

# Control Technology **Re**defined



MOTORiD, technology that comes to life when it's called, is redefining how we interact and bond with machines. Welcome to a new life-enriching technological journey.



# What is MOTORiD

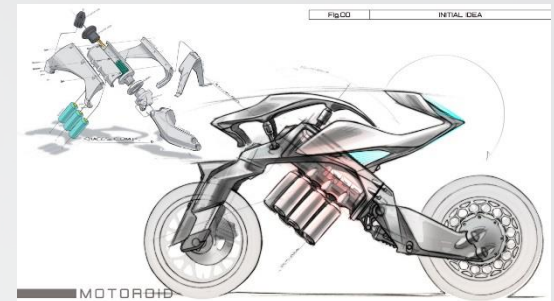
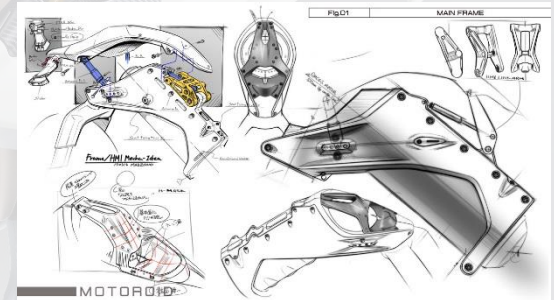
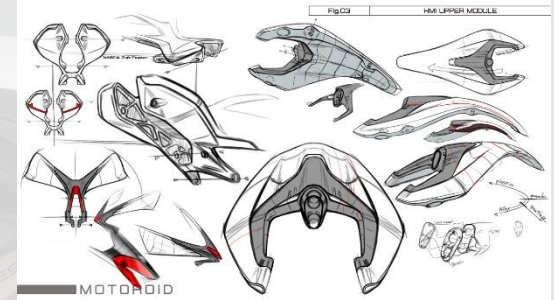
“MOTORiD” is a proof-of-concept experimental electric motorcycle aimed at new forms of personal mobility in which the rider resonates harmoniously with the machine. In order to create new experiences of *Kando*\* based on Yamaha's exclusive development ideal of *Jin-Ki-Kanno*, MOTORiD was developed under the concept of an “Unleashed Prototype.”

\**Kando* is a Japanese word for the simultaneous feelings of deep satisfaction and intense excitement that we experience when we encounter something of exceptional value.

MOTORiD is equipped with high-precision balance control via artificial intelligence and autonomous technology, and it can sense its own state and adjust its center of gravity accordingly to stand up off its kickstand and remain upright unassisted. It can also recognize its owner and move forward to meet him/her, as well as react based on its rider's actions thanks to its human-machine interface (HMI). These, among several other functions, allow MOTORiD to behave like a true partner of its owner.

MOTORiD inspires a vision of future mobility that takes vehicles beyond simple “tools for movement.” Based around AMCES,\* MOTORiD has a completely new level of functionality and an all-new structural layout, and Yamaha has taken up these kinds of development challenges with the goal of acquiring technology that creates new value for our customers.

\***Active Mass CEnter Control System:** This technology works to stabilize two-wheeled vehicles by using electronics to actively control the chassis itself and constantly optimize the vehicle's attitude.





# Feature MAP

## image recognition AI

React only to one's owner by facial recognition. Gesture recognition is also incorporated, recognizing movements of the hand such as 'come forward', 'stop' and 'go back'.

## by-wire system

Steering, throttle, braking and other vehicle controls are all done with handle switches.

## 3Dprint wheel

Carbon-containing 3D-printed wheel.  
(For both Front and Rear wheels)

## balance control (AMCES)

A control system that governs MOTOROiD's balance. The actuator is controlled based on the vehicle's posture information. The battery is being used as counterweight to modify the center of gravity for self-balancing during both stationary and in motion conditions.

## haptic HMI

A device that creates a sense of unity between the vehicle and its rider. Interacts according to the rider's riding behavior.  
(HMI = Human Machine Interface)  
※HMI function currently not available in current model

## lithium ion battery

The battery unit also serves as counterweight for the self-balancing function.

## in wheel motor

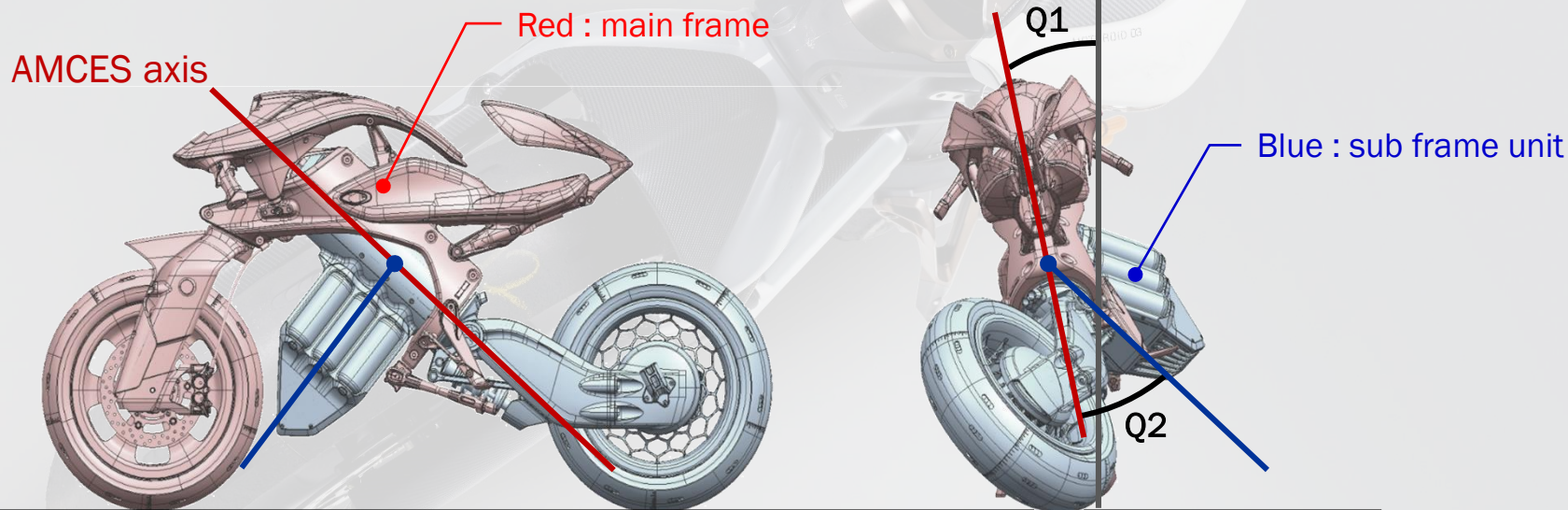
Integrated with a wheel motor.  
Reverse motion is also possible.



# balance control

## AMCES

AMCES is a Yamaha-exclusive technology aimed at electronically controlling and stabilizing the chassis of two-wheeled electric motorcycles. By actively controlling the chassis itself, the optimum attitude for the vehicle can be constantly maintained, allowing the machine to keep itself upright when standing still or when moving forward.



The basis for MOTOR0iD's balance control is the inverted pendulum, where using the information of the angle between the axis perpendicular to the ground and the vehicle inclination,  $Q_1$ , and the inclination of the pendulum,  $Q_2$ , the actuator controls the vehicle's self-balancing function.



# image recognition AI



A facial recognition system gives MOTOR0iD the ability to respond only to its owner. It is also able to recognize gestures, making it possible for MOTOR0iD to also respond to hand movements, such as using a beckoning wave or a raised palm to instruct it to start or stop moving. The system's data is continuously sent to the control unit, where it is collected and used as feedback for controlling the machine.



※image picture during recognition.

# MOTOROID



## Technical info

<https://global.yamaha-motor.com/about/technology/electronic/011/>

## Styling info

<https://global.yamaha-motor.com/about/design/concept/motoroid/>

**If you are interested please contact us.**

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