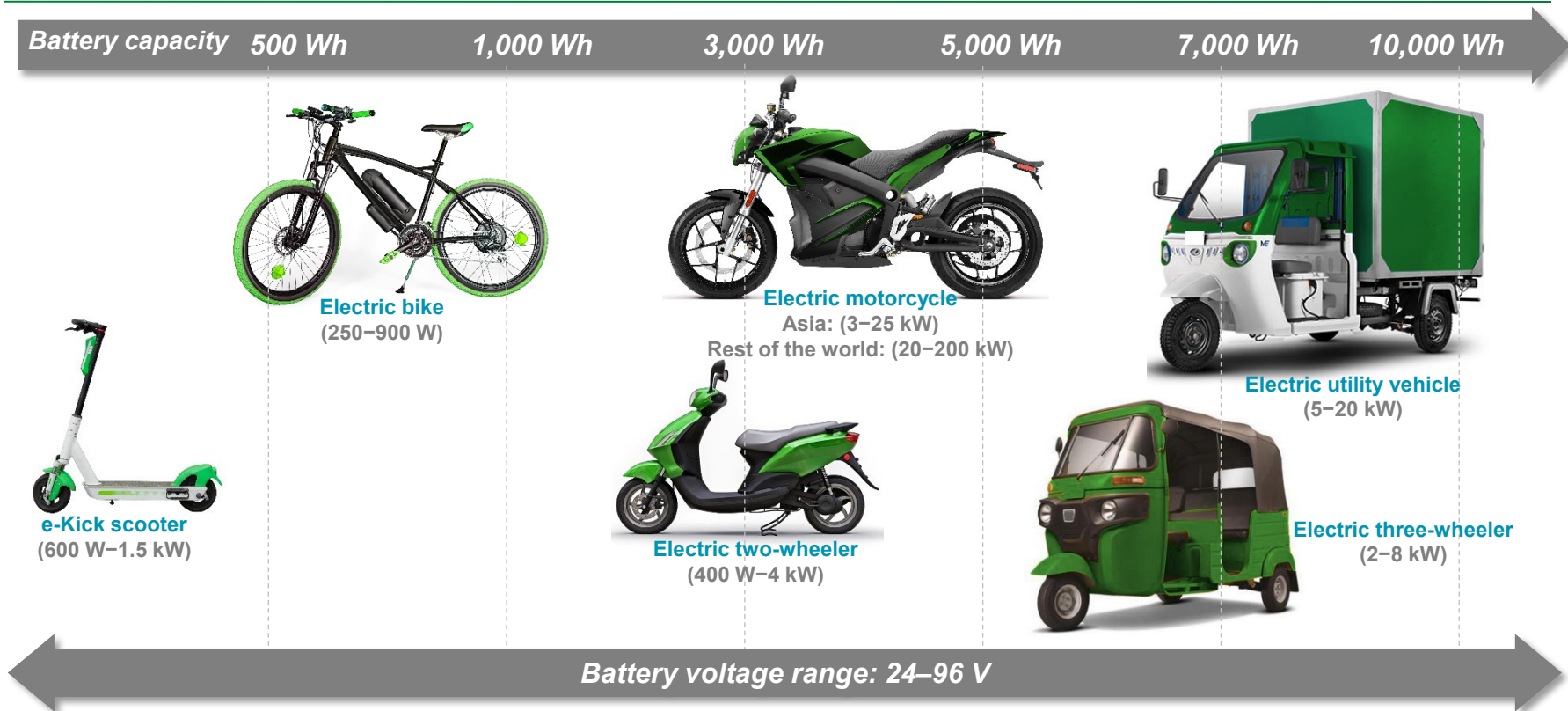
Littelfuse®

Expertise Applied | Answers Delivered

Recreational vehicles



By fulfilling zero-emission mandates, electric two-wheelers and three-wheelers help improve air quality



Electric two-wheeler and three-wheeler market trends and drivers

Market trends and drivers

The global electric two-wheeler and three-wheeler market is projected to grow from 1.05 M units in 2021 to 19.11 M units by 2031, at a CAGR of ~34%

The global electric two-wheeler and three-wheeler Li-ion battery pack market has shown double-digit growth. The limited life cycle and usable capacity are likely to shift the focus from lead acid batteries to Li-ion batteries

Li-ion batteries are lightweight, which helps maintain the energy-to-weight ratio of the vehicle

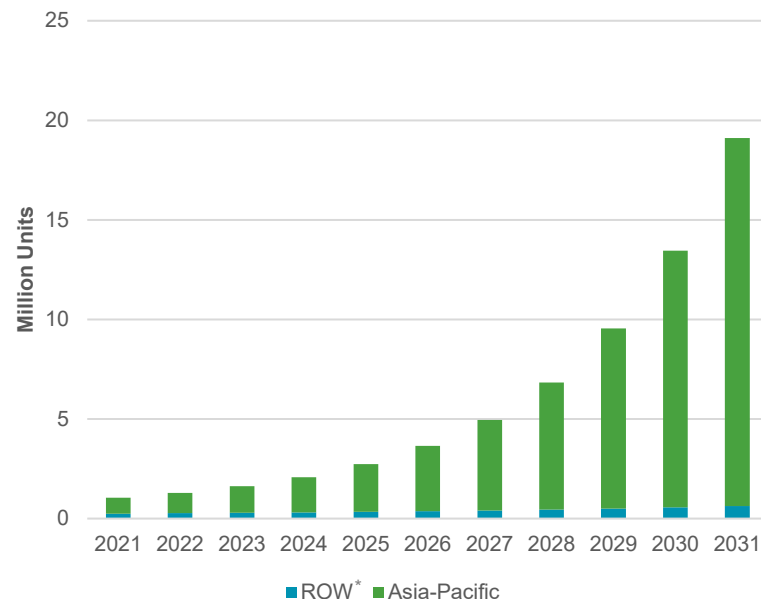
Most battery packs are 48 V; higher-end models (> 20 kW) also come with 60–96 V battery pack

Asia Pacific is expected to be the largest market. China spent about \$2.4 B by 2020 to improve its charging facility infrastructure

The Indian government has undertaken initiatives, such as FAME-II, offering subsidies and tax exemptions to encourage buyers to change from ICE bikes to electric two-wheeler and three-wheeler to reduce Carbon emissions

Currently, 27 European countries have imposed taxes on carbon dioxide emissions related to vehicles

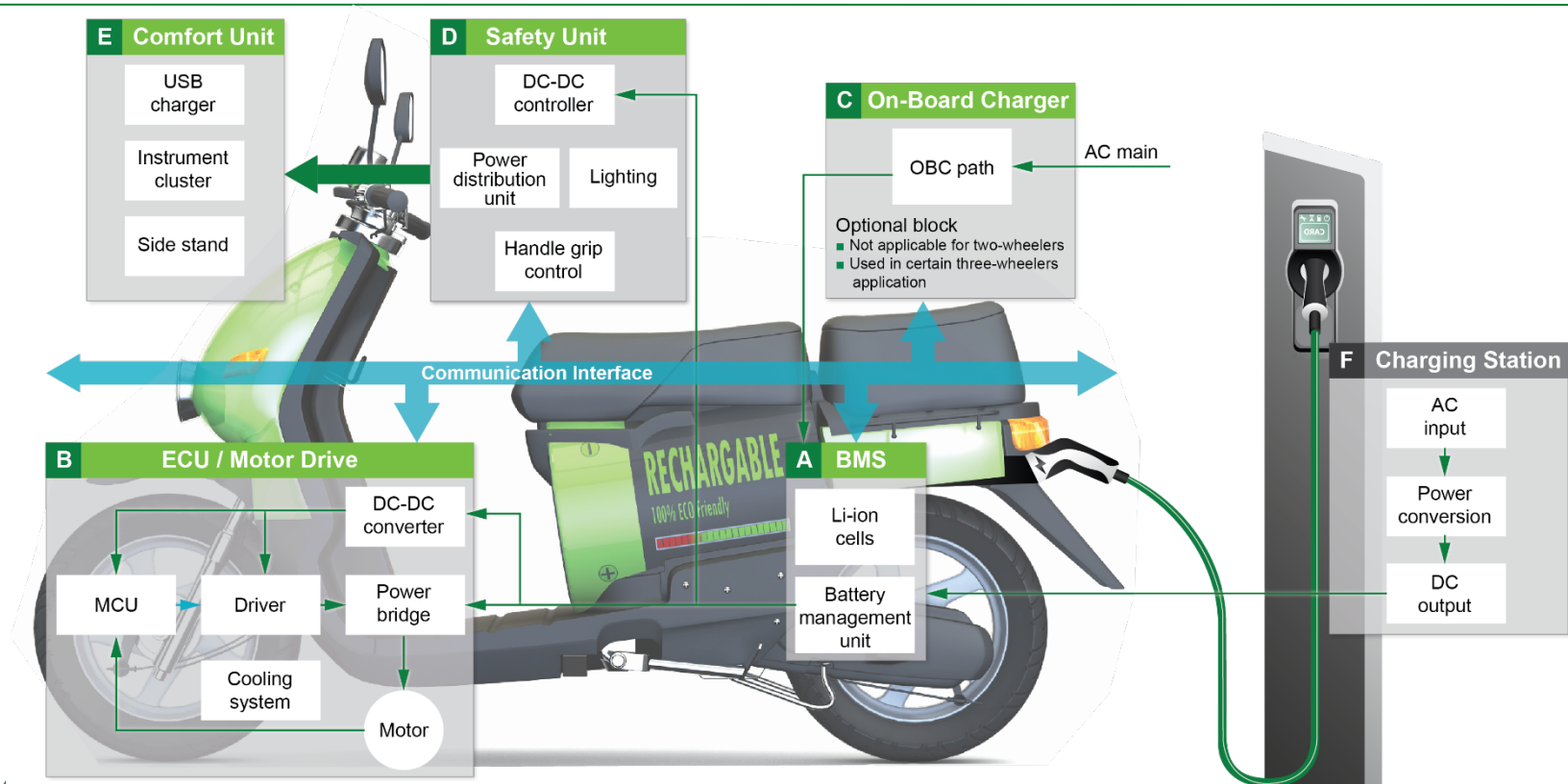
Rapid growth of electric two-wheelers and three-wheelers



Source: [CEEW](#), Littelfuse estimates (does not include kick scooter, electric bike, or Chinese electric two-wheeler forecast)

* Rest of the world

Electric two-wheeler and three-wheeler system architecture



Littelfuse solutions for electric two-wheelers

Comfort Unit (USB/Charging Port, Cluster, Side Stand)

TVS Diode, PPTC, Reed Switch



ECU/Motor Drive

TVS Diode Array, Si MOSFET
Hall Effect Sensor, NTC



Safety Unit (Lighting, PDU, Handle Grip Control)

Fuse, TVS Diode, MOV, Switch



EV Charging

Fuse, MOV, GDT, Diode,
MOSFET, Gate Driver



Battery detection

Snap-acting, Key Switch



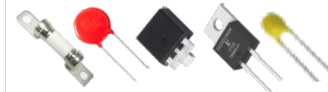
Battery Management System

Fuse, TVS Diode, TVS Diode Array,
NTC, Reed Switch, Switch



On-Board Charger

Fuse, MOV, TVS Diode, SiC Diode, NTC



Handle grip control

Tactile, Snap-acting, Key Switch



Click on the link to learn more about Littelfuse solutions for 'Two/Three Wheelers'



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C&K Switches features and benefits for two-wheelers

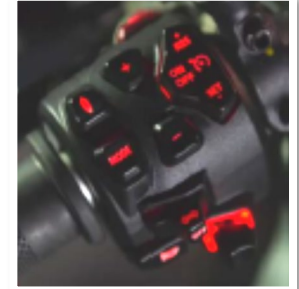


Click the product series in the table below for more info

	Switch type	Function in application	Product series	Benefits	Features
1	Snap Switch	Enables battery detection switching	ZMS , ZMSM , LCS , ZMV , ZMW	Mini size snap-acting switches are known for their reliable snap-acting mechanisms, precisions, compact sizes, and long electrical and mechanical lifespans, making them ideal space is limited	Compact size; IP65/IP67; SPST NO/SPST NC/SPDT; Value add solutions available: encapsulation of wires, wire harness; Integrated resistors for diagnostics; automotive grade products
2	Tactile Switch	Handle grip control	KSC	With its versatility, the KSC series boasts a high number of actuations, haptic selection and haptic homogeneity integration support; rated IP67 and above; features a new Electrical Height (EH version) , for easier integration calculations	Possible to combine high force (4-10N), high tactile ratio and long lifetime (up to 10M cycles); range of possible haptics to best fit the targeted use; IP67; Electrical Height (EH) version available
			EL2	Entry level series of mid-size sealed tactile switch; features basic characteristics with operating life at 200K cycles; ruggedness and IP67 rating are mainly recommended for basic application	6.2 x 6.2 mm form factor; heights 3.5 & 5.2 mm; actuation forces 2 & 3.5N; IP67; life expectancy 200K cycles
			RK	A low-profile, microminiature SMT top-actuated tactile switch, offering various actuation force options and a long lifespan; it is perfect for applications requiring a high component density in limited PCB space	Low profile and microminiature package (RKA2: 4.5 x 4.5 x 0.55 mm/ RKB2: 4.2 x 3.2 x 2.5 mm/ RKC: 3.5 x 2.6 x 1.4 mm); SMT termination; hard actuator; life expectancy up to 500k life cycles
	Key Switch		K12S	Offers an abuse-proof design; a wide range of travel and actuator forces providing strong tactile feedback; integrated illumination simplifies the design; can be sealed for environmental protection and are available in double stroke or detector versions; adapted to ride with gloves	Long travel and high actuation force; adapted to ride with gloves; multiple contact configurations (SPST, DPST, NO/NC); large range of actuation forces (from 3.5N (Detect) to 12N (Tactile effect)); illumination option; IP67 sealed; suitable for switching low-level signal circuits and CAN-BUS technology

Handle grip controls

- These are electro-mechanical switches, used underneath the buttons to provide the user with haptic feedback
- All buttons need to be ergonomic for the driver, including when wearing gloves
- All functions must be intuitive
- Correct illumination required



Handle grip controls for premium motorcycles

Keyswitch K12S Series

- Abuse-proof design
- SMD soldering
- Sealing option
- Small form factor
- Long travel and high actuation force, adapted to ride with gloves
- Multiple contact configurations (SPST, DPST, NO/NC)
- Large range of actuation forces (from 3.5N (Detect) to 12N (Tactile effect))
- Illumination option
- Suitable for switching low-level signal circuits and CAN-BUS technology

Its unique design separates the electrical and mechanical functions of the switch

Actuation

- Large actuation surface: Ø5 mm
- Able to operate with 3° rocking angle
- Not sensitive to off-centered actuation: 0.5 mm max

Environment

- High sealing level for wet/harsh environment
- Robust design: overload 100N with abuse-proof contacts, and self-cleaning contacts



Handle grip controls solutions

Tactile Switches

KSC Series

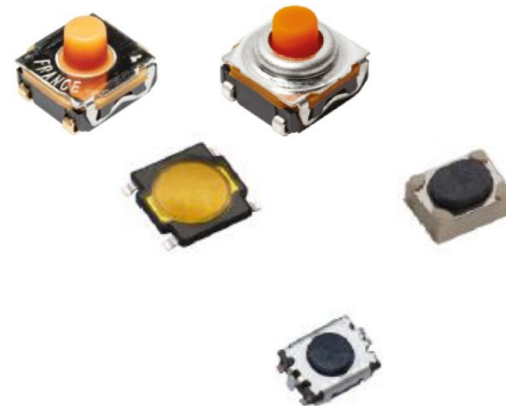
- IP 67
- Long life up to 2 million cycles
- Detect versions
- SPDT version suitable for self-diagnosis
- Overload-friendly configurations
- Forces up to 9.8N
- Silver or gold plating
- Different sounds and haptics available

EL2 Series

- Actuation forces 2 & 3.5N
- IP67
- Life expectancy 200K cycles

RKX Series

- Low profile
- IP40
- Three compact form factors
- Up to 5.4N actuation force



Battery detection solutions

Snap Switches

ZMS & ZMSM Series

- IP 65
- SPST NO / SPST NC / SPDT
- Long electrical and mechanical life
- Compact size: ideal when space is limited
- Various PCB terminals and actuators
- Specific lever on demand



ZMV & ZMW Series

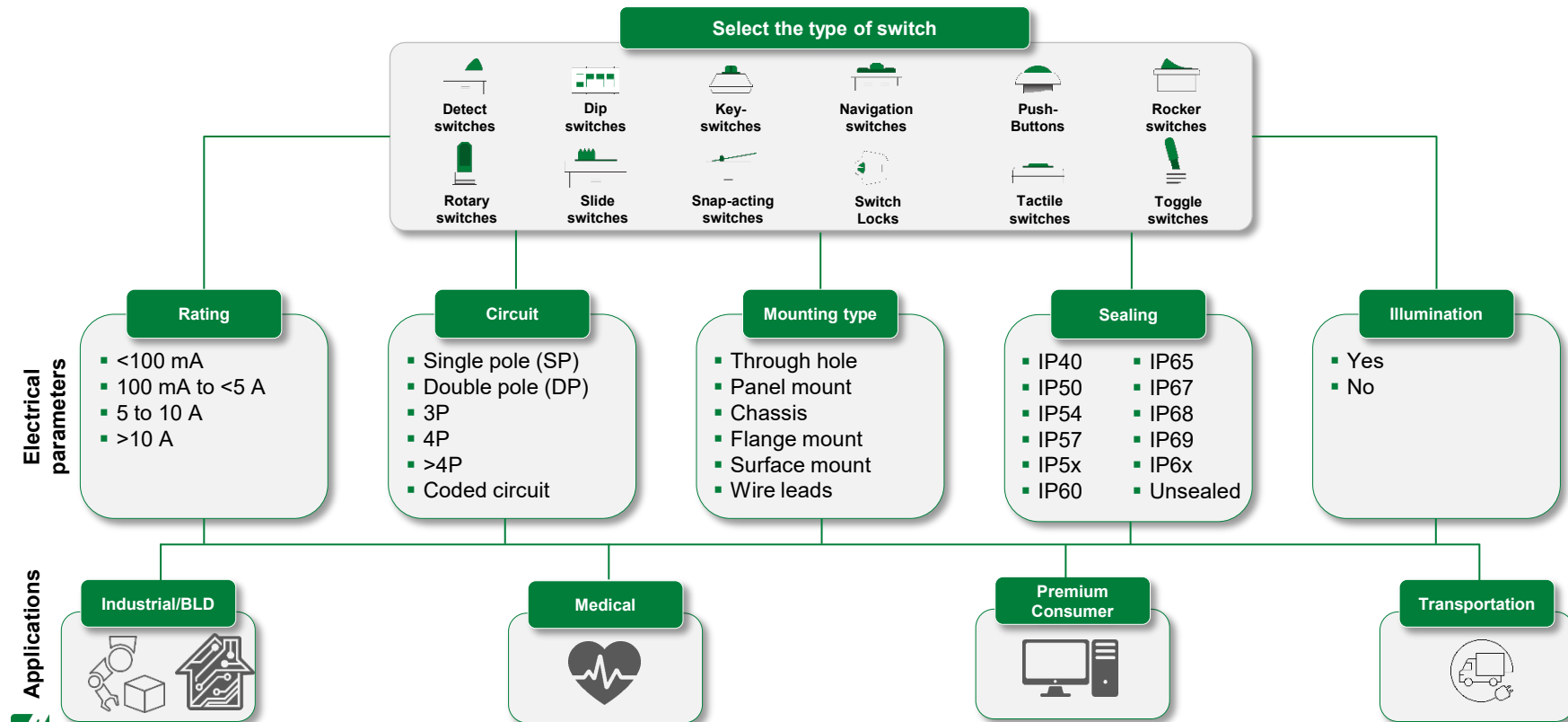
- IP 67 (except terminal part; fully IP67 on potted wire versions)
- SPST NO / SPST NC / SPDT
- Silent actuation for reduced audible click
- Up to 3 mm stroke
- Twin sliding contacts design
- Lever option

LCS Series

- IP67
- SPST NO / SPST NC / SPDT
- Quick connect, solder, and PC terminals
- Wide variety of levers and actuators
- Long life and high electrical capacity



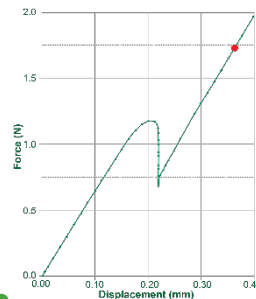
Selecting a Switch



C&K customization expertise

Enhance user experience

- Customized Haptic Switches
 - Desirable appearance, feel & sound
- Decorative solutions
 - Custom graphics, logos, & textures
- Lighting
 - Backlight accenting & light piping to enhance your product appearance

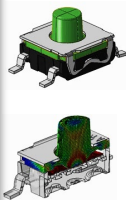


Design & manufacturing tools

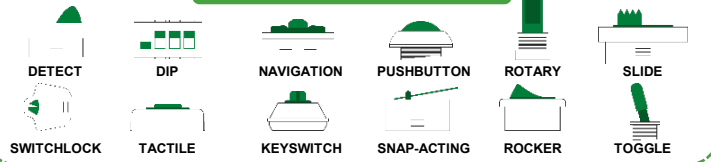
- 3-D CAD modeling
- Mold flow analysis
- FEA
- Dynamic motion analysis
- High-speed photography
- Fixed & dynamic X-ray
- Thermal imaging
- SEM/FTIR
- Sound chamber and force/displacement tester

Value added services

- Designing switches into modules & assemblies
- Multi-function & multi-axis switching
- Integrating switches and electronics
- Provides wire harnesses, terminated wires, integrated connectors, or header pins



C&K Switches portfolio



Quality & reliability

- Develop & manufacture sealed switches to meet either IP67 or IP68 standard
- Harsh environmental compatibility
- Sweat resistance testing
- SO₂ and SO₄ gas testing

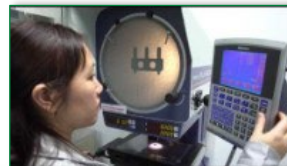


Design products to meet customer requirements for haptic touch, look, sound, & other unique features

C&K manufacturing excellence

Dole, France

- Vertically integrated, R&D (400 employees, defect rate < 0.5ppm)
- Proprietary equipment & methods
- Custom molds, dies & assembly machines
- Quality certifications (ISO 9001:2008, ISO 14001:2004, ISO 50001, TS 16949:2009, ESCC - MIL-NASA)



Huizhou, China

- Vertically-integrated, R&D capabilities (800 employees, 60 lines, defects rate < 2ppm)
- Auto-assembly & Auto-inspection machines (80 sets, 90% In-house designed, cycle time 0.8s to 2s)
- Quality certifications (ISO 9001:2008, ISO 14001:2004, TS 16949:2009)

Workshops

- 90% tooling designed and manufactured internally
- Stamping Workshops (Dole and Huizhou)
- Molding Workshops (Dole and Huizhou)
- Plating Workshops (Dole)
- Assembly Workshops (Dole and Huizhou)



Hung Yen, Vietnam

- Built in 2019 (47 lines, 250 employees, and defects rate < 2ppm)
- Manual assembly lines with semi-automated machines and tools (Cycle time 2s, lean work cells, in-line QA processes)
- Quality certifications (ISO 9001:2015)

Striving for complete customer satisfaction through state of art manufacturing facility & defect free performance



Additional information can be found at [Littelfuse.com](https://www.littelfuse.com)

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information



C&K Switches
Selection Guide



C&K Transportation
Flyer

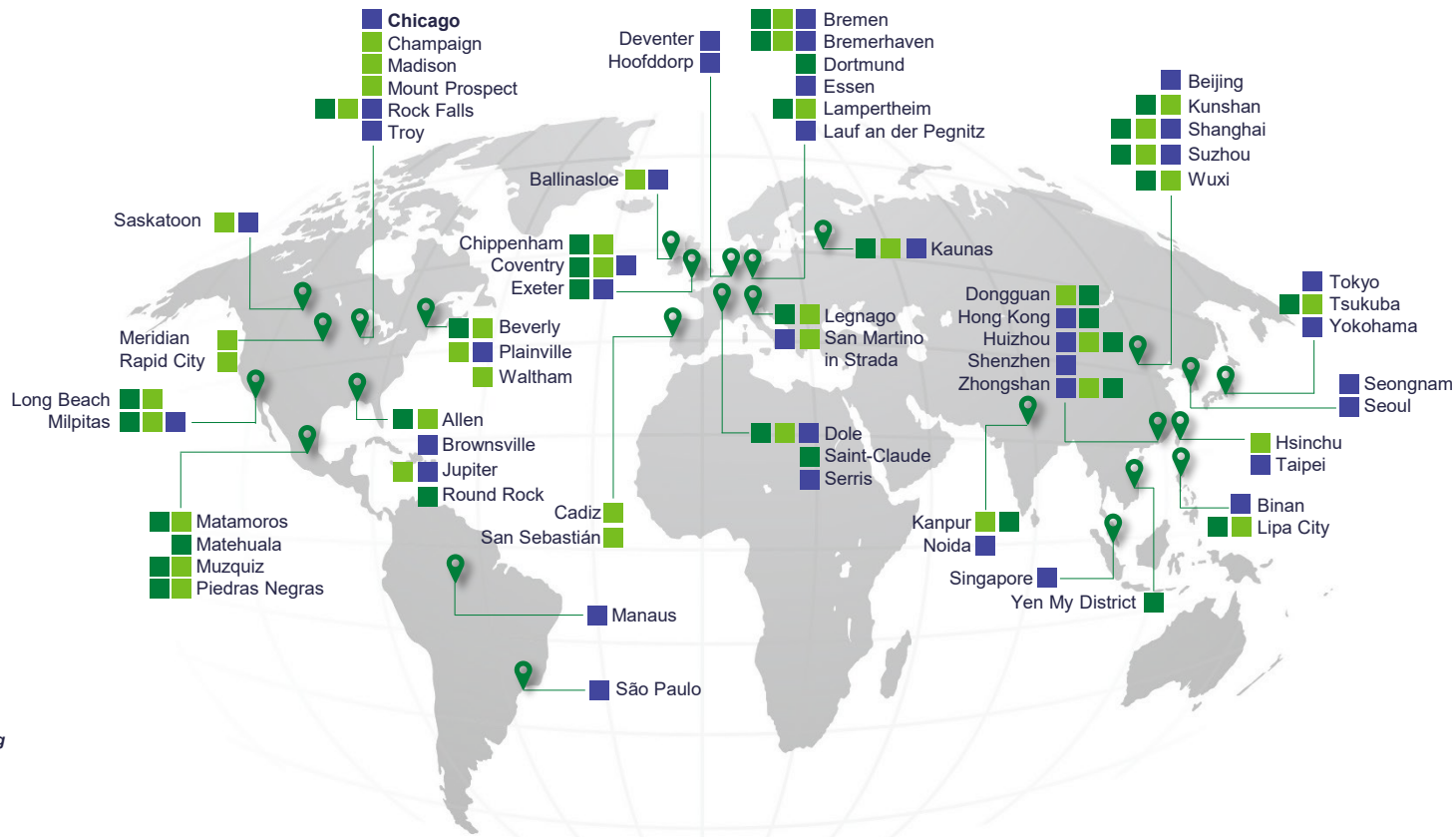


Electric Two-/Three-
Wheeler Spotlight



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Local resources supporting our global customers



Partner for tomorrow's electronic systems





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