

# No.1 Military Ground Vehicle Solutions Company

Automatic Fire Sensing  
& Suppression System  
Camera & Monitor System





# Company Business Areas



## Automatic Fire Sensing & Suppression System (AFSS) for military ground vehicles

- The development of the AFSS began in 2003.
- AFSS for various types of military ground combat vehicles have been developed and mass-produced.

## Camera and Monitoring Systems

- The development of the Camera began in 2005.
- CCD / CMOS Sensor Camera
- Thermal Camera
- AVM (Around View Monitoring)
- Camera device for RCWS
- Monitor

## Electronic products

- Development & supply of special purpose electric signal circuit cards for MBT and armored vehicles.



K2 MBT



K9 SPH



K600 CEV



30mm AAGW



K1A2 MBT



K10 ARV



K1 AVLB



K808 / K806



K1E1 MBT



120mm SPMC



K1 ARV



KM3



REDBACK IFV



K21 IFV



K21 ARV

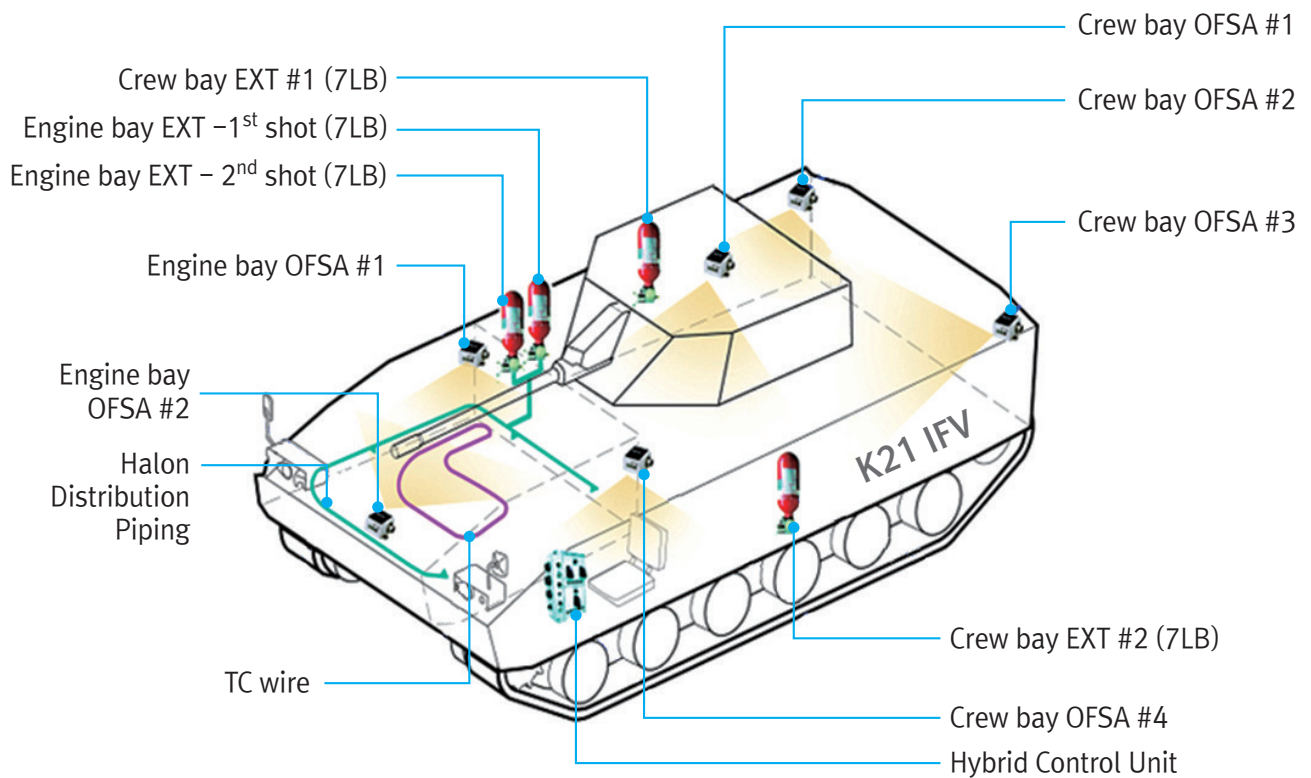


NBC Vehicle (K216A / K332)

## AFSS (Automatic Fire Sensing & Suppression System)



AFSS senses and suppresses fires and secondary explosive fires which arise from various causes such as oil leakage, electrical accident, ballistic impact, gun firing etc. in ground vehicles including tanks and armored vehicles during missions.



# AFSS Performance Summary

## Sensing



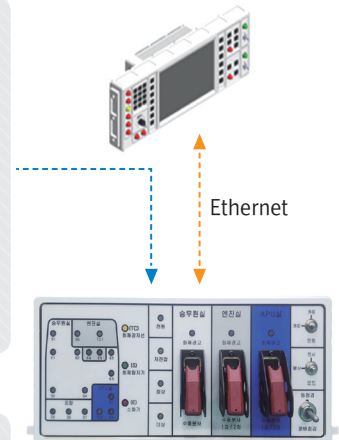
Crew & Turret Bay



Engine Bay



APU Bay



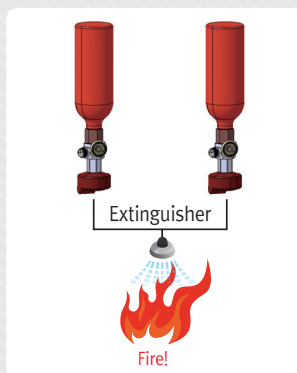
## Suppression



Crew & Turret Bay



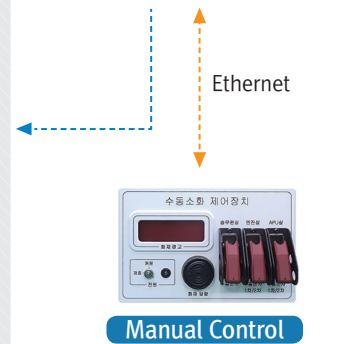
Engine Bay



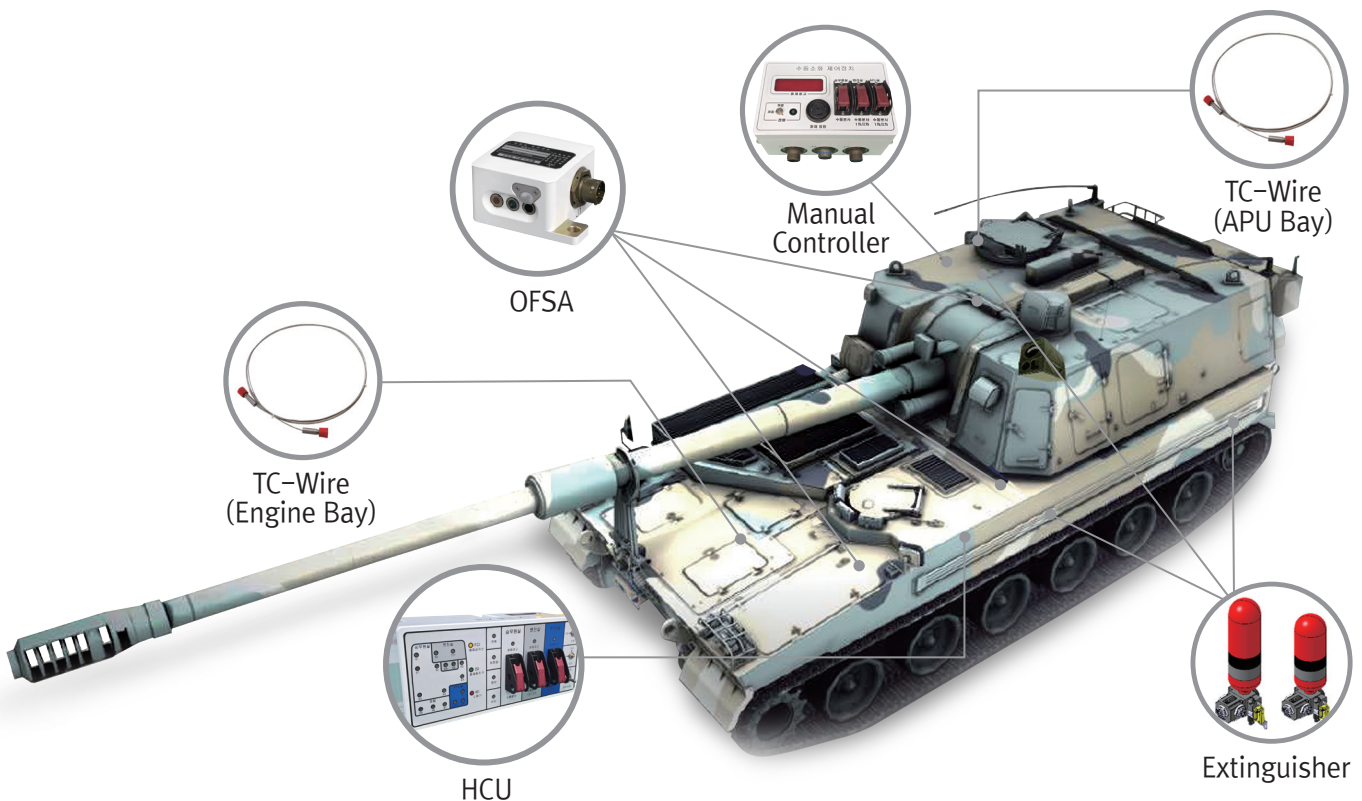
APU Bay

## Control

System Integrated Control



## Manual Control





# Hybrid Control Unit (HCU)



**HCU-08-S6E4**

K21 IFV / K21ARV  
NBC Vehicle



**HCU-12-S6E4**

K2 MBT / K1ARV



**HCU-16-S6E4**

Wheeled Armored Vehicle  
30mm AAGW

| Model                         | HCU-08-S6E4                                                                                                                                                                                                                                                                                          | HCU-12-S6E4        | HCU-16-S6E4        |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|
| Power                         | 24 ± 6 VDC                                                                                                                                                                                                                                                                                           | 24 ± 6 VDC         | 24 ± 6 VDC         |
| Size                          | 260 × 200 × 135 mm                                                                                                                                                                                                                                                                                   | 260 × 220 × 135 mm | 270 × 210 × 150 mm |
| Weight                        | Max 4.0 kg                                                                                                                                                                                                                                                                                           | Max 4.0 kg         | Max 4.0 kg         |
| Environmental Qualified       | MIL-STD-810F, 810C                                                                                                                                                                                                                                                                                   | MIL-STD-810F, 810C | MIL-STD-810F       |
| EMI / EMC Qualified           | MIL-STD-461F                                                                                                                                                                                                                                                                                         | MIL-STD-461F       | MIL-STD-461F       |
| Performance & Characteristics | HCU controls & operates AFSS in Crew & Engine bay<br>Operational capability of Detection item – TC wire 1set, OFSA 4 ~ 6EA<br>Operational capability of Extinguisher 4 ~ 6EA<br>Built-in Test Equipment<br>Built-in timer keeps system active after powering off<br>Manual discharge of extinguisher |                    |                    |

# Hybrid Control Unit (HCU)


**HCU-24-S6E6**

REDBACK IFV


**HCU-25-S6E6**

K9/K11 SPH / K10 ARV


**HCU-25-S7E8**

K9A2 SPH

| Model                         | HCU-24-S6E6                                                                                                                                                                                                                               | HCU-25-S6E6                             | HCU-25-S7E8                              |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------------------------------------|
| Power                         | 24 ± 6 VDC                                                                                                                                                                                                                                | 24 ± 6 VDC                              | 24 ± 6 VDC                               |
| Size                          | 260 × 160 × 105 mm                                                                                                                                                                                                                        | 260 × 160 × 105 mm<br>180 × 120 × 92 mm | 350 × 140 × 105 mm<br>240 × 130 × 100 mm |
| Weight                        | Max 4.0 kg                                                                                                                                                                                                                                | Max 4.0 kg / 2.0 kg                     | Max 4.0 kg / 2.0 kg                      |
| Environmental Qualified       | MIL-STD-810G<br>AECTP 300(Edition 3)                                                                                                                                                                                                      | MIL-STD-810H                            | MIL-STD-810H                             |
| EMI / EMC Qualified           | MIL-STD-461F                                                                                                                                                                                                                              | MIL-STD-461G                            | MIL-STD-461G<br>MIL-STD-1275E            |
| Communication                 | CAN                                                                                                                                                                                                                                       |                                         | Ethernet                                 |
| Performance & Characteristics | HCU controls & operates AFSS in crew, engine & APU bay<br>Operational capability of detection item – TC wire 2set, OFSA 7EA<br>Operational capability of Extinguisher 8EA<br>Fire alarm and manual discharge controller applied to turret |                                         |                                          |



# Optical Fire Sensing Assembly (OFSA)



**OFSA-08**

K1 MBT / K1A1 MBT



**OFSA-12**

K21 IFV / K21ARV / K2 MBT / K1ARV  
NBC Vehicle



**OFSA-16**

Wheeled Armored Vehicle  
30mm AAGW

| Model                         | OFSA-08                                         | OFSA-12                                                                                                                        | OFSA-16                                                                    |
|-------------------------------|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Power                         | 16.5 ± 3 VDC                                    | 16.5 ± 3 VDC                                                                                                                   | 16.5 ± 3 VDC                                                               |
| Size                          | 89 × 61 × 43 mm                                 | 89 × 67 × 43 mm                                                                                                                | 89 × 61 × 43 mm                                                            |
| Weight                        | Max 0.4 kg                                      | Max 0.4 kg                                                                                                                     | Max 0.4 kg                                                                 |
| Environmental Qualified       | MIL-STD-810                                     | MIL-STD-810C                                                                                                                   | MIL-STD-810F                                                               |
| EMI / EMC Qualified           | MIL-STD-461F                                    | MIL-STD-461F                                                                                                                   | MIL-STD-461F                                                               |
| Performance & Characteristics | Response time : 2ms<br>FOV : 90° solid cone min | Response time : 4ms<br>FOV : 90° solid cone min<br>Built-in Test Equipment<br>Discrimination between small fire and large fire | Response time : 4ms<br>FOV : 90° solid cone min<br>Built-in Test Equipment |

# Extinguisher



**EXT-08-Halon1301**

K21 / K21ARV  
K1 / K1A1 / K1AVLB



**EXT-12-Halon1301**

Wheeled Combat Vehicle (BITE)



**EXT-12-HFC-227ea  
EXT-24-HFC-236fa**

NBC Vehicle  
30mm AAGW (BITE)

| Model                               | EXT-08-Halon1301                                                          | EXT-12-Halon1301                                                                             | EXT-12-HFC-227ea<br>EXT-24-HFC-236fa                                                                                    |
|-------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Power                               | 24 ± 6 VDC                                                                | 24 ± 6 VDC                                                                                   | 24 ± 6 VDC                                                                                                              |
| Size                                | 10LBS : 140(∅) X 607 mm                                                   | 10LBS : 140(∅) X 600 mm                                                                      | 10LBS : 140(∅) X 600 mm                                                                                                 |
| Weight                              | 5LBS : 8.4 kg<br>7LBS : 10 kg<br>10LBS : 12.5 kg                          | 5LBS : 8.4 kg<br>7LBS : 10 kg<br>10LBS : 12.5 kg                                             | 5LBS : 8.4 kg<br>7LBS : 10 kg<br>10LBS : 12.5 kg                                                                        |
| Environmental<br>Qualified          | MIL-STD-810F, 810C                                                        | MIL-STD-810H                                                                                 | MIL-STD-810                                                                                                             |
| Performance<br>&<br>Characteristics | Filling pressure<br>– Halon 1301 : 750±20 PSI<br>– Low pressure detection | Filling pressure<br>– Halon 1301 : 750±20 PSI<br>– Low pressure detection<br>– Built-in Test | Filling pressure<br>– HFC-227ea : 900±20 PSI<br>– HFC-236fa : 900±20 PSI<br>– Low pressure detection<br>– Built-in Test |



# Thermocouple Wire



3.8m

K1 / K1A1 / K2



4.3m

K21 / K21ARV

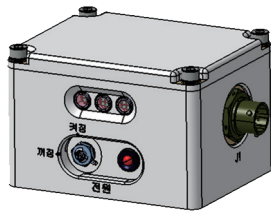


7.6m

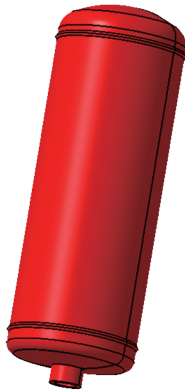
NBC Vehicle /  
Wheeled Armored Vehicle /  
30mm AAGW

| Model                         | TC-WIRE-380                                                                                                                                                                                                                                                                                                                  | TC-WIRE-430                   | TC-WIRE-760                   |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|
| Length                        | Customized per request (3.8m)                                                                                                                                                                                                                                                                                                | Customized per request (4.3m) | Customized per request (7.6m) |
| Weight                        | 0.4 kg                                                                                                                                                                                                                                                                                                                       | 0.5 kg                        | 1.0 kg                        |
| Environmental Qualified       | MIL-STD-810C                                                                                                                                                                                                                                                                                                                 | MIL-STD-810                   | MIL-STD-810F                  |
| Performance & Characteristics | Fire detection by thermocouple<br>Adjustable length<br>Can be installed where OFSA is not suitable due to its contamination such as engine bay<br>Consists of thermocouple & ceramic elements in stainless steel pipe<br>Takes 12±5 sec to detect 25.4mm diameter flame<br>ITS 90(K-type) Qualified<br>MIL-F-7872C Qualified |                               |                               |

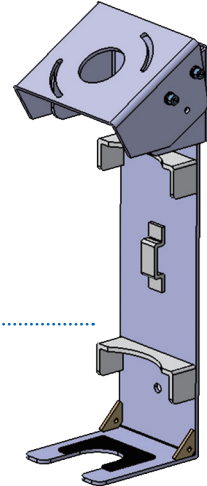
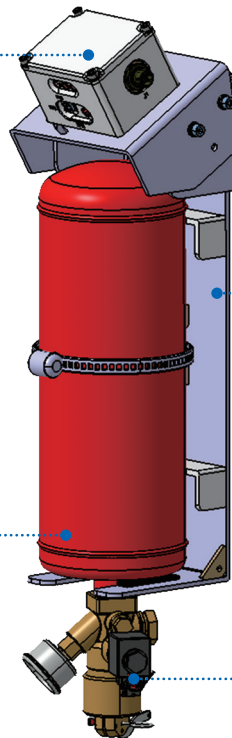
## Compact AFSS



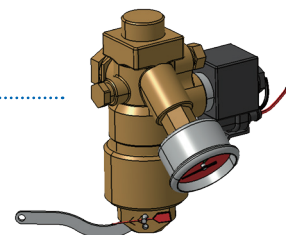
OFSA & Controller



Cylinder



Bracket

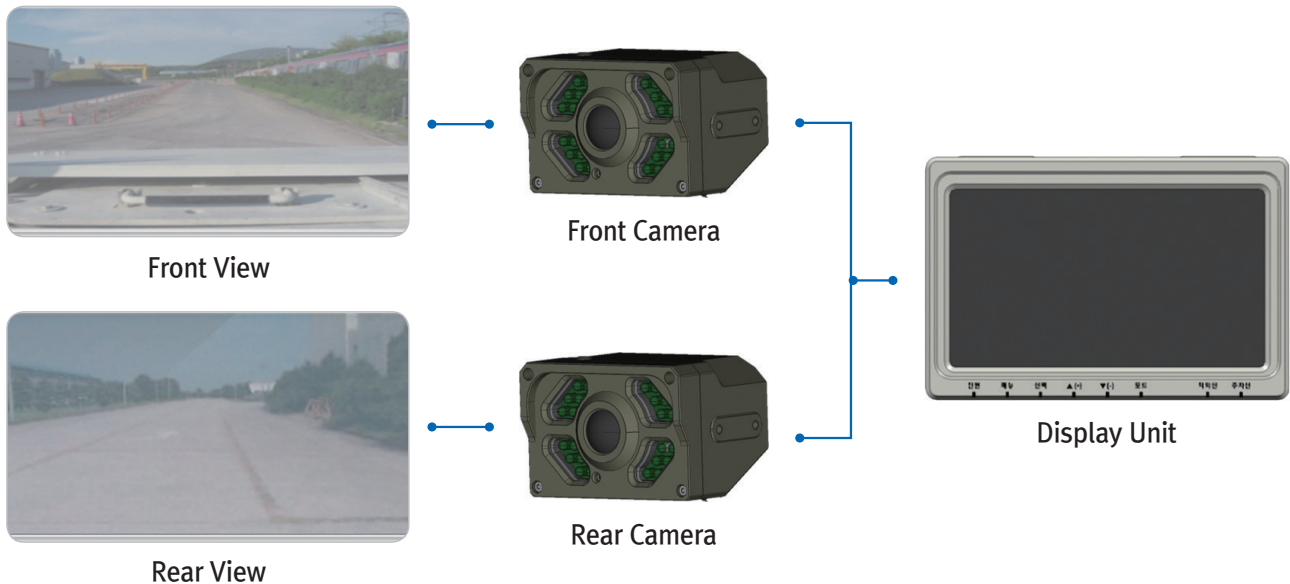


Manual Valve  
Valve Assembly

| Model                               | LCA-25                                                                                                                                                                                                                                                                                     |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power                               | 24 ± 6 VDC                                                                                                                                                                                                                                                                                 |
| Size                                | 6,386 × 1,560 × 1,500 mm                                                                                                                                                                                                                                                                   |
| Weight                              | Max 8.0 kg                                                                                                                                                                                                                                                                                 |
| Performance<br>&<br>Characteristics | Integrated Controller, OFSA and Extinguisher<br>Tilt Angle : ±30° (Vertical), ±30° (Horizontal)<br>Respond Time : 4ms<br>FOV : 90° (Solid Cone)<br>Built-in Test Equipment<br>Extinguisher Agent Amount Quantity : 4 kg<br>Available Extinguisher Agents : Halon1301, HFC-227ea, HFC-236fa |

## Camera / Display

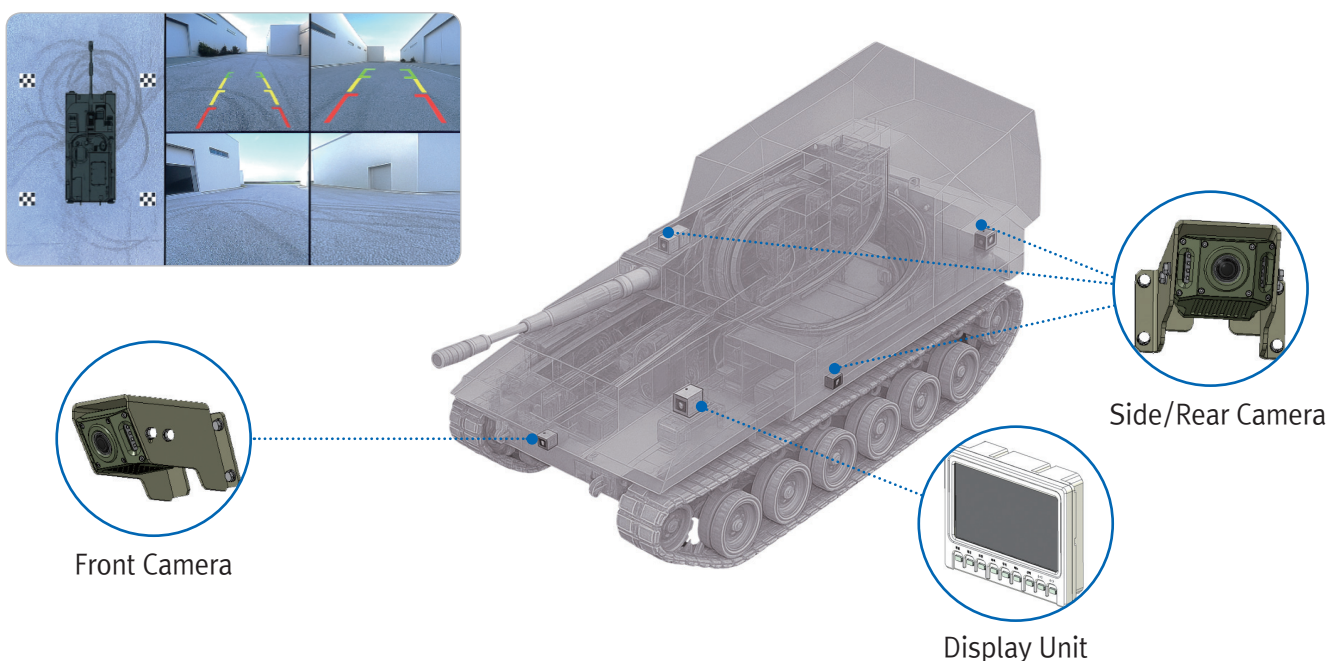
The camera and display unit enhance combat efficiency and operational safety by providing real-time front and rear visibility to the driver. Cameras are mounted at the front and/or rear of the ground combat vehicle, and video feeds are displayed on the in-cabin display unit.



## AVM (Around View Monitoring)

The AVM (Around View Monitoring) system enhances vehicle situational awareness by providing a real-time 360° surround view through multiple cameras mounted around the vehicle. The image control unit seamlessly corrects and integrates these video feeds for a clear and unified display.

Equipped with both a daytime camera and a thermal imaging camera, the front system ensures reliable performance in all lighting conditions—day or night. It delivers clear visibility across various environments, significantly enhancing obstacle detection, maneuverability in tight spaces, and overall driving safety.



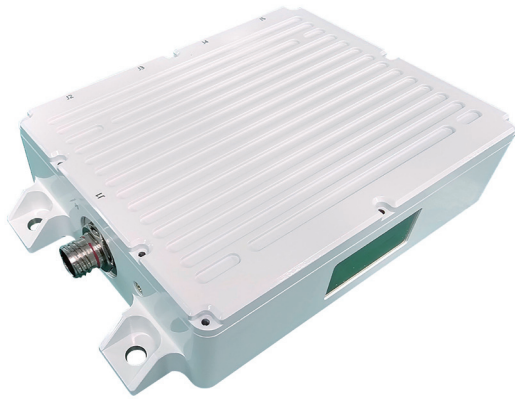


# Driver Camera for Combat Vehicle

|                   |                                                                                   |                                                                                    |                                                                                     |
|-------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Figure            |  |  |  |
| Application       | K9A1 SPH                                                                          | K277A1<br>K288A1                                                                   | K9A2 SPH (AVM Camera)                                                               |
| Sensor Resolution | 1920 x 1080<br>(2M pixels higher)                                                 | 1920 x 1080<br>(2M pixels higher)                                                  | 2592 x 1944<br>(5M pixels higher)                                                   |
| Size              | 106 x 106 x 100 mm                                                                | 104 x 68 x 74 mm                                                                   | 85 x 58 x 62 mm(Front)<br>90 x 116 x 80 mm(Side)                                    |
| Weight            | Under 1.0 Kg                                                                      | Under 1.0 Kg                                                                       | Under 1.0 Kg                                                                        |
| Output            | NTSC(RS-170) / PAL<br>(600 × 350 TV Line)                                         | AHD<br>(1920 x 1080)                                                               | AHD<br>(2560 x 1440)                                                                |
| FOV (H×V)         | 130° × 90°<br>(Rear)                                                              | 110° × 60°<br>(Front, Rear)                                                        | 180° × 100°<br>(Front, Rear, Side)                                                  |
| Sensor Type       | CMOS                                                                              | CMOS                                                                               | CMOS                                                                                |
| Power             | 24VDC(18~30VDC)                                                                   | 24VDC(18~30VDC)                                                                    | 24VDC(10~32VDC)                                                                     |
| Environment       | Temp./Shock/Vib.<br>– MIL-STD-810                                                 | Temp./Shock/Vib.<br>– MIL-STD-810                                                  | Temp./Shock/Vib.<br>– MIL-STD-810                                                   |

|                   |                                                                                     |                                                                                      |                                                                                       |
|-------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Figure            |  |  |  |
| Application       | K21 IFV / K21 ARV                                                                   | Wheeled Armored- Vehicle<br>30mm AAGW                                                | 6x6 Ticon<br>(Saudi Arabia)                                                           |
| Sensor Resolution | 1020 × 507<br>(0.5M pixels)                                                         | 680 x 512<br>(0.3M pixels)                                                           | 1920 x 1080<br>(2M pixels higher)                                                     |
| Size              | 135 x 108 x 165 mm                                                                  | 75 x 74 x 113 mm                                                                     | 75 x 70 x 100 mm                                                                      |
| Weight            | Under 4.0 Kg                                                                        | Under 1.0 Kg                                                                         | Under 1.0 Kg                                                                          |
| Output            | NTSC(RS-170)                                                                        | NTSC(RS-170)<br>(380 × 300 TV Line)                                                  | AHD<br>(1920 x 1080)                                                                  |
| FOV (H×V)         | 64° × 54°<br>(Front, Rear)                                                          | 80° × 60°<br>(Front, Rear)                                                           | 110° × 60°<br>(Front, Rear)                                                           |
| Sensor Type       | CCD                                                                                 | CMOS                                                                                 | CMOS                                                                                  |
| Power             | 24VDC(18~30VDC)                                                                     | 24VDC(18~30VDC)                                                                      | 24VDC(18~30VDC)                                                                       |
| Environment       | Temp./Shock/Vib.<br>– MIL-STD-810                                                   | Temp./Shock/Vib.<br>– MIL-STD-810                                                    | Temp./Shock/Vib.<br>– MIL-STD-810                                                     |

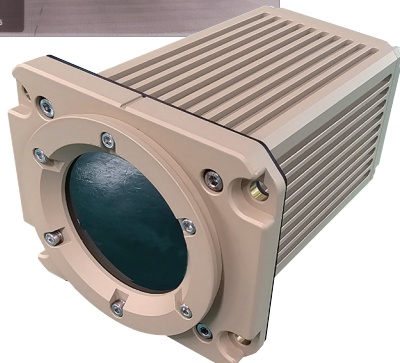
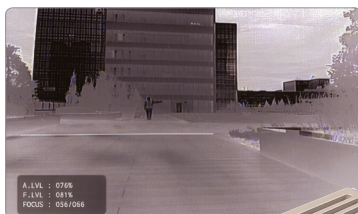
## Image Processing unit



- Applied to 8 x 8 Ticon
- Size : 250 x 160 x 55 mm
- Weight : 1.7 kg
- Input : AHD 5CH, NTSC 3CH
- Output : AHD 2CH (FHD)
- Function
  - Around view screen composition
  - Multi-Camera Image Correction and Stitching

## Thermal Camera

- Size : 110mm x 92mm x 155mm  
Weight : 1.7 kg
- Wide 90° Horizontal Viewing Angle  
Provides stable viewing with a wide 90° horizontal angle
- Activation Time Within 7 Seconds  
High-performance sensor and FPGA application enable an activation time twice as fast as existing systems.
- High-Definition Image Quality  
Delivers high-definition images using a display function that reflects thermal characteristics.
- Long Image Retention Without Distortion  
Applies a special shutter-less algorithm to maintain clarity without distortion.

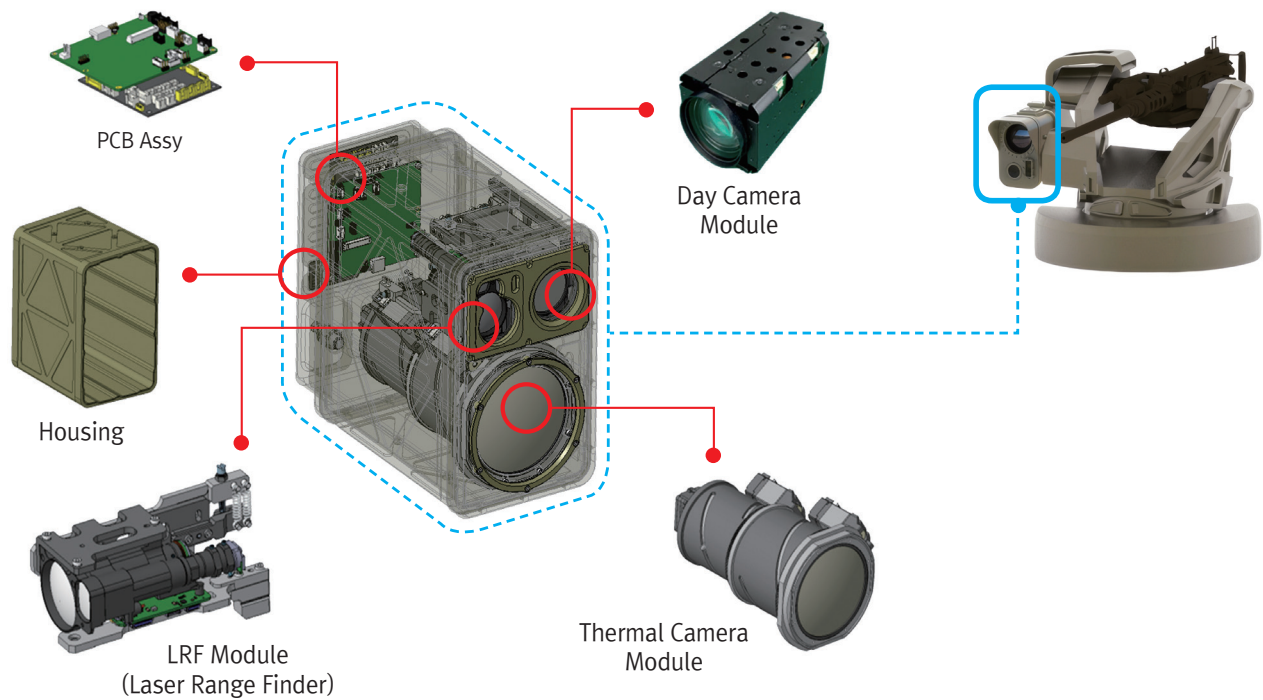


| Optics                                  |                                                                                                                                                                                  |              |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| FOV                                     | 90° × 60°                                                                                                                                                                        | Fixed Focus  |
| Imager                                  |                                                                                                                                                                                  |              |
| Sensor                                  | 640 x 480                                                                                                                                                                        | Uncooled     |
| PixelSize                               | 12 μm                                                                                                                                                                            |              |
| Spectral Range                          | 8 to 14 μm                                                                                                                                                                       |              |
| NETD                                    | ≤ 50mk [at300K,F/1]                                                                                                                                                              |              |
| Boot-up Time                            | < 8sec                                                                                                                                                                           |              |
| Electrical                              |                                                                                                                                                                                  |              |
| Video Out                               | NTSC                                                                                                                                                                             |              |
| Control                                 | RS422 & CAN                                                                                                                                                                      |              |
| Power Input                             | DC 18~36 VDC                                                                                                                                                                     |              |
| Function                                |                                                                                                                                                                                  |              |
| User-Controlled Functions               | · Contrast/Brightness Adjustment (Manual/Auto)<br>· Image Mode Selection (Black Hot/White Hot/Color)<br>· Image Correction Function (NUC)<br>· Built-in Self-Diagnostic Function |              |
| Environmental                           |                                                                                                                                                                                  |              |
| Temp./Shock/Vib.<br>SaltSpray/Immersion |                                                                                                                                                                                  | MIL-STD-810F |
| EMI                                     |                                                                                                                                                                                  | MIL-STD-461  |

| Figure                                   |  |  |  |
|------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Application                              | 6×6<br>Wheeled Armored Vehicle                                                      | 8×8<br>Wheeled Armored Vehicle<br>(For Infantry)                                     | 8×8<br>Wheeled Armored Vehicle                                                        |
| Size/Weight                              | 310 × 300 × 100 mm<br>6.0 kg                                                        | 460 × 315 × 55 mm<br>6.3 kg                                                          | 292 × 226 × 54 mm<br>3.5 kg                                                           |
| LCD Resolution                           | 1280 × 720                                                                          | 1920 × 1080                                                                          | 1920 × 1080                                                                           |
| LCD Size<br>Aspect Ratio<br>Input Signal | 10.1 inch<br>16:9<br>AHD 2CH, NTSC 1CH                                              | 18.5 inch<br>16:9<br>AHD 5CH                                                         | 10.1 inch<br>16:9<br>AHD 5CH                                                          |



# RCWS Imaging device



| Item                     |                     | High-Performance Model                                                              | Lightweight and Compact Model                                                         |
|--------------------------|---------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                          |                     |  |  |
| Size/Weight              |                     | 180 × 270 × 350 mm / 13 kg                                                          | 159 × 239 × 273 mm / 4.5 kg                                                           |
| Day Camera               | Optical Zoom        | 35x, Continuous Zoom                                                                | 30x, Continuous Zoom                                                                  |
|                          | FOV (Field of View) | 3.5° × 2.0° ~ 60.0° × 35.0° (±10%)                                                  | 1.8° × 1.3° ~ 54.0° × 39.0° (±10%)                                                    |
|                          | D/R/I               | 24,000 / 8,000 / 4,000 m                                                            | 14,000 / 6,400 / 3,200 m                                                              |
| Thermal Camera           | Optical Zoom        | 3x, Dual Fixed FOV & Continuous Zoom                                                | 4x, Dual Fixed FOV & Continuous Zoom                                                  |
|                          | Sensor Type         | Uncooled, 8~14 μm<br>640 × 480 pixels                                               | Uncooled, 8~14 μm<br>640 × 480 pixels                                                 |
|                          | FOV (Field of View) | Narrow : 3.5° × 2.5° (±5%)<br>Wide : 13.0° × 9.0° (±5%)                             | Narrow : 4.4° × 3.5° (±5%)<br>Wide : 17.0° × 13.0° (±5%)                              |
|                          | D/R/I               | 7,200 / 3,500 / 2,100 m                                                             | 7,100 / 3,200 / 1,600 m                                                               |
| LRF (Laser Range Finder) | Range               | 5 km min (NATO target)                                                              | 5 km min (NATO target)                                                                |



# No.1 Military Ground Vehicles Solution Company

## Automatic Fire Sensing & Suppression System

## Camera & Monitor System



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