MPM Consortium Technology

### Description

# 1. Technology Scope

The MPM Consortium governs the **Mechanical Power Module (MPM)** as a universal, interoperable mechanicalâ??power primitive. The technology scope includes:

- **Core mechanical geometry**
- **Attachment interface system**
- **Safety envelope and lockout semantics**
- **Digital orchestration schemas**
- **Identity, capability, and telemetry protocols**
- **Compliance and certification infrastructure**

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The consortium ensures that all implementations remain interoperable across manufacturers, regions, and digital ecosystems.

# 2. Core Mechanical Architecture

The MPM is defined by a **standardized mechanical envelope** and **universal interface planes** that allow attachments, tools, and modules to connect without custom engineering.

## 2.1 Mechanical Envelope

- Standardized dimensions and tolerances
- Load-bearing frame geometry
- Universal mounting points
- Shock, vibration, and fatigue requirements

## 2.2 Interface Planes

- **Primary mechanical interface** (torque, thrust, lift)
- **Hydraulic interface** (pressure, flow, return)
- **Electrical interface** (power, control, auxiliary)
- **Data interface** (telemetry, identity, safety signals)

These interfaces are versioned and governed by the Technical Chamber.

# 3. Attachment Ecosystem Technology

The MPM supports a global ecosystem of attachments for agriculture, construction, logistics, emergency response, and industrial operations.

### 3.1 Attachment Compatibility

All attachments must comply with:

- Interface geometry
- Safety envelope constraints
- Control semantics
- Telemetry requirements

### 3.2 Attachment Categories

- Mechanical tools (buckets, forks, blades)
- Agricultural implements (tillers, planters, sprayers)
- Construction modules (mixers, compactors, breakers)
- Logistics modules (lift systems, conveyors)
- Emergency response tools (pumps, cutters, generators)

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Attachment innovation is encouraged as long as compatibility is maintained.

## 4. Digital Orchestration Architecture

The MPM is designed for **cloudâ??integrated mechanical power**, enabling fleet management, safety monitoring, and deployment optimization.

### 4.1 Identity & Capability Protocols

Each MPM unit has:

- Globally unique identity
- Capability profile (force, speed, lift, hydraulic power)
- Firmware versioning
- Safety state indicators

### 4.2 Telemetry Schema

Standardized telemetry fields include:

- Position, orientation, and motion
- Load, torque, and hydraulic pressure
- Battery/fuel state
- Attachment identity and status
- Safety envelope compliance

### 4.3 Control Semantics

Digital orchestration systems must implement:

- Start/stop semantics
- Mode switching
- Safety lockout
- Emergency override
- Attachment handshake

### 4.4 Cloud Integration

Cloud systems may provide:

- Fleet management
- Predictive maintenance
- Operator training analytics
- Deployment optimization
- Digital twins

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All cloud implementations must conform to consortium schemas.

## 5. Safety Technology

Safety is a firstâ??class technology domain governed by the Safety Envelope.

### 5.1 Safety Envelope

Defines:

- Maximum force, torque, and speed
- Stability criteria
- Operator proximity rules
- Emergency stop semantics
- Lockout/tagout procedures

### 5.2 Safety Systems

- Redundant sensors
- Realâ??time envelope monitoring
- Automatic derating
- Attachment safety handshake
- Remote emergency override

Safety updates require supermajority approval across all chambers.

# 6. Compliance & Certification Technology

The consortium maintains a global certification pipeline to ensure interoperability and safety.

## 6.1 Certification Domains

- Mechanical geometry compliance
- Interface compatibility
- Safety envelope adherence
- Telemetry schema conformity
- Digital orchestration compatibility

## 6.2 Test Infrastructure

Certification labs must implement:

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- Mechanical load testing
- Hydraulic performance testing
- Electrical interface validation
- Digital protocol conformance testing
- Cybersecurity audits

## 6.3 Compliance Marks

Certified products may use:

- **MPMâ??Certified**
- **MPM Attachmentâ??Compatible**
- **MPM Digitalâ??Compatible**

Marks require ongoing compliance.

# 7. Versioning & Evolution

The MPM technology stack evolves through controlled versioning.

## 7.1 Versioning Principles

- Backward compatibility whenever possible
- Clear deprecation timelines
- Public change logs
- Multiâ??chamber approval for breaking changes

## 7.2 Release Cadence

- Minor updates: quarterly
- Major updates: annually
- Emergency updates: as required

## 8. Interoperability Guarantees

The consortium guarantees:

- Crossâ??OEM compatibility
- Crossâ??attachment compatibility
- Crossâ??cloud compatibility
- Global deployment interoperability

These guarantees are enforced through certification and compliance audits.

## 9. Technology Governance

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Technology decisions are governed by:

- **Technical Chamber** â?? mechanical, interface, safety
- **Digital & Orchestration Chamber** â?? telemetry, identity, cloud schemas
- **Market & Policy Chamber** â?? deployment, regulatory alignment

Major technology changes require supermajority approval across all chambers.

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