# FP009 Pitch Control System

■ As the main braking system of wind turbines, the FP009 series pitch system achieves maximum wind energy capture through precise control of blade pitch angles while effectively reducing the overall load of the turbine. With over a decade of industry experience and technical accumulation, Fute Technology can provide customers with industry-leading high-performance pitch systems.

## ✧ Application Description

▶ **Impeller Diameter:** Full-scenario solutions covering impeller diameters from 70 to 260 meters.
▶ **Driver Configuration:**
  ▷ DC driver: 1.5~2MW
  ▷ AC driver:
    ▪ 52A driver platform: 1.5 ~ 6.25MW
    ▪ 60A driver platform: 5 ~ 10MW
    ▪ 80A driver platform: 8 ~ 15MW
    ▪ Dual-driver platform: 18+ MW
▶ **Motor Types:** DC motor, AC asynchronous motor, permanent magnet synchronous motor.
▶ **Backup Power Supply:** Lead-acid battery, super capacitor.
▶ **Environmental Adaptability:** Verified in harsh environments including extreme cold (-40℃), high altitude (5000m), high humidity, and offshore salt spray.

| Applied Turbine Model | 1.5~4MW | 4~6MW | 6~10MW | 10MW+ | 18MW+ |
|---|---|---|---|---|---|
| Rated Torque | <85Nm | >104Nm | >128Nm | >182Nm | >2*152Nm |
| Maximum Torque | 250Nm | 350Nm | 420Nm | 580Nm | 2*455Nm |
| Braking Torque | 200Nm 250Nm | 370Nm | 500Nm 2*370Nm 620Nm | 620Nm 2*500Nm | 2*500Nm |
| Rated Speed | 1500rpm | 1500rpm | 1500rpm | 1500rpm | 1500rpm |
| Maximum Speed | 3000rpm | 3000rpm | 3000rpm | 3000rpm | 3000rpm |

## ✧ Key Features

**▶ Modular Product Architecture Design:**

Adopting a multi-modal working mechanism, it supports dynamic switching and collaborative operation of functional modules, enabling adaptation to complex and variable operating environments. This significantly enhances the system's reliability and stability under complex working conditions.

**▶ Multiple Safety Protection Mechanisms:**

▷ Priority Principle for Safe Feathering of Wind Turbines:

A strategy prioritizing turbine feathering, which attempts safe feathering even after severe driver failures.

▷ Chip-Level Safety Redundancy Design:

Core driver chips are equipped with built-in watchdog circuits and dual-core verification, allowing independent execution of feathering commands even if the main control chip crashes.

▷ Motor Encoder Redundancy Control Technology:

Utilizes a sensorless observation algorithm to maintain blade angle control accuracy of ±0.5° even when the encoder fails, enabling safe feathering under high-speed and heavy-load conditions.

▷ Grid-Adaptive Protection Strategy:

The pitch system incorporates a built-in EMI filtering unit to handle complex grid conditions such as voltage dips/surges, frequency deviations, and grid harmonics.

Supports seamless switching between high-voltage ride-through and low-voltage ride-through modes.

▷ Special Working Condition Protection Strategies:

Built-in anti-typhoon strategies ensure turbine safety during typhoons. Equipped with an active suppression algorithm against vortex-induced vibrations.

▷ Backup Power Monitoring Function:

Real-time monitoring of backup power voltage, current, and capacity status, with multi-threshold alarm mechanisms to ensure backup power reliability.

**▶ Efficient Maintenance Tools:**

▷ Supports virtual testing scenarios such as main control logic simulation and pitch load simulation to improve efficiency.

▷ Real-time I/O status monitoring and precise matching of fault codes with a case library to enhance maintenance efficiency.

▷ Millisecond-level data snapshots for detailed analysis of system operation data.

▷ Supports multiple protocol interfaces (CANBUS, TCP/IP, RS485, etc.).

▷ Capable of automatically generating debugging reports.