Eng Ver.

MNC SOLUTION

Creating Motion& Control

Ground · Sea · Sky · Space

We create and precisely control movement anywhere
in the ground, sea, sky and space

MNC SOLUTION

(Nae-dong)171, Wanam-ro, Seongsan-gu, Changwon-si, Gyeongnam, Korea 51528

Official No. +82- 55-269-5541

MNC SOLUTION

Starting with the development of hydraulic parts for construction machinery, MNC Solution, since its establishment in 1974, has **steered the defense industry** in Korea towards growth by extending its drive **stabilization and precision control technologies** into various sectors such as the defense industry.

1974. 12
- Established 'TongMyung' Industries, INC

1976. 11
- Started to produce hydraulic products
- Started defense business

1996. 08
- Obtained ISO 9001 certificate (Quality Management System)

2000. 02
- Obtained National Defense Quality System (KDS 0050-9000)

2008.08
- Chagned company name as Doosan Corporation Mottrol (Incorporated into Doosan)

2010.09
- Obtained AS9100 C certificate

2016.06
- Obtained Productivity Management Systems Certificate (Level 6)

2017.12
- Won the Quality Management National Defense Award 2017

2021.01
- Changed company name as 'Mottrol' (apart from Doosan group)

2023.12
- changed company name as 'MNC Solution' (Spin-off)

With accumulated technology and quality, MNC Solution has contributed to the establishment of a state-of-the-art defense system by providing the hydraulic/electronic solutions as a core function for the defense industry sector.

Vision

MNC Solution vision

MISSION
We create and precisely Control movement anywhere In the ground·seal·sky and space

VISION
Motion & Control Key Technologies Global Leader Dominating the Global Market

SLOGAN
Creating Motion & Control

Core values

core values

Since its foundation in 1974, MNC Solution have manufactured high-quality products that meet the requirements of our clients and their trust through continuous technological innovations. These two values of technological innovation and quality control are of the highest priority and critical to the future growth of MNC Solution Co., Ltd.

01 **Continuous Technological** Innovation

02 **Customer-Level** Quality

03 **World-Class** Expertise

04 **Cooperation Through Communication** Trust

05 **Positive Tenacity's** Challenge

Work place

workplace

Location (Nae-dong)171, Wanam-ro, Seongsan-gu, Changwon-si, Gyeongnam, Korea 51528

Contact +82-55-269-5541 FAX : +82 55-269-5224

Web site www.mncsolution.com


Company View


Production Facility


R&D Center


Test Facility

MNC SOLUTION

Creating Value through Technology

Creating Motion& Control

MNC Solution has contributed to **national defense** by developing and supplying the hydraulic systems and electro-hydraulic systems to the Army, Navy and Air force.

Applications & Solutions

1 Driving & Stabilization System

1) Gun/Gun Turret Driving System
- Hydraulic type of Gun/Gun Turret Driving System
- Electric type of Gun/Gun Turret Driving System

2) Precision Driving System for Laser Weapon
- FSM, Fast Steering Mirror
- Pedestal Driving system for Laser Weapon

3) Stabilization Systems for Terminal Antenna Pedestal

4) Electro-Mechanical Servo System for Short Range Tracking Radar

5) Controller for Helicopter gun driving and ammunition feeding

6) Gyroscope for Ground Vehicle

2 Hydraulic Components & System

1) Hydraulic Systems for Missile Launcher

2) Hydraulic Components for Aerospace
- Hydraulic Pump
- Accessary parts for turbo-fan engine

3) Hydraulic Servo Valve

3 Hydraulic & Electric Winch System

1) Winch System for Sonar Detection Unit

2) LARS, Launch and Recovery System

4 Hydro-pneumatic Suspension System

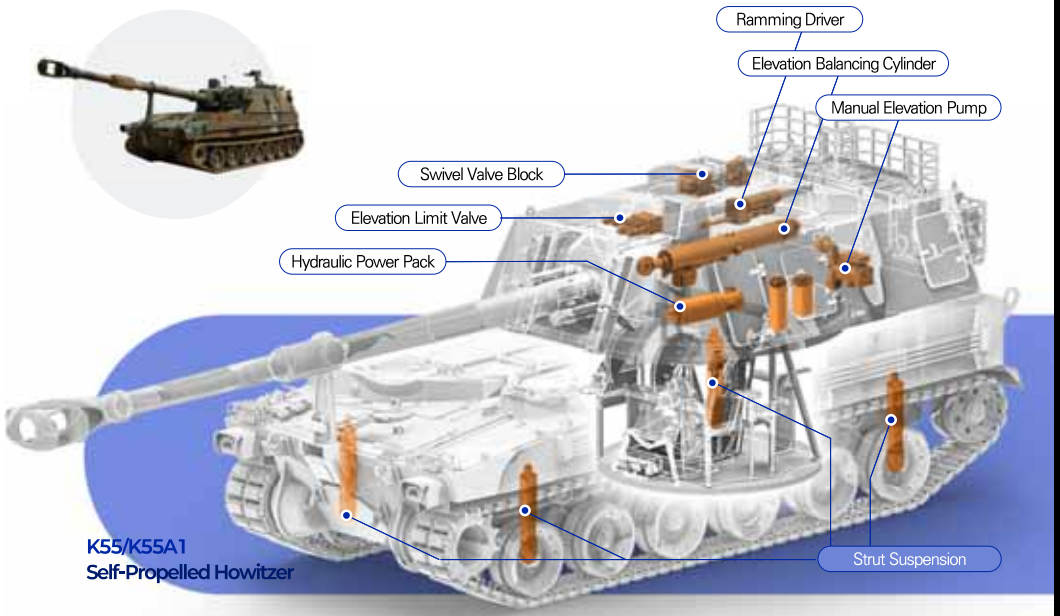
5 Core-components for Space Industry

1) 3 stages TVC(Thrust Vector Control) system for Space Rocket

2) Coupling Device for Satellite & Space Debris Removal Payload

Hydraulic Gun/Turret Driving System

The hydraulic gun/turret driving system for K55/K55A1 is a key device that supplies hydraulic pressure to the elevation balancing cylinder responsible for up-and- down operation, traverse device for rotating the gun turret and ammunition auto-loading system.



1 | Elevation Balancing Cylinder

Drives gun up/down with the hydraulic power from gun control system and protects the gun by absorbing the firing shock.

2 | Elevation Balancing Cylinder

High angle is limited to prevent loading device collision with the floor.

3 | Ramming Driver

Piston rod pushes or pulls push-rod assembly for automatic loading.

4 | Swivel Valve Block

This block controls hydraulic oil flow direction to raise or lower loading device assembly.

5 | Hydraulic Power Pack

Converts the electric power from power supply system to hydraulic power (pressure/flow rate) to supply to elevation, traverse and loading systems.

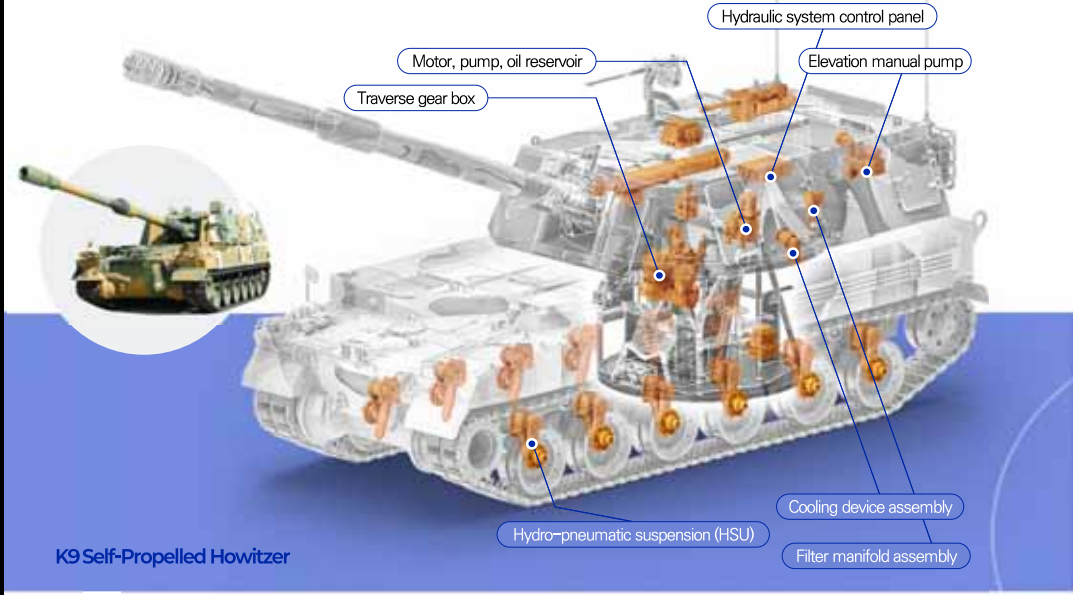
6 | Manual Elevation Pump

Raises or lowers gun manually in case of main power line failure.

Key features

- Operating gun up-and-down **through Elevation Balancing Cylinder**
- Rapid loading shells **through auto flick ramming system**
- Energy saving **through discontinuous drive**

The hydraulic drive system of K9 self-propelled howitzer uses hydraulic power generated from the hydraulic power generator to drive the gun up-and-down, drive the gun turret rotation, and it also loads shells into the gun barrel.



1 | Traverse gear box

Converts hydraulic power into mechanical rotational motion to traverse turret.

2 | Motor, pump, oil reservoir

Controls hydraulic fluid flow according to the signal from the electronic unit to control the speed of the elevation drive system.

3 | Filter manifold assembly

Removes impurities from the hydraulic oil in supply and return lines. A pressure switch triggers alarms when clogged.

4 | Hydraulic system control panel

Supplies power to the hydraulic system components of turret, and drive electric motor and pump to generate the hydraulic power for turret driving.

5 | Elevation manual pump

Raises or lowers gun manually in case of the main line failure.

6 | Cooling device assembly

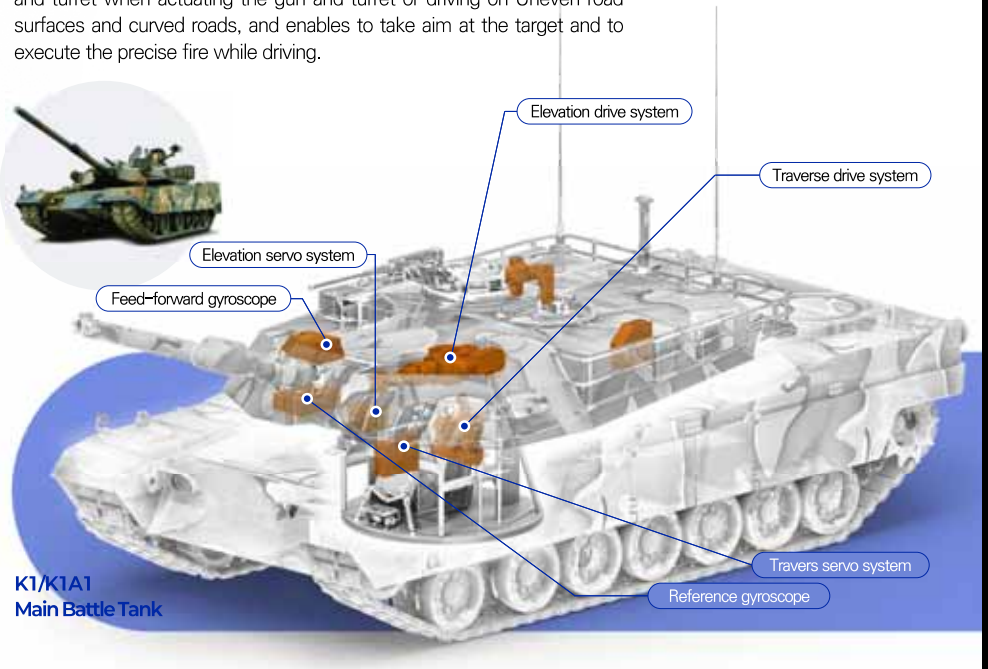
Keeps steady state of hydraulic fluid temperature by blasting external air into turret system.

Key features

- Rotating the gun turret **through Traverse gear box**
- Operating gun up-and-down **through Elevation Balancing Cylinder**
- Rapid loading shells **through auto flick ramming system**
- Optimized hydraulic power generator **which is unified by Motor, Pump and Oil reservoir**

Hydraulic Gun/Turret Driving System

The Gun/Turret Driving System (GTDS) on the K1A1 MBT detects the impact of yawing and pitching motion of the vehicle's body onto the gun and turret when actuating the gun and turret or driving on Uneven road surfaces and curved roads, and enables to take aim at the target and to execute the precise fire while driving.



1 | Elevation servo system

Controls hydraulic fluid flow according to the signal from the electronic unit to control the speed of the elevation drive system.

2 | Elevation drive system

Converts hydraulic power into mechanical linear motion to move gun up and down.

3 | Reference gyroscope

Detects and converts the angular speed of gun and turret into electric signals and sends them to the electronic unit

4 | Traverse servo system

Controls hydraulic oil flow according to the signal from the electronic unit to control the speed of traverse system.

5 | Traverse drive system

Rotates turret by converting hydraulic power to mechanical force.

6 | Feed-forward gyroscope

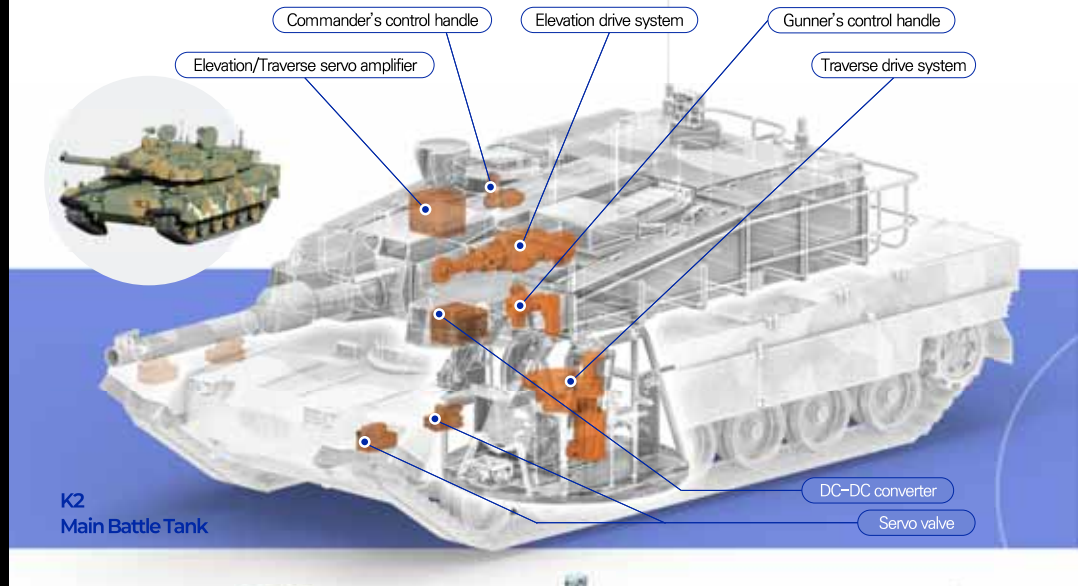
Detects and converts the angular speed of turret and chassis into electric signals and sends them to the electronic unit.

Key features

- Electro-hydraulic servo system
- **Technology to** minimize vibration and noise
- Feedback control **using servo valves and speed sensors**
- Hydraulic drive control technology **for the overload system**

Electric Gun/Turret Driving System

Electric Gun/Turret Driving System(EGTDS) boosts 28VDC power of the vehicle to 260VDC and Controls the servo motor by high-response control using a power amplifier for elevation/slewing Devices.This enables the EGTDS to perform high efficiency/precision drive control and has improved its performance for advanced stabilization.



1 | Elevation/Traverse servo amplifier

Drives elevation/traverse device with the current input from drive/power controller.

2 | Traverse drive system

Rotates turret at the torque and speed provided from electric motor and reducer using the electric energy according to the control of the commander/artillery man's handle operation.

3 | Elevation drive system

Drives gun up/down at the torque and speed provided from electric motor and reducer using the electric energy according to the control of the commander/artillery man's handle operation.

4 | Commander's control handle

Converts mechanical displacement of handle into electric signal to control the speed and direction of turret.

5 | Gunner's control handle

Converts mechanical displacement of handle into electric signal to control the speed and direction of turret.

6 | DC-DC converter

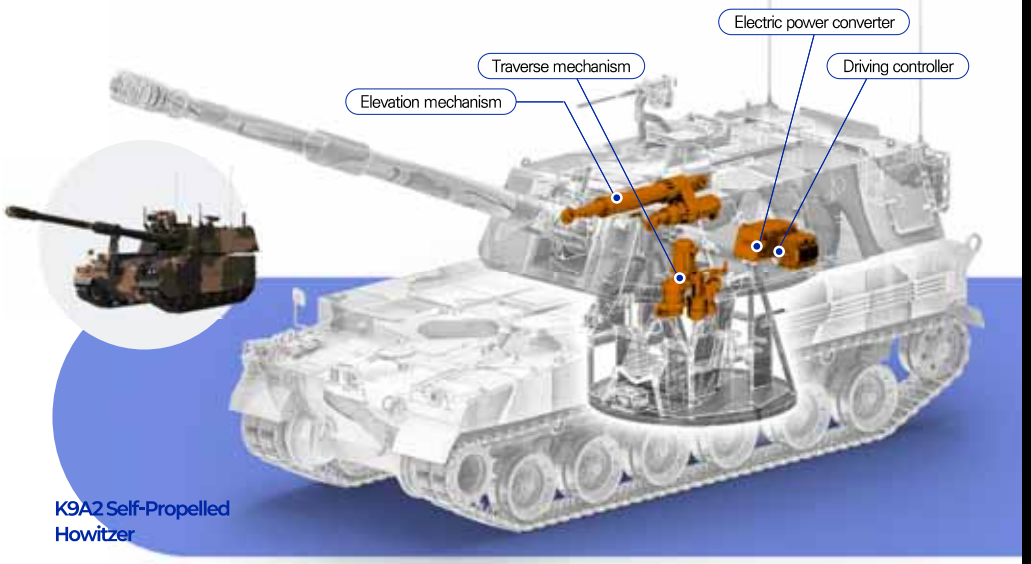
Steps up 28VDC of battery to 260VDC And supply it to elevation/swing power amplifier.

Key features

- Precision gear design technology **for high stiffness and low baddess**
- Noise and vibration reduction **technology**
- High efficiency power transmission **technology**
- Electric drive control **technology for the overload system**

Electric Gun/Turret Driving System

The electric type of gun/turret driving system uses automation technologies in order to shorten the reaction time, increase the firing rate of the gun, improve the operational continuity, and minimize the number of people.



1 | Traverse Mechanism

Rotating the turret using the torque/speed generated by electric motor and reduction gear

2 | Elevation Mechanism

Moving the gun up/down using the electric motor, linear converter and reduction gear

3 | Driving Controller

Provide gun/turret driving control function, calculation algorithm function for gun/turret driving stabilization, rapid firing control function

4 | Electric Power Converter

ower supply that generates power to drive the gun/turret drive.

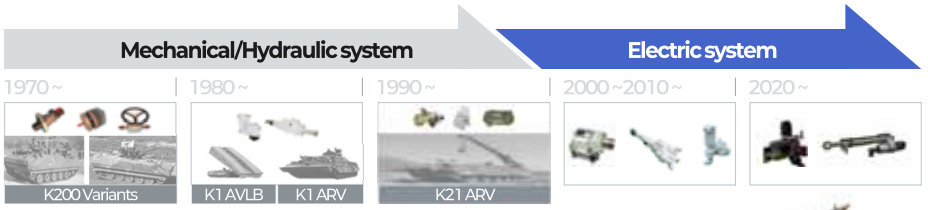
Key features

- Applied precision gear design technology for high rigidity and low backlash
- Applied vibration/noise reduction technology
- Applied high-efficiency power transmission technology
- Applied electric drive control technology against heavy load

I II III IV V

History of Driving & Stabilization Systems

Starting with the production of hydraulic systems for K200 armored vehicles, MNC Solution has developed and supplied various types of gun/turret driving & stabilization systems applied to defense ground vehicles. Since 2000s, MNC Solution has successfully developed and applied high-precision electric gun/turret driving & stabilization systems to mass production by reflecting the latest technology trends and customer needs.



Performance improvement

Increased user convenience

Precision Driving System for Laser Weapon

It is a key part of the laser weapon system that neutralizes the target with a high-energy laser beam, and it plays a role in maintaining the aiming point precisely while focusing the high-energy laser on the weak area of the target. In addition, it is possible to expand into the field of ultra-high-speed space optical communication that uses lasers to exchange data between the ground and satellites orbiting in space.

Applications

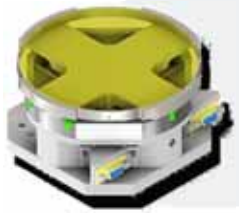
Fixed laser weapon

Naval laser weapon

Movable laser weapon

Aerial laser weapon

FSM (Fast Steering Mirror)



Key features

- Voice Coil Motor(VCM)
  By applying the electro-magnetic actuator, it provide **wide driving range, excellent linearity and rapid response.**
- Driving range : ±5 mrad
- Driving bandwidth : 150 Hz
- Driving accuracy : 10 urad

Key features

- Piezo-electric(PZT)
  By applying the Piezo-electric actuator, it provide **wide driving range, excellent linearity and rapid response.**
- Driving range : ±5 mrad
- Driving bandwidth : 120 Hz
- Driving accuracy : 5 urad

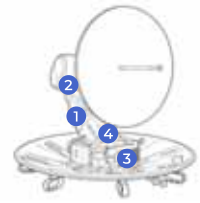
Pedestal Driving System for Laser Weapon

Key features

- **High tracking precision** with a heavy load and direct driving mechanism
- **High rigidity structure**
- **Zero Backlash**
- Position repeatability < 1 arc-sec
- Retractable and deployable lift structure
- Height repeatability < 20 μm

Stabilization System for Terminal Antenna Pedestal

Precise, stabilized pedestal for surface ship antenna to enable accurate satellite tracking automatically or manually. Ship's roll, pitch, yaw are automatically compensated for uninterrupted military satellite communication.



Function	3-axis stabilization
Load	250 [kg]
Driving Range	Elevation : -30°~120° Cross: -55°~ 55° Azimuth : 360°
Angular velocity	Max. 20 [deg/sec]
Angular acceleration	Max. 25 [deg/sec2]
Control accuracy	Less than 3.4 [mrad-rms]

1 | Pedestal Control Unit

High speed DSP is applied to compensate external source of disturbance by waves. And an algorithm for precise satellite tracking control is built-in.

2 | Sensor Box

Consists of the rate sensor for measuring external disturbance signals and tilt sensor for measuring inclination.

3 | Power Supply Unit

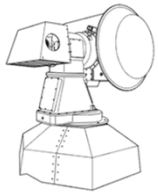
Supplies electric power to motor drive, pedestal control assembly board and various sensors.

4 | Pedestal Device

A device for low back lash and high speed precision control. This device controls satellite antenna direction with 3-axes electric precision drive control.

Electro-Mechanical Servo System for Short Range Tracking Radar

Precise, stabilized pedestal for surface ship antenna to enable accurate satellite tracking automatically or manually. Ship's roll, pitch, yaw are automatically compensated for uninterrupted military satellite communication.



Function	2-axis stabilization
Load	380 [kg]
Driving Range	Elevation : -20° ~ 85° Azimuth : 360°
Angular velocity	Max. 114 [deg/sec]
Angular acceleration	Max. 401 [deg/sec2]
Control accuracy	Less than 0.3 [mrad-rms]

1 | Servo Amplifier

This device is for the operation of the high voltage, high precision BLDC motor for precise control of servo driver.

2 | Servo Controller

Compensates the external disturbance, such as waves, to the ship by applying high speed DSP. An algorithm for precise tracking is built-in.

3 | Servo Driver

A device for low backlash and high speed precision control of antenna direction based on 2-axis electric precision drive control.

4 | Emulator

The emulator tests and analyzes servo system performance by creating drive commands.

Controller for Helicopter Gun Driving and Ammunition Feeding

Control of turret-type machine gun driving/ammunition feeding system by receiving the driving & firing commands from the Store Management Computer (SMC).

Main functions

Number of machine gun firing and fire control
- Firing control : number of ammunitions
- Firing/Stop function
- Safety control : Firing limit function in landing

Control for Turret driving
- Rotating range : -110 ~ +110deg
- Elevation range : -50 ~ +23deg
- Max. speed : 90deg/sec

Control for ammunition feeding
- Feeding control while firing
- Manual feeding control in landing

Firing and driving power control
- Machine gun/turret driving,
- Supplying electric power to feeding system

Key features

BIT(Built-In Test) self-diagnosis function
- Gun Jamming, over current, low voltage

Specifications
- MIL-STD-1553B communication : interlocking with SMC
- Discrete Input/Output : interlocking with SMFD, AFCS

Light Armed Helicopter (LAH)

Controller for Gun Driving and Ammunition Feeding System

Abbreviations

- GCU (Gun Control Unit)
- SMC (Store Management Computer)
- TGS (Turret Gun System)
- LAH (Light Armor Helicopter)
- AFCS (Automatic Flight Control System)
- SMFD (Smart Multi Function Display)

Electronic Gyroscope for Ground Vehicle

Electrically/physically compatible with existing type of gyrosocpes (mechanical & electrical type)
- High impact resistance
- High reliability

Key feature

01 Stabilization Function
Key sensors for gun/turret **speed control and stabilization**

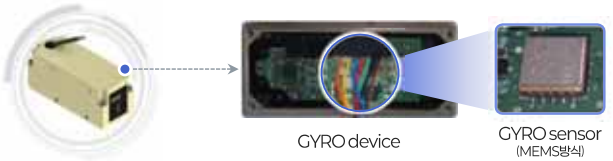
02 Tracking Capabilities
Provide targeting and tracking functions with GPS, CPS

03 Precise Goal
Accuracy aiming and targeting when shooting and vehicle maneuvering

04 Compatible / Alternative
Compatible/replaceable with existing mechanical type of 'reference gyro' and 'feed forward gyro'

05 Applicable Equipment
Applications : K1/K1A1/K2 MBT, M1 series MBT, IFV, SPH etc.

Electronic type of Gyroscope

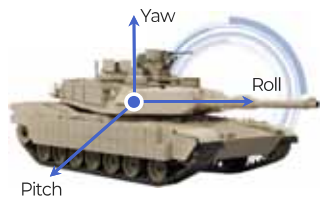


item	specification
Input Rate	±100 °/sec
Sensitivity	100mV/°/sec
Linearity	≤ 5 % + 0.02 °/sec
Start-up time	≤ 1 sec.
Band width	〉70 Hz @-90°
Size	635 x 264 x 264 mm

Final Gyroscope Assemblies

1 | · Reference gyro
- 2 Axis
- Installed in gun

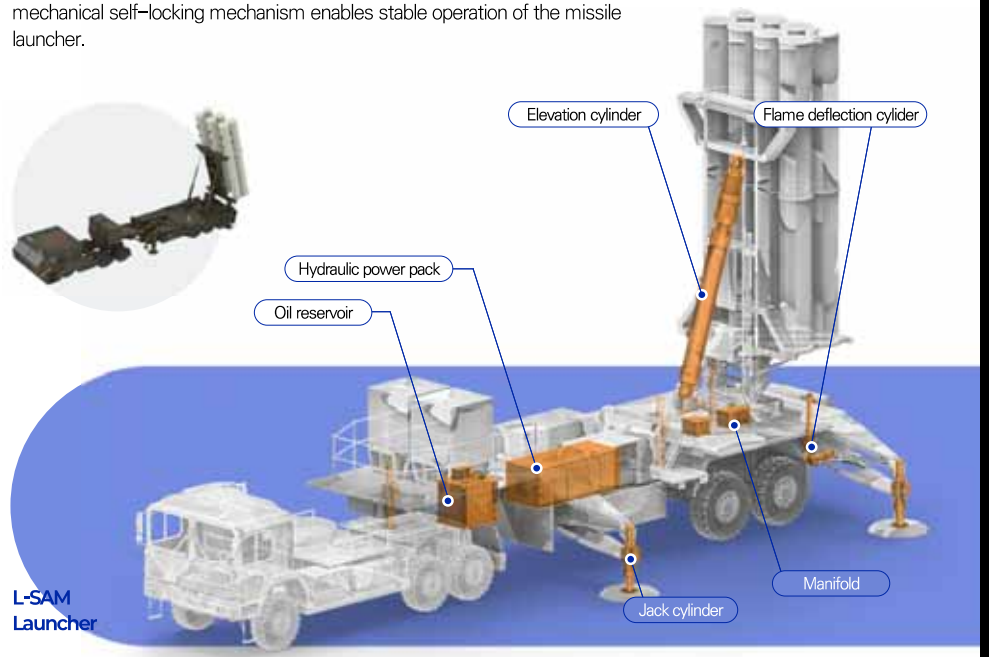
2 | · Feed forward gyro
- 1 Axis
- Installed in gun and vehicle body



- K1/K1A1 MBT
- K2 MBT

Hydraulic Systems for Missile Launcher

Efficient operation is possible by applying the BLAC motor and the constant-power pump, and the elevation cylinder and jack cylinder with mechanical self-locking mechanism enables stable operation of the missile launcher.



1 | **Hydraulic power pack**

2 | **Elevation cylinder**

3 | **Manifold**

4 | **Jack cylinder**

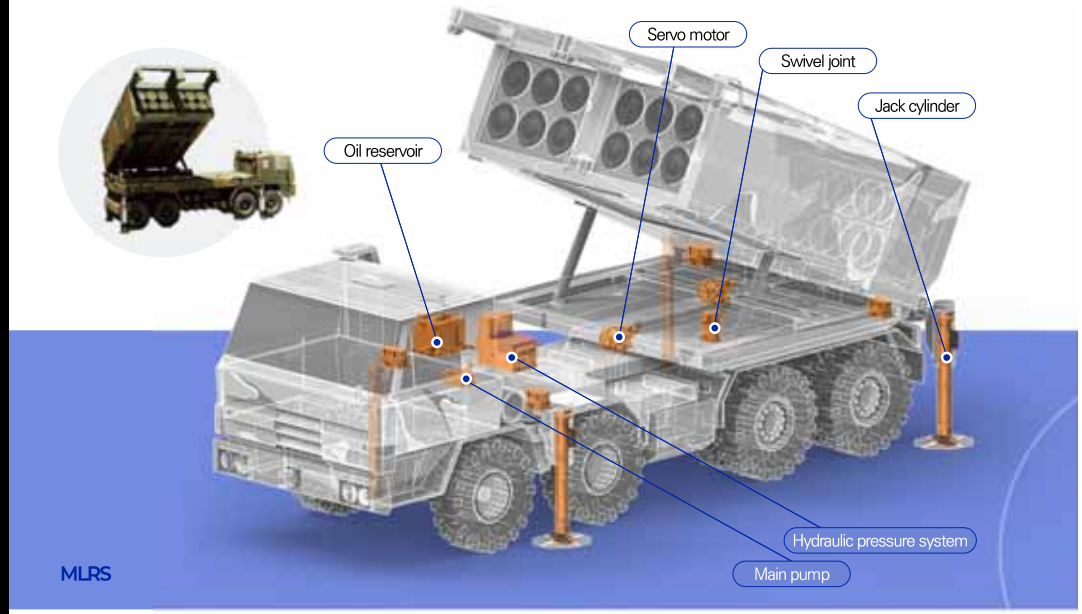
5 | **Oil reservoir**

6 | **Flame deflection cylider**

Key features

- Applied high-efficiency servo motor and constant power type of pump
- Jack cylinder with improved mechanical self-locking mechanism
- Elevation cylinder including hydraulic locking unit supports heavy loads
- Sequential operation of hydraulic actuators
- Emergency operation through auxiliary power device
- Cylinder protection from flame by application of bellows

Hydraulic Drive System supports the MLRS(Multiple Launch Rocket System) when it firing and drives the pod up/down, turns it to the right/left. It plays a role in improving firing accuracy by driving quickly and precisely.



1 | **Servo motor**

Drives the launching ramp to precise position and angle with the hydraulic power from the main pump controlled with servo valve.

2 | **Hydraulic pressure system**

Provides hydraulic power to hydraulic system during engine stop to enable firing.

3 | **Oil reservoir**

The reservoir of the hydraulic oil, which cools down the oil from its metallic surface.

4 | **Main pump**

Generates hydraulic power from the energy of engine, and supply the power to hydraulic system.

5 | **Jack cylinder**

Supports vehicle horizontally for accurate firing control using the hydraulic power from the main pump.

6 | **Swivel joint**

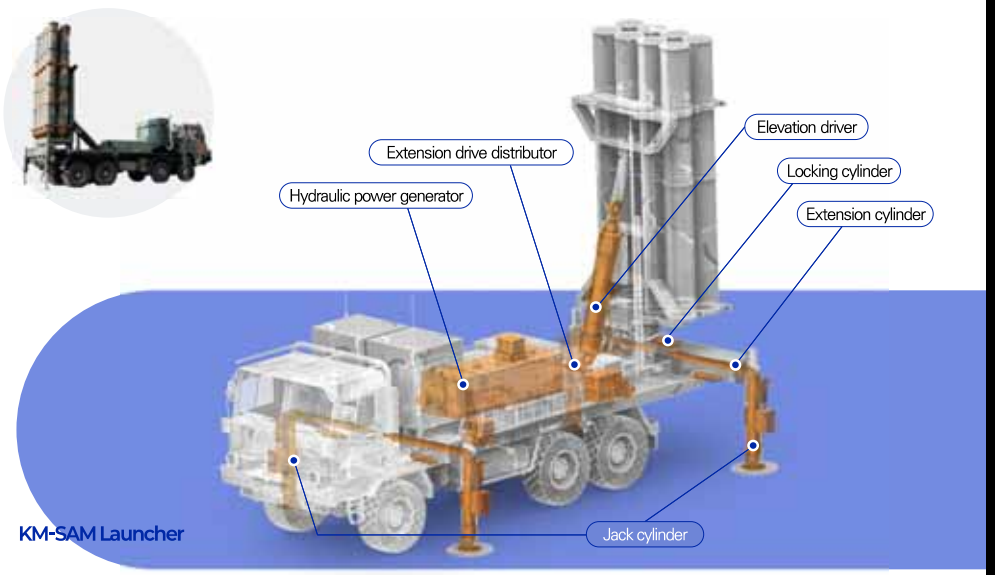
This device provides hydraulic oil paths from the hydraulic power system beneath the vehicle to the hydraulic motor for rotate up/down and left/right.

Key features

- High precision position control by using the electro-hydraulic servo motor
- Feedback control by servo vale and yoke position sensor
- Optimal system design for the hydraulic system and energy saving

Hydraulic Systems for Missile Launcher

Hydraulic Drive System and Controller for KM-SAM(Korean Medium range Surface-to-Air Missile) Launcher is capable of combining and separating vehicle from launcher, supporting launcher, driving launcher up/down and controlling attitude.



1 | Elevation driver

Being connected with the lower and upper frames, the driver extends to move the projectile to the position.

2 | Elevation drive distributor

Controls the pressure and low fed to, returned from elevation driver according to the control signal of the launching ramp.

3 | Jack cylinder

Extends jack to fix, support the launching ramp and lifts ramp up for separation, combination with vehicle.

4 | Hydraulic power pack

Comprised of the hydraulic pressure generator with electric motor and hydraulic oil reservoir.

5 | Locking cylinder

Locks high angle driver and outrigger during travel.

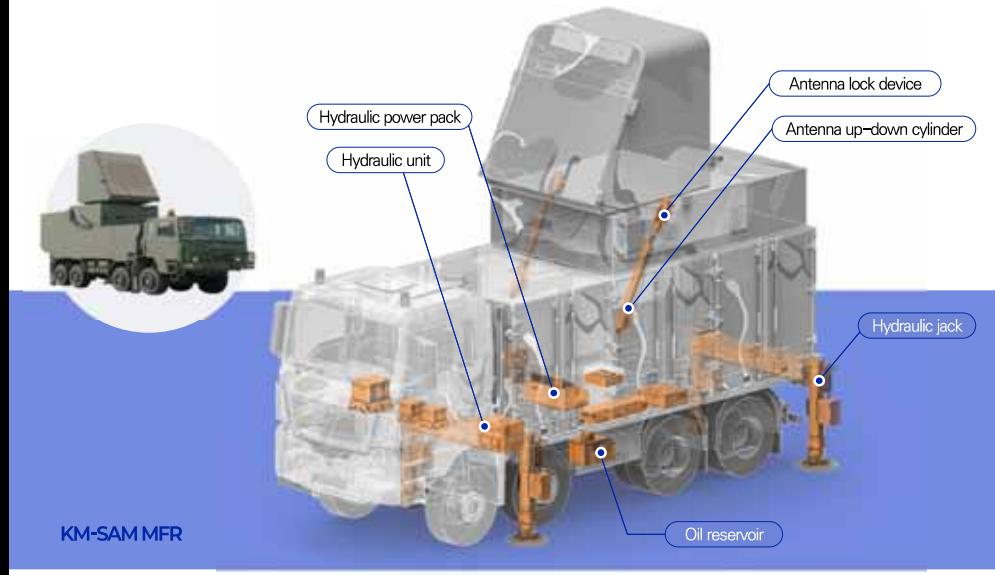
6 | Extension cylinder

Extends front outrigger and rear rotating beam to allow vehicle separation.

Key features

- Applied mechanical automatic locking jack cylinder
- Low energy consumption under 9KW
- Possible to separate the launcher and vehicle by using the jack and extension cylinder
- Operating temperature : -32 ~ 50℃
- Max. installation slop angle : 5°

Hydraulic Drive System and Controller for KM-SAM MFR(Multi-Function Radar) is capable of combining and separating vehicle from radar, supporting radar, driving radar up/down and controlling attitude.



1 | Hydraulic power pack

Using electric motor, generates hydraulic power and supply the power to hydraulic devices.

2 | Antenna up-down cylinder

Extends/retracts cylinder to raise/lower antenna.

3 | Antenna Lock device

At start/completion of antenna up-down, locks or releases antenna locking device.

4 | Hydraulic unit

Controls antenna up-down cylinder and locking device.

5 | Hydraulic jack

Extends hydraulic jack for stable support of antenna base, or raises antenna base for separation, combination with vehicle.

6 | Oil reservoir

Stores hydraulic oil.

Key features

- Applied mechanical automatic locking jack cylinder
- Low energy consumption under 9KW
- Possible to separate the launcher and vehicle by using the jack and extension cylinder
- Operating temperature : -32 ~ 50℃
- Max. installation slop angle : 5°

Hydraulic Components for Aerospace_Rotary-wing aircraft

Starting with the successful localization of hydraulic pumps for UH-60 helicopters, MNC Solution has secured own technology. And, MNC Solution has been proven their technical capability through completion of successful development and mass production of hydraulic pumps for LCH/LAH helicopters.

Main hydraulic pump/auxiliary hydraulic pump for LCH/LAH

items	specifications
Rated discharge pressure (M Pa)	14.0
Rated discharge flow rate (lpm)	Min. 27.0
Displacement (cc/rev)	5.29
Rated rotation speed (rpm)	5,862 & 6,004
Total efficiency (%)	Max. 85.0
Weight (kg)	Max. 3.2
Rated operating temp. (˚ C)	110

items	specifications
Rated discharge pressure (M Pa)	12.5
Rated discharge flow rate (lpm)	Min. 1.1
Displacement (cc/rev)	0.243
Electric current (A)	Max. 23
Weight (kg)	Max. 1.56
Rated operating temp. (˚ C)	– 45 ˚ ~ 70

Key features

- High efficiency and light weight variable capacitive type of piston hydraulic pump
- Meet with SAE-AS-19692, MIL-STD-810, RTCA-DO 160
- Geared type of hydraulic pump with integrated with electric motor
- Supplies flow rates to the hydraulic system when helicopter is landing in ground for inspection
- Meet with MIL-STD-810, RTCA-DO 160

Hydraulic pump for KUH

items	specifications
Rated rotation speed (rpm)	4,723
Rated flow rate(l/min)	Min. 20.0
Displacement (cc/rev)	4.87
Rated outlet pressure (M Pa)	20.7
Rated operating temp. (˚ C)	107.2
Weight (kgf)	Max. 2.67

Key features

- High efficiency and light weight variable capacitive type of piston hydraulic pump
- Meets durability requirements of 2,000 hours including 20,000 case pressure cycle tests per SAE-AS1962
- Meet with MIL-STD-810

Hydraulic Component Fixed Blade For Aircraft

Based on accumulated and proven technologies in ground vehicles and guided weapons, MNCSolution have completed the development of hydraulic pumps for fixed-wing aircraft.
Through continuous R&D, MNC Solution have secured design and development capabilities for various actuators of unmanned aerial vehicles and core engine accessories parts.

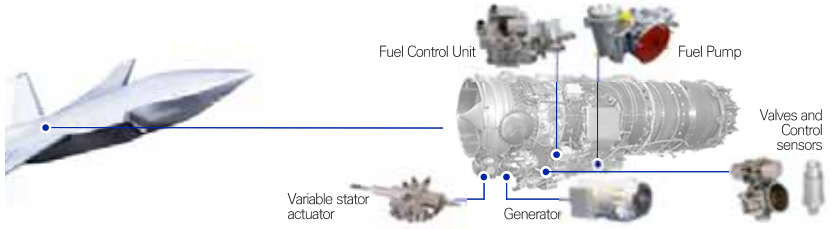
Hydraulic pump for KF-21 fighter jet

items	specifications
Rated rotation speed (rpm)	4,480
Rated flow rate(l/min)	Min. 295
Displacement (cc/rev)	70.58
Rated outlet pressure (M Pa)	20.7
Rated operating temp. (˚ C)	107.2
Weight (kgf)	17.85

Key features

- High efficiency and light weight variable capacitive type of piston hydraulic pump
- Minimized pulsation by using the 11 units of piston
- Meet with SAE-AS-19692, MIL-STD-810, MIL-STD-704

Engine accessory parts for UAV



Key features

- Components design and manufacturing for environment resistant, light weight, high reliability
- Applied self-developed high precision and high response servo valve
- Applied high linearity (within 0.5%) LVDT LVDT
- Generator with maximized cooling efficiency
- Applied duplexing control design for securing the back-up function
- Applied high-temperature/high-pressure blush type air seal

Hydraulic Servo Valve

Servo valve can make **accuracy pressure and flow control** using the low current electric signal and are **suitable for electro-hydraulic position, speed, pressure or force control** systems with **high dynamic response requirements.**

Applications


Defense

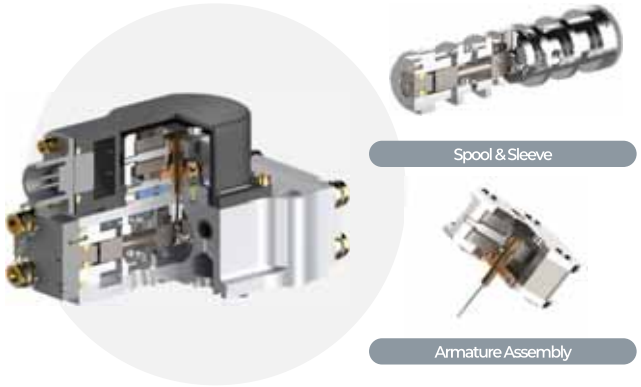

Steel/Power plant


Aerospace


Equipment


Robot

Nozzle Flapper type of Servo Valve



Model	Rated Flow (@3000 psi, gpm)	Maximum Leakage (@3000 psi, gpm)	Frequency of Phase Point(Hz)	Maximum Amplitude Ratio(dB)
NF03	3.0	〈 0.2	〉200	〈 2
NF08	8.0	〈 0.3	〉170	〈 2
NF14	14.0	〈 0.4	〉160	〈 2
NF19	19.0	〈 0.6	〉110	〈 2
NF44	44.0	〈 0.8	〉80	〈 2

Hydraulic Servo Valve

MNC Solution developed and produced various types of servo valves appling to applications through continuous R&D investment. And, MNC Solution is **expanding business area into the servo driving systems** based on accumulated technologies.

Jet pipe type of Servo Valve

- Has a **structure for resistant to contamination** of hydraulic oil
- **Applicable to aviation actuators** and **fuel control devices** that requires reliability

Key features

Structure in which nozzle flow is sprayed from the armature assembly.

Simple structure operated by differential pressure between nozzle and receiver

3D printing tech. of Servo Valve

- By using the advantages of 3D printing technology, designed and analyzed inside of housing and sleeve suitable for 3D printing
- Developed servo valves that **realized parts simplification** and **weight reduction**

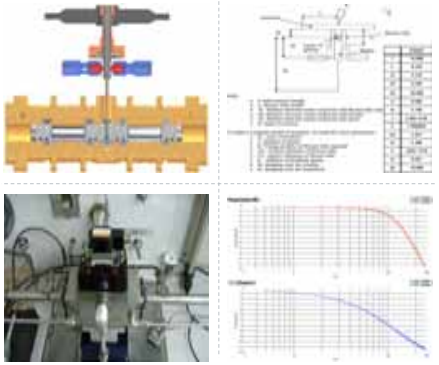
Key features

Integrated housing and sleeve

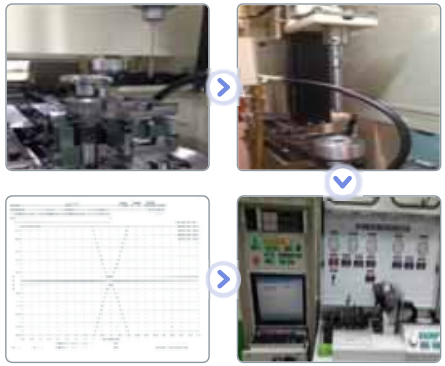
Reduced the number of parts

Light weight (33% lighter than before)

Design and testing technologies



High-precision machining technologies



Winch System for Sonar Detection Unit

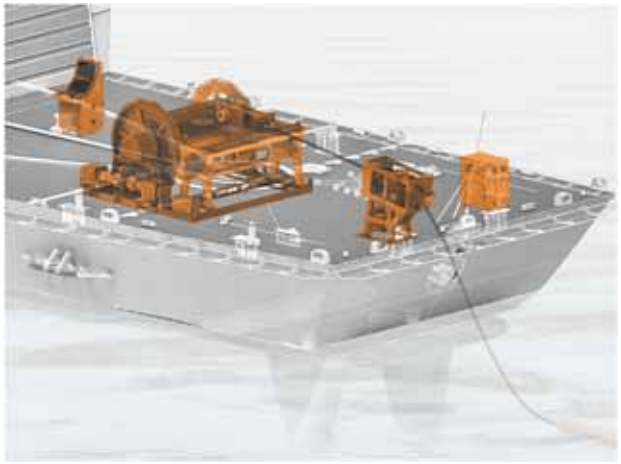
Using the signals reflected by the target when surface vessels generates a sound wave, the hydraulic winch for sonar detects enemy submarines or sea mines by dropping the active sonar unit and tow cable onto the water surface for surveillance and salvage of the unit.

Applications

TASS for KDX I, II

ULTASS for AGS

TACM for FF



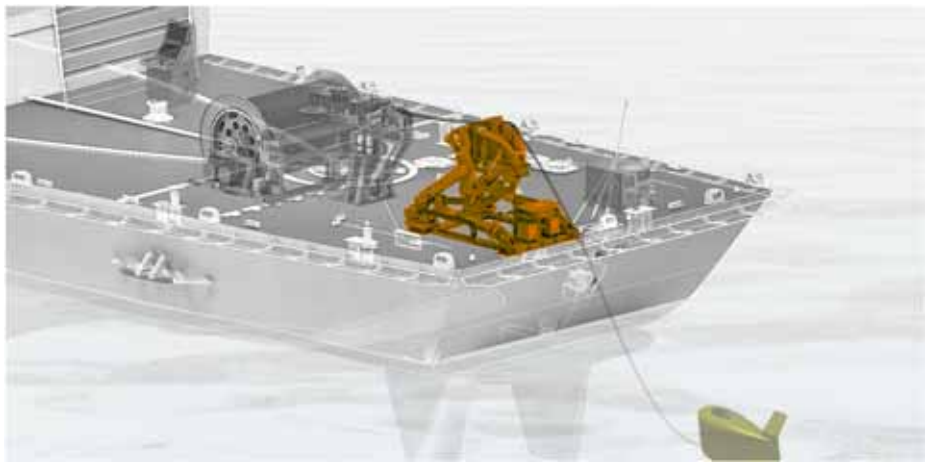
Hydraulic type of Winch system	Electric type of Winch system	Power supplier & Controller
		

Key features

- Automatic, semi-automatic, manual control possible
- Deployment, retrieval, towing possible at sea state level 3
- Corrosion-resistant design considering seawater contact
- Securing the stability of deployment, retrieval, towing through the optimal design of the drive unit
- Application of tow cable emergency cutter considering emergency situations
- Improved equipment reliability through physical/functional duplexing of main components

LARS, Launch and Recovery System

LARS system mounted on a naval ship works as an active stability control device for launching and recovering the variable depth sonar assembly unit and tow cable at sea for operating a low-frequency variable depth active sound detector(LFPA) that detects an enemy submarine.



Linkage apparatus	Main cylinder	Gripper unit	Sub-cylinder
			

Key features

Applied hydraulic servo drive type of cylinder manipulator structure	Automatic, semi-auto, manual mode control considering operating conditions	Application of individual control and interlocking control for each cylinder	Improved equipment reliability through duplexing of main components	Corrosion-resistant design considering seawater contact
01	02	03	04	05

Hydro-pneumatic Suspension System

Hydro-pneumatic suspension uses the non-linear spring characteristics of nitrogen gas(N2) and the damping characteristics of the damper to minimize vibration and shock transmitted from the road surface when driving the vehicle, thereby improving the vehicle's off-road performance, riding comfort and improving vehicle's maneuverability.

Line-up of Hydro-pneumatic Suspension Units

Item	In-arm Suspension Unit (ISU)		Strut suspension
Shape			
Application	Redback 	K21/K21 ARV 	K55A1 
Max. load	22.5 ton	18.0 ton	10.0 ton
Wheel travel	Up to 320 mm	Up to 360 mm	Up to 180 mm
Static load	40~45 kN	25~30 kN	7 kN
Weight	less than 180 kg	less than 120 kg	less than 30 kg
Size	717 x 512 x 345 mm	702 x 470 x 435 mm	Ø120 x 740 mm

Key features

01 Increasing the interior space **of the vehicle's body by removing the torsion bar.**

02 Shock absorption and improved rideability **through characteristics of nonlinear spring and fixed hydraulic damper**

03 Easy maintenance **as independently installed outside the vehicle's body**

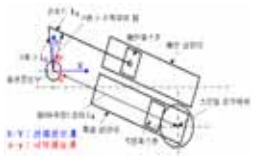
04 Easy control and operate **the vehicle's ground level by adjusting the spring force for each wheel position**

Based on more than 30 years of hydraulic suspension development capabilities and track records, MNC Solution is providing optimal solutions to meet customer needs and fit vehicle interfaces.

Design/analysis capabilities

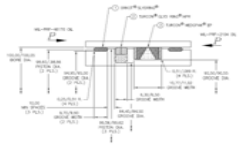
Optimal design technologies for spring and damping

Kinematic analysis



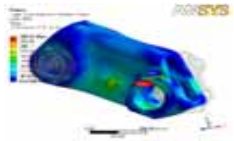
High pressure lubrication/sealing Mechanism design technology

Design of sealing configuration



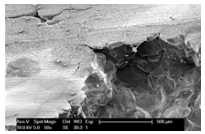
Structural and lightweight Design technology

Structure analysis with M&S



Test evaluation and Failure Analysis

Analysis of Micro section



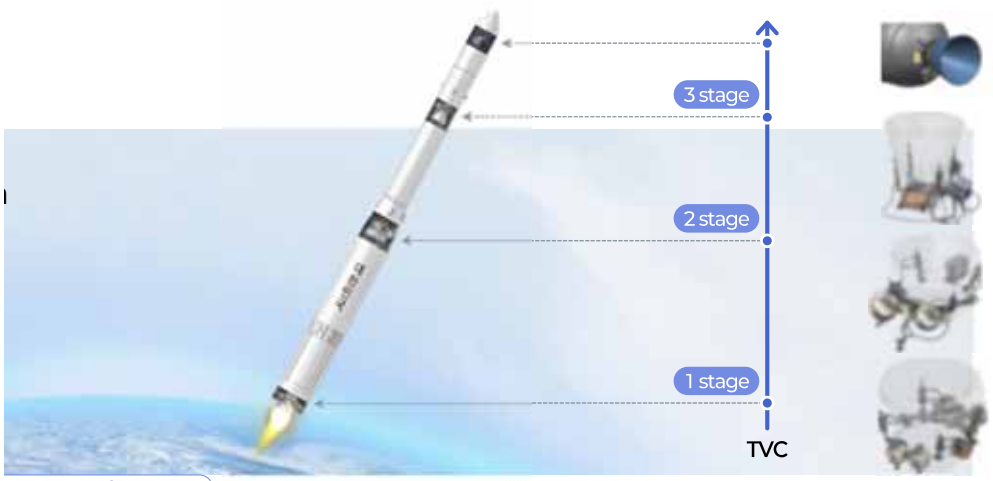
> MNC Solution have various types of hydro-pneumatic suspension system line-up and have proven technologies and production facilities which can supply the products to customers in a timely manner.

Test facilities

Items	Spring test	Damping test	Proof pressure test
Image			
Spec.	• Max. travel : 600 mm • Max. speed : 0.7 m/s • Max. load : 25 ton	• Flow rate : 25~600 lpm • Pressure : 0~200bar	• Max. pressure : 15,000 psi
Quantity	• HSU : 1 unit • ISU/HSU : 1 unit • Strut : 1 unit	• 1 unit	• 1 unit

3 Stages TVC System for Space Rocket

As a key component, the 3 stages nozzle 'Thrust Vector Control system' applied to the space rocket is **maintaining the flight trajectory** and have **a role for entering the space rocket to high-altitude orbit.** MNC Solution has completed successful development and performance verification through the accumulated technologies and know-hows in the field of guided weapons for the past 40 years.

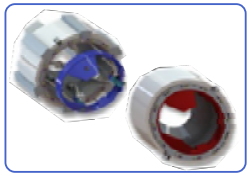


Key features

01	02	03	04	05
Realized high rigidity & light weight through high power-to-weight control	Realized high-response characteristics through the self-developed/manufactured special servo valves.	Applied proven technology for stable performance in high-altitude space environments	Applied flexible shape design technology considering the interface of space rocket	Thermal Vacuum and Cycling Test Certification (ECSS)

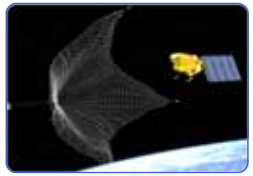
Coupling Device for Satellite & Space Debris Removal Payload

Coupling Device for Satellite



A key component that enables the combination and separation of two satellites in space, and is being developed on the technology and know-how accumulated in the actuator device field.

Space Debris Removal Payload



A paylod for the removal of debris in space orbit, applying rhe structural design and material for securing the weight lightening and high stiffness

Integrated Product Support

Based on **own organization/manpower and specialized capabilities/experience,** MNC Solution has been continuously **contributing to the maintenance and operation of armed forces over the past 40 years.** Moreover, MNC Solution is conducting the whole required IPS(Integrated Product Support) elements throughout the entire life cycle from product development to disposal.

IPS flow chart

Disposal

RAM — Development

PDC — Test & evaluation

LSA — Deploy & Operate/ Depot Maintenance

CSP — Deploy/Operate

Requirement

IPS 12 elements

Development

- Design interface
- Computer Resources
- Maintenance Planning & Management
- PHS & T
- Support Equipment
- Product Support Management

Operation

- Sustaining Engineering
- Supply Support
- Manpower & Personnel
- Training & Training Support
- Technical Manual
- Facilities

IPS work experiences

K1 / K1A1 MBT (GTDSS)

K9 SPH (GTDS & HSU)

Field & Depot maintenance element development

K2 MBT (EM-GTDSS)

K21 IFV (ISU)

Field maintenance ILS element development

Launcher Vehicle (Hydraulic Device)

Radar & Sonar (Antenna & Winch)

Field maintenance ILS element development

Missile (TVC Device)

Quality Control

Quality Management

By **establishing the quality management system** and **establishing the performance/environment verification system,** MNC Solution is **securing product** reliability required for various weapon systems and **realizing the customer satisfaction.**

3D Measuring equipment

Environmental test facility

Inspection room

Certificates

Certificates

MNC Solution pursues customer satisfaction with the best products and services, MNC Solution is **building a solid quality management system** that considers **safety and the environment beyond quality.**

ISO 45001

ISO 14001

OHSAS 18001

AS9100D

KDS

PMS

MNC SOLUTION

The Best Solution Provider in Motion & Control

MNC Solution strives to continue into a company that **contributes** to the society and **offers values** to our clients via constant **quality improvement** and **innovations.**

- Innovation
- Value
- Contribution