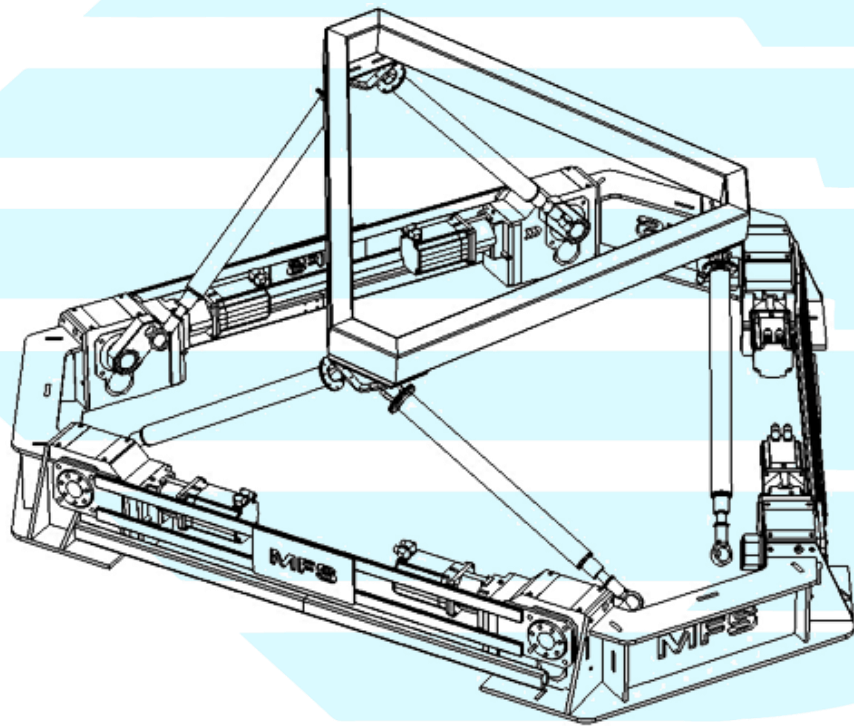# MOTION
FOR SIMULATORS

GENERAL INFORMATION & KEY FEATURES

Strong foundations for successful projects

All motion motion-systems are not alike.

- *Poorly engineered machines*
  - *collision of the platform with itself or the environment*
  - *non-optimized excursions, accelerations, velocities, motion.*
- *Low quality components*
  - *High hidden maintenance and repair costs*
  - *Overheating or breaking leading to down time*
  - *Low accuracy*
  - *unsmooth*
- *High electrical bill*
- *Noisy system*
- *Good quality machine but poor software*
  - *driver issues*
  - *disconnections*
  - *bad motion cueing*
  - *unrealistic behavior*
  - *geometry of the machine not included in the software*
  - *unwanted vibrations*
- *Poor security*
- *Basic required software cost increasing platform cost*
- *And many more*

MFS Standard & Customized performances

With our 6DOF systems, we can control any axis we want, individually or combined, such that you can even control the location of the center of rotation of your sensor. MFS can provide a wide range of possible excursions, velocities and accelerations but there is always a trade-off to be applied.

At a glance here is an order of magnitude about our standard Performances:

- Size : scale from 400mm to 5m
- Payload : up to 5500kg
- Angular Excursions : from -25° to 25°
- Angular Velocities : up to 40°/s
- Angular Accelerations : up to 500°/s2
- Linear Excursions : from -300mm to 300mm
- Linear Velocities : up to 400mm/s
- Linear Accelerations : up to 2g

The combination of possible performances is a matter of compromise and depends on one situation to the other. Custom projects we've designed outreach those standard values

- Payload of 20 tons
- Higher angular excursions
- Higher velocities
- Higher acceleration

Key features for all MFS motion systems

- CE Compliant
- Solid industrial quality
- Reliable components: Schneider electric servo motors and drives
- Engineered by a team of highly skilled and experimented mechatronic engineers
- Long life span
- Minimal maintenance/ highly reduced cost compared to hydraulic machines and other electrical motors (visual checks, torque check ...)
- Easy repair/replacement

- Operation 24/7 with no overheating issue
- Designed to run in a failsafe environment
- Silent operation

- Compact dimensions with minimum base height
- Customization service available (of the platform and upper platform)
- Hardware selection to fit your exact needs (system tailored for your specific requirements at the right price)

- Micro vibrations elimination system
- Update rate 4msec (250Hz) & Up to 1 msec if required

- No installation, driver, usb needed (Ethernet socket enough)
- Software communicates with the motor drives directly (no external sensors - no external encoders - no extra motion controller) - The lesser components in the chain, the more accurate the communication & the faster the response time.
- Fast ethernet communication between controlling PC and motion controller
- CAN Technology for communication between motion controller, drives and servo motors
- Platforms can be run in serial from one machine
- Platform geometry parameters entered in the software for ultra-precision

- Low power operation requirements - Minimal operation cost due to low power requirements
- High-end industrial AC electrical servo technology
    - Servo control systems are best suited to high speed, high torque applications that involve dynamic load changes
    - Very high dynamics
    - Servos are excellent in applications requiring speeds greater than 2,000 RPM and for high torque at high speeds or requiring high dynamic response
    - Motion Controller Update Rate : Standard of 4msec / 250 Hz with up to 1 msec optional for customized projects.
    - Overall better quality
    - Ultra-smooth operation
    - Ultra-precise (over 2 million positions per motor rotation)
    - Ultra-High repetition rate
    - Reactiveness
    - Very compact compared to an asynchronic solution and hydraulic machines
    - Very balanced relation between nominal and peak power
    - Drivers may be installed next to each other.
    - Sincos in the motor for an automatic motor recognition
    - Drive equipped with SIM card slot for eventual parameter upload/ download
    - All connections on puller plugs
    - Absolute encoder a no homing required
    - Very extended tuning possible
    - Silent and do not need extra cooling nor holding brakes and have a remarkable torque
    - Low power consumption
    - …

- Maximum automated safety & emergency stop buttons

- High quality powder coating paint

- Reliable company, over 20 years in the business with world renown customers

Platform extra available options (not included)

- Custom upper platform (instead of a base triangle or square on which you must anchor your upper platform, we design and build your upper platform to suit your unique specifications. Upper platform will be modular for large projects to allow easy worldwide transport
- Visual systems (HD, Curved screens, projector bridge,…), case study
- Cabins
- Custom service available
  - Restricted available space
  - Specific system, and requirements
  - Customized upper platforms
  - Customized platform, screen and cabins
- Protection bellow
- Protecting fences
- Extra external I/O for control in and outside the platform (one already included)
- Stairs
- Computer
- Monitors or projectors
- Solid, vibration, resonance visual solutions and cabins
- Gaming or simulation controller
- Security Flashing Light/beacon
- Stairway
- Fencing
- Seats
- Extra emergency stop button
- Extra cable length between control box/ electrical cabinet and the servo motors (platform): 5 meters (more length available optionally)

MFS motion control software specifications

GENERAL TO ALL SOFTWARE AND INCLUDED WITH ANY PURCHASE

- Easy and quick software setup. No driver installation, no library installation. Runs on every windows PC. Just copy-paste and run. Thus, no need for installing USB drivers and conflicts, …

- 100Mbps Ethernet connection to the motion controller gives you plug and play access to the motion controller. The high bandwidth of this standard communication channel ensures maximum performance of the motion platform servo drives giving you quick response time to get the best out of your system. This makes it possible to simulate for a wide range of applications, from slow soft movement to rough and very hard vibration.

- Ethernet connection also allows you to place your motion control PC wherever you want

- Easy to find cables, easy to find switches, etc.

- Auto-monitoring / auto recovery system: the software provides a robust interface to the motion controller and the platform. Any disconnection is auto recovered to avoid interruption.

- Load indication: At all times the load of the motors can be monitored from the main screen. This will always guarantee maximum performance.

- Easy manual control of each axis. They can be individually controlled or in a multi-axis mode. This allows maximum working flexibility for setup and service of your system.

- Quick and easy configuration of the platform settings. The entire platform behavior can be adapted to the needs of your setup.

- You can adapt each axis separately and reduce excursions if needed. You can reduce the platform in restricted space and remove limitations once the system is placed in a bigger room.

- Extended troubleshooting possibilities: the status of each axis can be monitored at any time. Our diagnosis screen which allows us to monitor different parameters of the motors like temperature, error codes… This makes it easier for our support team to offer quick and appropriate support with minimum effort and minimum downtime for your system.

- Motion recording: platform motion recording will provide you with a visual image of your last simulation. This will help you to tune the parameters (washout filters, landing impact…) of your simulation to its maximum. Getting a visual image of your simulation is very important to understand the motion behavior and to compare different sets of parameters.
- Easy remote support
- Easy remote firmware and software upgrade

Maintenance software (included with any purchase)

- Verify the motion system for functionality
- Motor and drive load indication
- Move and calibrate the platform
- Manual control of each axis
- Reassign neutral position and set limitation to the axis
- Troubleshooting
- Motion recording

Platform 3D Emulator

- View platform motion without the platform
- Recommended for developers

Industrial testing software

- Recommended for developers
- Create highly customized motion profiles
- User friendly trajectory editor
- Easy on the fly profile adaptation
- Superimposition of tunable motion primitives

Precision Motion Base Software

- This software removes the non-linearities within our motion controller. In addition, the software allows the center of the moving platform coordinate system to be

moved anywhere. The software can determine the location of a point(s) on a Unit Under Test in free space such as in antenna testing. As part of the Precision Control Software, a Dynamic Software Evaluator reads the feedback pots from each of the six actuators and calculates the roll, pitch, yaw, X, Y, and Z position of the motion base moving platform. The positions can be sent to the computer so that the user knows exactly where the motion base moving platform is at any time. This allows our 3D emulator to work (the geometry of our systems being programmed within our motion controller for maximum precision.

Entertainment Ride

- Software is primarily used in the entertainment industry to program a ride profile to a predetermined video or entertainment production.
- Easy edition of motion profiles
- On the fly edition

Flight sim software

- Ultra-simple installation (copy and run exe / click FLY – PAUSE – STOP – PARK)
- Fadeout braking system (tunable) to avoid rough and unrealistic shocks.
- Ultra-realistic motion cueing based on the best thesis and fine-tuned with flight instructors from reknown airlines and pilots
- Highly customizable motion cueing: The motion cueing algorithm provides a realistic simulation of all important parts of simulation. (Turbulence generation, take off force feedback, braking push forward, landing touchdown, terrain vibration on the ground, washouts for all movements such as pitch, roll, sway…)
- For every simulation, a profile can be selected or generated to optimize the motion and washout filters in every situation. Standard profiles for most common vehicle are available (Airliners, GA, Helicopters, truck, racing car, boat, spaceship …). They can be selected, copied or optimized and fine-tuned according to your needs.
- Strong community of flight simulation enthusiasts

Sea state profile

- This software performs Sea State level 6 as long as the motion system can perform to that specification. This software is used, but not limited to, testing the stability of modern transmitting/receiving equipment for seaboard use, simulation of on board landing deck for drones…
- Prerecorded motion scenario available (sea motion in different condition)

Games and software interface

- Interface software for popular racing games and others.

Custom software

- Tailored to meet your needs
- On request

Solutions for developers

Developers can control our motion platforms in 2 ways.

The **.NET DLL (API.DLL)** holds easy access functions to control our motion controller (For instance: enable platform, disable platform, setPitch, setRoll, etc). This DLL can be integrated into the customers own proprietary software package. An API document describes all available functions.

The **MFS Ethernet protocol** is used to control the MFS motion controller. The protocol is TCP/IP based and allows customers to control the platform from another Ethernet capable embedded controller or other non-windows hardware. The protocol is described in a single PDF document.