

TELEOPTIK - GYROSCOPES



AIRBORNE

&

GROUND BASED SYSTEMS

&

COCKPIT DISPLAYS



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ABOUT US

Teleoptik-Gyroscopes is a modernly equipped company focused on the development of avionics and optoelectronics. In the last two years we have been participating in the project of modernization of the ORAO fighter airplane at the initiative of the Ministry of Defense (MoD) by working on hardware and software, as well as an offensive navigation system, with a carefully selected engineering team. We continue to improve the production of optical and thermal sights as well as sighting devices. We especially plan to invest in engineering staff in the field of avionics, optoelectronics, electronics, and mechanical engineering. We are able to create the most complex 3D models thanks to the investments of the Government of Republic of Serbia. Also we provide a surface protection service with the help of unique machine Rotamat for the application of nanotechnology which enables a serial procedure of applying NANO protection on a wide range of materials (steel, bronze, brass, aluminium alloys, plastics, wood, rubber).

We have modernly equipped, certified laboratories by the Accreditation Institution of Serbia (optical and metrological, physical and chemical) provide testing, inspection and calibration service.)



TV Homing Head 145 mm

TV HH 145 mm is a highly reliable system presenting ideal solution at the smart weapon integration, the examples being remotely and self-guided airborne vehicles and self-guided missiles.

TV HH 145 mm can, in accordance to the carrier vehicle properties and customer requirement, be prepared/integrated in two system configuration forms, LOBL (Lock On Before Launch) or LOAL (Lock On After Launch).

TV HH 145 mm ruggedized electronics for control, stabilization and video processing is integrated around TV camera carrying structure.

TV HH 145mm has additional input enabling, in systems with this capability, mission simulation from launching up to terminal flight phases.

TV HH 145mm – pilot interface and software routines set enables monitoring and control of all it observing functions, TV.HH-145mm control within all motion phases of ground or airborne system carrying operator, as well as control in all flight phases of armament device having TV.HH-145mm integrated on-board.



CHARACTERISTICS	
Detector type	1/2,8 type "EXMOR R" CMOS sensor
Resolution	2130 kPix
Field of view	63,7° (1X zoom) – 2,3° (30X zoom)
Image frequency	25 Hz
Zoom	30X optical, 12X digital
MONITORING OBJECTS POSSIBILITY	
Tracking algorithm	Contrast / correlation
Radial tracking speed	10°/s
SYSTEM PERFORMANCE	
Stabilization system	Position / speed
Azimuth range	-30° - +30°
Elevation range	-55° - +30°
Angular speeds (both axes)	60°/s
SYSTEM INTERFACE	
Video input	Pixel port (LVDS)
Aux Video input (opcional)	HD-SDI (1080p, 25Hz)
Video output	HD-SDI (1080p, 25Hz)
Remote control interface	RS 422
TV camera interface	RS 232/ TTL
ENVIRONMENT - EXTERNAL INFLUENCES	
Operating temperature	-20° C - +55° C
Storage temperature	+10° C - +45° C
POWER SUPPLY	
Power	28V DC (±10%)
Nominal consumption	0,7A typically, 8A max
PHYSICAL CHARACTERISTICS	
Caliber / Length	145mm / 247,5mm

- ▶ TV HH 145 mm is TV camera based element of surveillance / homing system
- ▶ Aimed for integration on airborne vehicles as part of a surveillance / homing system
- ▶ Robust design resistant to external influences
- ▶ Integration capability through various interface types (RS422, CAN, UART, 1553)
- ▶ INS strap down support capability
- ▶ Fully compliant with MIL / SORS standards
- ▶ Calibration capability in accordance with customer requirements
- ▶ Full customer support during integration



TV Homing Head

TV.HH-175mm is a highly reliable TV equipped missile homing head intended for use in daylight conditions, capable of tracking targets up to 3km away, designed and manufactured in our company.

TV.HH-175mm has the capability of integration on-board of various armament devices, including UAV, UCAV and guided missiles, enabling them precise attacks on ground targets by using advanced tracking algorithm.

TV.HH-175mm is designed to be an ideal solution in accordance to the guided missile terminal phase video information requirements, as applied on board of the ground-to-ground & airborne-to-ground smart weapons.

TV.HH-175mm can, in accordance to the carrier vehicle properties and customer requirement, be prepared/integrated in two system configuration forms, LOBL (Lock On Before Launch) or LOAL (Lock On After Launch), in both cases operator of ground or airborne system keeping full HOTAS control. TV.HH-175mm ruggedized electronics for control, stabilization and video processing is integrated around TV camera carrying structure.



- ▶ TV.HH-175mm is TV camera based homing head
- ▶ Designed and manufactured for integration on ground & airborne carriers
- ▶ Ruggedized design suitable for various carriers dynamics
- ▶ Various kind of interfaces for missile & carrier integration (UART, CANBus)
- ▶ MIL standards qualified
- ▶ Various user defined kinds of HH calibration
- ▶ Full Customer support during HH integration

175 mm

TV.HH-175mm has additional input enabling, in systems with this capability, mission simulation from launching up to terminal flight phases.

TV.HH-175mm – pilot interface and software routines set enables monitoring and control of all it observing functions, TV.HH-175mm control within all motion phases of ground or airborne system carrying operator, as well as control in all flight phases of armament device having TV.HH-175mm integrated on-board.



TV IMAGER	
Detector Type	1/2.8 CMOS
Resolution	2Mpix
Refreshment rate	25 Hz
Optics	F1.4.3÷129 mm, f#1.4, HFOV 65.1÷2.3°, VFOV 38.8÷1.4°
Detection	> 2 km (2.3m x 2.3m NATO target size)
Remote Control	Gain, Shutter, Iris, AGC, AE, VB
Digital zoom	20x
OBJECT TRACKING CAPABILITY	
Tracking algorithm	Correlation, Contrast/Centroid, Combined
Radial tracking velocity	> 10°/s
Sampling frequency	25 Hz
SYSTEM PERFORMANCE	
System stabilization	2-axis gimballed
Azimuth range	±40 °
Elevation range	+10° ÷ 70 °
Point accuracy	50 μrad
Stabilization Accuracy	80 μrad
Angular rate (both axis)	0.1 ÷ 30°/s
System Interface	
Video	Composite (PAL/NTSC) SD digital
Data & Remote Control	RS—422, CANBus
ENVIRONMENT REQUIREMENTS	
Standards	MIL-STD-810E, MIL-STD-461F
Operational temperature range	-25°C ± 55°C
Storage temperature range	-30°C ± 70°C
POWER SUPPLY	
Voltage	18-32 V DC (in accordance to MIL-STD-704E)
Power consumption	30W continuous, 160 W peak
PHISICAL PROPERTIES	
Diameter	175 mm
Length	270 mm
Weight	2.8 kg

IC Homing Head

IR.HH-175mm is a highly reliable IR equipped missile homing head intended for use in night at low light conditions, capable of tracking targets up to 3km away.

IR.HH-175mm has the capability of integration on-board of various armament devices, including UAV, UCAV and guided missiles, enabling them precise attacks on ground targets by using advanced tracking algorithm.

IR.HH-175mm is designed to be an ideal solution in accordance to the guided missile terminal phase video information requirements, as applied on board of the ground-to-ground & airborne-to-ground smart weapons.

IR.HH-175mm can, in accordance to the carrier vehicle properties and customer requirement, be prepared/integrated in two system configuration forms, LOBL (Lock On Before Launch) or LOAL (Lock On After Launch), in both cases operator of ground or airborne system keeping full HOTAS control.

IR.HH-175mm ruggedized electronics for control, stabilization and video processing is integrated around IR camera carrying structure.



- ▶ IR.HH-175mm is IR camera based homing head
- ▶ Designed and manufactured for integration on ground & airborne carriers
- ▶ Ruggedized design suitable for various carriers dynamics
- ▶ Various kind of interfaces for missile & carrier integration (UART, CANBus)
- ▶ MIL standards qualified
- ▶ Various user defined kinds of HH calibration
- ▶ Full Customer support during HH integration

175 mm

IR.HH-175mm has additional input enabling, in systems with this capability, mission simulation from launching up to terminal flight phases.

IR.HH-175mm – pilot interface and software routines set enables monitoring and control of all its observing functions, IR.HH-175mm control within all motion phases of ground or airborne system carrying operator, as well as control in all flight phases of armament device having IR.HH-175mm integrated on-board.



THERMAL IMAGER

Detector type	Uncooled bolometer, Shutterless technology
Resolution	640x480 pix
Spectral range	8-14 μm
Pixel pitch	17 μm
Image refreshment rate	25 Hz
Optics: Ge. Lens	f1.75mm, f#1, FOV. 8.3° x 6.5°, athermalized
Detection	>3km (Target size: 4.8m x 1.8m x 2m)
Remote control	LUT, AGC, Scene
Digital zoom	2x, 4x

OBJECT TRACKING CAPABILITY

Tracking algorithm	Contrast/Centroid, Correlation, Combined
Radial tracking speed	> 10°/s
Sampling rate	25Hz

SYSTEM PERFORMANCE

System stabilization	2-axis gimballed
Azimuth range	$\pm 30^\circ$
Elevation range	$\pm 30^\circ$
Point accuracy (ext. comm)	50 μrad
Stabilization accuracy	80 μrad
Angular velocities (both axis)	0.1÷30 °/s

SYSTEM INTERFACES

Video	Composite (PAL/NTSC) / SD digital
Data and Remote control	RS-422, CANBus

ENVIRONMENTAL

Applied standards	MIL-STD-810E, MIL-STD-461F
Operating temperature range	-25°C to +55°C
Storage temperature range	-30°C to +70°C

POWER REQUIREMENTS

Voltage	18-32 VDC (per MIL-STD-704E)
Consumption	50W (180W peak max)

PHYSICAL CHARACTERISTICS

Diameter	175 mm
Length	340 mm (including WarHead PF electronics)
Weight	4.2 kg (including WarHead PF electronics)

PRODUCTION

Production status	Full serial production
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TV Homing Head

TV HH 200 mm is a highly reliable system presenting ideal solution at the smart weapon integration, the examples being remotely and self-guided airborne vehicles and self-guided missiles.

TV HH 200 mm can, in accordance to the carrier vehicle properties and customer requirements, be prepared/integrated in two system configuration forms, LOBL (Lock On Before Launch) or LOAL (Lock On After Launch).

TV HH 200 mm ruggedized electronics for control, stabilization and video processing is integrated around TV camera carrying structure.

TV HH 200 mm has additional input enabling, in systems with this capability, mission simulation from launching up to terminal flight phases.

TV HH 200 mm – pilot interface and software routines set enables monitoring and control of all its observing functions, TV HH 200 mm control within all motion phases of ground or airborne system carrying operator, as well as control in all flight phases of armament device having TV HH 200 mm integrated on-board.



200 mm

- ▶ TV HH 200 mm is TV camera based element of homing system
- ▶ Aimed for integration on airborne vehicles as part of a homing system
- ▶ Surveillance system integration capability
- ▶ Robust design resistant to external influences
- ▶ INS strap down support capability
- ▶ Integration capability through various interface types (RS422, CAN, UART, 1553)
- ▶ Fully compliant with MIL / SORS standards
- ▶ Calibration capability in accordance to customer requirements
- ▶ Full customer support during integration



CHARACTERISTICS	
Detector type	1/2,8 type "EXMOR R" CMOS sensor
Resolution	2130 kPix
Field of view	63,7° (1X zoom) – 2,3° (30X zoom)
Image frequency	25 Hz
Zoom	30X optical, 12X digital
MONITORING OBJECTS POSSIBILITY	
Tracking algorithm	Contrast / correlation
Radial tracking speed	10°/s
SYSTEM PERFORMANCE	
Stabilization system	Position / speed
Azimuth range	-50° - +50°
Elevation range	-80° - +80°
Angular speeds (both axes)	60°/s
SYSTEM INTERFACE	
Video input	Pixel port (LVDS)
Aux Video input (opcional)	HD-SDI (1080p, 25Hz)
Video output	HD-SDI (1080p, 25Hz)
Remote control interface	RS 422
TV camera interface	RS 232/ TTL
ENVIRONMENT - EXTERNAL INFLUENCES	
Operating temperature	-20° C - +55° C
Storage temperature	+10° C - +45° C
POWER SUPPLY	
Power	28V DC (±10%)
Nominal consumption	0,7A typically, 8A max
PHYSICAL CHARACTERISTICS	
Caliber / Length	200 mm / 258 mm
Mass	3261 g

HOMING HEAD ARROW 10

Homing head is a part of circle for directing a rocket and is designed for providing passive homing missiles at an air target by providing the control signal for angular velocity and line of sight for bearing corner, disaggregated by two-channel control, the vertical and horizontal fin rockets. GSN provides day and night operation and target tracking in real situations during the shooting, in order to meet or departing. It also enables shooting a rocket, as the mobile and the immobile air targets: aircraft with reactive, jet engines, aircraft – missiles, helicopters and planes to transport aircraft.

It can operate in two diapason spectrum:

- "F" channel to the visible range of the background of the uniform, with three degrees of cloud cover and in the final day cloudiness;

- "I" channel in the infrared spectrum of the complex background of the sky during the day and at night

Angle of field operation "F" and "I" channel: 1°

The maximum angular velocity: $15^\circ/s$

Maximum angle of bearing: $\pm 40^\circ$

Temperature range: $-40^\circ \div 50^\circ C$



HOMING HEAD ARROW 2M



- ▶ Arrow 2M" is intended for the destruction of low-air targets in the airspace under optical visibility conditions
- ▶ IR homing head is for forming control signal proportional to angle of the vision line (distance vector) of the target
- ▶ Operating temperature: $-40^{\circ} \div 50^{\circ}\text{C}$
- ▶ Optical system field of vision angle: $2\alpha = 1,5^{\circ}$
- ▶ Maximal target reaching distance: up to 6 km
- ▶ Voltage supply of electric circuit: 40 V
- ▶ Mass of standard head: 930 g

Airborne Mission Computer

- ▶ Intel Core i5 1.9Ghz Quad Core
- ▶ 16GB DDR3 Memory
- ▶ 2 touchscreen displays support (HDMI/DVI, VGA)
- ▶ 2/4 independent PAL/NTSC analog or HD/SD video inputs
- ▶ OS: Windows 7, Windows 8, Windows 10, VxWorks
- ▶ DO-160 Certified
- ▶ Analog/Digital signal processing support
- ▶ Multiple I/O ports including 2x1553, ARINC 429 Rx/Tx, 2xCANBus, multiple UARTS
- ▶ Removable USB SSD for mission plan loading, data recording and debrief support
- ▶ MIL 38999 III circular connections
- ▶ Robust and fan less convection cooling

The Airborne Mission Computer (ARM-AE1) is a highly reliable airborne mission control and information system. ARM-AE1 is an ideal solution for military airborne (fixed and rotor wing aircraft) and ground vehicles with harsh space and reliability requirements. ARM-AE1 is optimised in accordance to Military airborne harsh environment requirements, offering exceptional performance and versatility in a small package.



ARM-AE1 has the capability of acquiring processing and controlling analogue/digital signals, giving it the function of integrator of system containing analogue/digital components and subsystems, as well as processing analogue/GPIO digital outputs.

ARM-AE1 communication suite with core based upon MIL-1553 & ARINC data buses enables user to communicate with integrated third party devices such as Inertial Navigation System, Air Data Computer, HOTAS, Radio Navigation equipment, Airborne armament FCS, as well as pilot HMI or other USB or Ethernet peripherals.

ARM-AE1

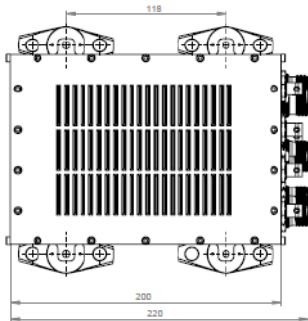
ARM-AE1 supports specially interfaced removable USB Solid State Drive for loading mission execution sensitive and classified data and post mission downloading of video, audio and digital flight record data. Specially interfaced removable USB Solid State Drive is securely stored in vault away from the ARM-AE1.

ARM-AE1 is provided with a two-way connection with armament subsystem containing IR/TV/laser sensing suite, the interface connection consisting of 1553/422/CAN/Ethernet digital data busses and dual co-axial BNC video links, enabling control of Electro-Optical and armament delivery systems.

ARM-AE1 can output video to 2 independent touch-screen displays allowing the users to carry out tasks such as:

- ▶ Primary Flight Display & Navigation visualization using mapping and augmented reality software
- ▶ Operate the surveillance/armament function of a OE system/HH viewing video feed
- ▶ Record and play back video

Further details about interfacing available on demand.



Processor and Interface Characteristics

Processor & Memory & SSD	Intel Core i5 1.9Ghz Quad Core, 4/8/16GB, 256GB
Operation System	Windows 7, 8 ,10 / VxWorks
UARTS	4x RS – 232, 3x RS – 422
CAN BUS / Ethernet	2 Independent isolated channels / 1 channel
Discrete Input 28V / 5V	24 / 9
Analogue Inputs / Outputs	16 single ended (8 differential) / 2 ($\pm 10V$ with Programmable Gain)
MIL – STD – 1553B	2xCH1 + 2xCH2 (Dual redundancy configuration)
ARINC – 429	8 Rx + 16 Tx
Analogue VIDEO Input	2 independent channels (625/25 PAL & 525/30 NTSC)
Display Output / AUDIO Output	1xHDMI/DVI + 1xVGA / 1 Audio output

Environmental and Mechanics

Dimensions	156mm x 180.1mm x 265 mm (including connectors)
Weight	3.7 kg
Temperature, Vibration, Shock	MIL-STD-810G
EMI/EMC	MIL-STD-461/464
Power	28VDC, 1.7A

COCKPIT DISPLAY 5.6"

Rugged APM 5.6" display is particularly suitable for application in Military Mission execution of Airborne/Ground vehicles with limited installation space, such as Jet Fighter and Helicopter Cockpits and Armored vehicles.

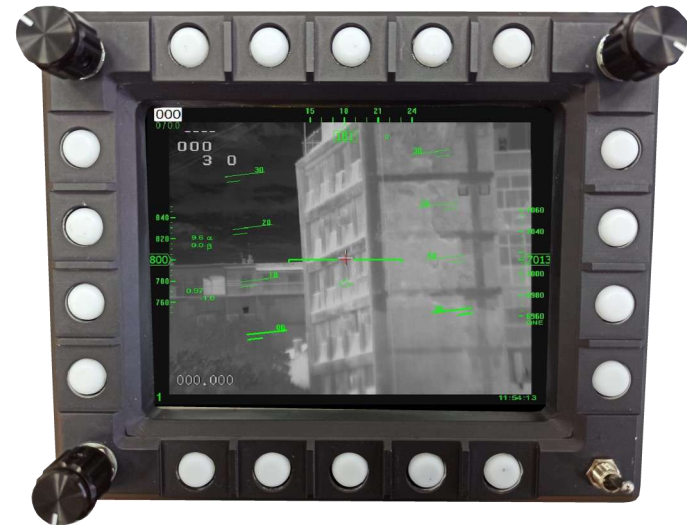
APM 5.6" small frame and bezel size, configurable I/O, flexible mounting configurations and AC/DC power supply, makes it a valuable solution for many mission critical applications.

Full-featured military specified APM 5.6" display can be delivered with a wide variety of standard options enabling TELEOPTIK - Gyroscopes to provide customized display fitting exact user requirements.

Our company has over 30 years of experience in designing, producing and supporting a variety of rugged optical, computing and display solutions that serve airborne, land based and naval applications.

Our LCD displays are integrated into the set of 4.8", 5.6", 6.4", 8.0", 10.4", 12", 15" and 17" solutions in both portrait & landscape formats. TELEOPTIK-Gyroscopes LCD displays are designed for applications within extreme, combat like harsh environment.

We have developed a standing reputation for cooperation with customers to design custom solutions and reliable products. This, together with extensive industry knowledge, makes us a partner you can trust.



- ▶ Screen diagonal 5.6"
- ▶ High Brightness (Sun-light Readable)
- ▶ Extremely Small Frame and Bezel Dimensions
- ▶ Fully User defined 18 x Bezel Buttons & switches
- ▶ Fully User defined 3xEncoder features
- ▶ Multiple Video inputs (HDMI/DVI, VGA, CVBS PAL/NTSC)
- ▶ Integrated light sensor, NVG Compatibility (Optional)
- ▶ Low Weight
- ▶ Flexible Mounting Configuration
- ▶ MIL 38999 III Backplane Circular Connectors
- ▶ Wide Range Environmental/EMI/EMC resistance
- ▶ Fully Enclosed Unit (IP66), Convection Cooling
- ▶ Ruggedized AR Touch Screen (Optional)



Optical

Viewable Area	5.6" Diagonal; 112.9mm x 84.7mm
Display Type	TFT LCD w/ LED Backlight
Resolution	640 x 480
Contrast Ratio	1000:1
Brightness	1500 cd/m2
Viewing angle	+60°÷-60°(H), +65°÷-55°(V)
Touch Screen	Resistive
NVG	NVG Compatibility (Option)

Overall Unit

Dimensions	157mm x 127mm x 30mm
Weight	
Power Input	19 ÷ 32 VDC
Power Consumption	10W
I/O Options	1xHDMI/DVI+1xVGA+1xCVBS+1xRS422 Bezel control+1xRS232 TS
Connectors	Circular MIL-38999 serial
Enclosure	Aluminium (No openings)
User Controls	18xBezel buttons, 3xEncoders, OSD, Day/Night Switch

Environmental and Mechanics

Operating Temperature	-20 ÷ 55 °C
Storage Temperature	-40 ÷ 70 °C
Vibration, Shock, Alt, Humidity	MIL-STD-810G
EMI/EMC	MIL-STD-461/464

COCKPIT DISPLAY 8.0"

Highly reliable and rugged APM 8.0" display is particularly suitable for application in Military Mission execution of Airborne/Ground vehicles with limited installation space, such as Jet Fighter and Helicopter Cockpits and Armored vehicles.

APM 8.0" small frame and bezel size, configurable I/O, flexible mounting configurations and AC/DC power supply, makes it a valuable solution for many mission critical applications.

Full-featured military specified APM 8.0" display can be delivered with a wide variety of standard options enabling TELEOPTIK - Gyroscopes to provide customized display fitting exact user requirements.

Our company has over 30 years of experience in designing, producing and supporting a variety of rugged optical, computing and display solutions that serve airborne, land based and naval applications.

Our LCD displays are integrated into the set of 4.8", 5.6", 6.4", 8.0", 10.4", 12", 15" and 17" solutions in both portrait & landscape formats. TELEOPTIK-Gyroscopes LCD displays are designed for applications within extreme, combat like harsh environment.

We have developed a standing reputation for cooperation with customers to design custom solutions and reliable products. This, together with extensive industry knowledge, makes us a partner you can trust.



- ▶ Screen diagonal 8.0"
- ▶ High Brightness (Sun-light Readable)
- ▶ Extremely Small Frame and Bezel Dimensions
- ▶ Fully User defined 22 x Bezel Buttons & switches
- ▶ Fully User defined 3xEncoder features
- ▶ Multiple Video inputs (HDMI/DVI, VGA, CVBS PAL/NTSC)
- ▶ Integrated light sensor, NVG Compatibility (Optional)
- ▶ Low Weight
- ▶ Flexible Mounting Configuration
- ▶ MIL 38999 III Backplane Circular Connectors
- ▶ Wide Range Environmental/EMI/EMC resistance
- ▶ Fully Enclosed Unit (IP66), Convection Cooling
- ▶ Ruggedized AR Touch Screen (Optional)



Optical

Viewable Area	8.0" Diagonal; 170.4mm x127.8mm
Display Type	TFT LCD w/ LED Backlight
Resolution	800 x 600
Contrast Ratio	1000:1
Brightness	1500 cd/m2
Viewing angle	+60°÷-60°(H), +65°÷-55°(V)
Touch Screen	Resistive
NVG	NVG Compatibility (Option)

Overall Unit

Dimensions	211mm x 170mm x 62mm
Weight	
Power Input	19 ÷ 32 VDC
Power Consumption	12W
I/O Options	2xHDMI/ DVI+1xVGA+1xCVBS+1xRS4
Connectors	22 Bezel control+1xRS232 TS
Enclosure	Aluminium (No openings)
User Controls	22xBezel buttons, 3xEncoders, OSD, Day/Night Switch

Environmental and Mechanics

Operating Temperature	-20 ÷ 55 °C
Storage Temperature	-40 ÷ 70 °C
Vibration, Shock, Alt, Humidity	MIL-STD-810G
EMI/EMC	MIL-STD-461/464

COCKPIT DISPLAYS

NAVAL and GROUND BASED SYSTEMS

These TFT LCD displays with LED backlight are designed for use in harsh environment including water and high electromagnetic emissions. Cockpit Display has built in intelligent functions and therefore can be customized for any application upon request of the customer.

Display has built it embedded controller which holds multiple monitor functions as well as control of any external devices. Controller is based upon Cortex M4 core and has multiple UART, RS232, RS422 and CAN busses.

Primary functions of the display are full RS232 (or upon request USB) resistive touch screen, 2 or more RS232 or RS422 built in keyboard outputs for control of other devices, and additional serial comms which include additional three RS232 or RS422.

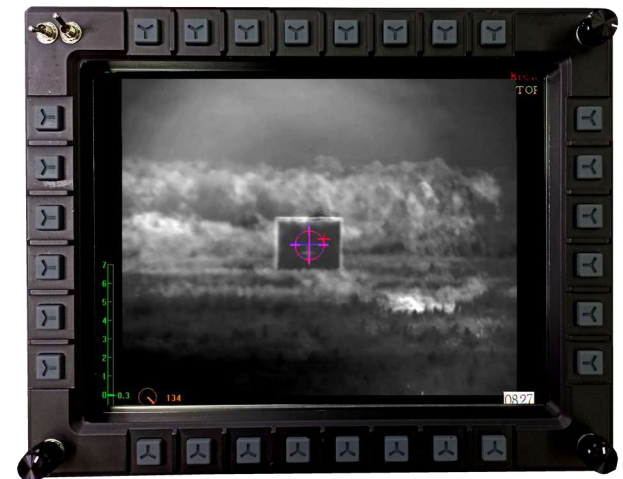
Second primary function is bult in 28 (16) keys keyboard, which has double action data output on serial bus. Action is on press and release and allows for control of monitor functions and/or other devices.

Build in LCD controller allows for several functions including HDMI, DisplayPort, DVI, VGA, CVBS input, with possible PiP mode displaying any two of the mentioned inputs. All inputs are ruggedized and prepared for harsh environment, and available via D38999 connectors.

10" Monitors ▼



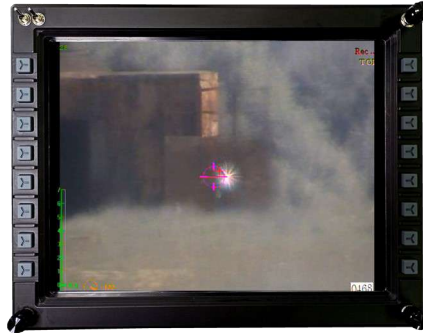
12" Monitor ►



10", 12" & 15"



◀ 12" Monitor



15" Monitor ▶

INPUT:	HDMI, DP, DVI, VGA, 4xCVBS
OUTPUT:	1xCVBS (of the selected CVBS input with OSD)
PiP:	HDMI, DP, DVI, VGA + CVBS
Size:	12inch
Resolution:	Max 1080p Min 640i
Backlight:	LED 1500 nits
Contrast:	1:10000
Built in controller:	Cortex M4
Serial output:	3xRS232
	1xRS422
	1xUART TTL
Touch Screen:	RS232 (calibrated, resistive) full size
COMM BUS:	CAN 1Mbit
Voltage:	9-36V
Current:	Max 3A (with high current output)

There are four available CVBS inputs, which are internally switched and fed towards an OSD embedding unit, and the towards TFT, this allows for any custom graphics and text to be overlaid on the picture, allowing powerful usage of the display in standalone environment with electro optic system without need to add additional PC. Input selections is possible either through combination of key presses or directly depending on customer request.

Additional display functions are three encoders which represent HMI, and allow for change of brightness and to control other functions internal or external devices. Cockpit Display has a built in ON/OFF switch and allows for DAY/NIGHT modes switch. It also has several digital outputs which are capable of sourcing 1A of current.

Also, optional built in IMU, and heating pad for extremely low temperatures, with controllable power on after warm up.

It is ruggedized according to MIL STD 810G and MIL STD 461F for EMC compatibility. This with its superior high brightness of over 1500 nits allow it full use in outdoor environment and with its HD capabilities picture provided is crystal clear for all information to be fully displayed and viewed in perfect clarity.

STORE MANAGEMENT SYSTEM

This system is comprised of multilevel device architecture, that allows diversity in SMS control. Primary components of the system are:

- UKBN – Main control box that provides an HMI and allows for easy installation and use of the system
- KBN – As a main control device that takes control over all Store Management functions
- IKBN – The last in the link of device providing execution of commands as well as data acquisition on the store location it self, these can be added as much as needed but default number is five

The system allows control of various types of weapons, intelligent and projectiles. It allows power distribution, video acquisition as well as generating overlaying information on the video signal. And providing with main communication hub for all of the stores that are connected to the system, and feedback of information to other central unit like a mission computer.

UKBN

This unit is an HMI for the system, and is designed to be installed in the cockpit of the aircraft. With its small dimensions and simplicity it provides with basic system control. Turning on the system and selecting the required store. It also provides with visual feedback of current SMS status, therefore eliminating the need of special indicator panel.

Unit is equipped with Cortex M4 controller therefore it allows for massive data input, and removes the need of central unit to acquire HMI functions. UKBN also allows data relay to other systems, allowing for more comprehensive status and data display.

Another function of UKBN is to add a control stick to the system, allowing for easy control of the attached intelligent weapon systems, and electrooptic systems. Equipped with its high voltage (28V DC) discrete digital inputs, UKBN can take data from other legacy systems, and therefore makes the installation of the unit with older systems easier.

KBN

This is the heart of the system. Everything captured by the UKBN is relayed to the KBN for main processing. Information is discerned here and pushed to the selected subsystem. Its main operations core is also based on an Cortex M4 and multiple communication interfaces.

Also KBN provides with main power distribution for double circuits. This means that power delivered to the supplied system is split to two circuits, where second system is powered by the first. This allows for separate and more secure power supply for critical part of the system.

Another function of KBN is to provide video switch capabilities and built in OSD generation for one or more video input channels. Also, system provides with video distribution to 2 or more outputs, for multiple monitor topology.

Perhaps the most important part of the KBN is capability to control MIL-STD-1553B and ARINC-429 busses. These represent the most advanced and redundant busses in avionics industry, and our unit is fully compatible with these. Allowing for interfacing with any possible device on the market allowing for mission and other critical busses to be added to legacy systems.

IKBN

These are small but very important devices, allowing for the third component which is directly connected to the attached payload, delivering power, relaying communication and performing tests of the attached payload to make sure all systems are go.

The device, in its standard configuration, is capable of measuring current consumption by the payload, test critical fire sensitive device with small current test mode, performing communication test.

All of this is possible thanks to the board Cortex M4, allowing for versatility of the system. It can also accept MIL-STD-1553B and therefore creating additional onboard bus, like a weapons bus.

MODERNIZATION OF "ORAO" AIRCRAFT



Work on the project of modernization of the "Orao" aircraft in "Teleoptik-Gyroscopes" began in 2018. This included the integration of pilot-flight visualization system, navigation system and support for the weapon system, including: integration of video-guided missiles and bombs, modern opto-electronic aiming system with thermal imaging camera and laser rangefinder for aiming with classic weapons in all weather conditions day and night. In the middle of 2021, the development of factory tests of the modernized set is expected to be completed.

The modernization project includes the installation of avionics from own development (pilot monitors, mission computers, opto-electronic systems, classical and guided weapons systems) with certain import components (inertial navigation system, computer of important data). The complete software integration of avionics on SIL (System Integration Laboratory), and later on airplanes in order to complete the mission, was performed in our company.

The modernization set significantly improves the combat use of aircraft in

complex weather conditions day and night.



The flight-pilot and navigation systems integrate a modern inertial-navigation system, an air data computer and a mission computer with visualization and monitoring elements displayed on two 8 "Head-Down Displays in the front and rear cabins.

For classic weapons, weapon integration involves generating CCIP symbology on 8 " and 6 " monitors:

- Head-Down Display in the rear cabin
- Head-Level Display in the front cabin

This enabled the efficient use of existing weapons from the usable range of "Orao" aircraft: GS-23, NRZ-57, NRZ-80, NRZ-128 and various types of bombs.

As part of the support for the use of guided weapons, the integration includes the development of control devices for generating missions to rocket auto-pilots, as well as control of optical systems. The control modules generate the appropriate symbology on 8 " and 6 " monitors:

- Head-Down Display in the rear cabin
- Head-Level Display in the front cabin

This enables the efficient use of video guided missiles with integrated Self-Guidance Heads in the IR and TV spectrum.

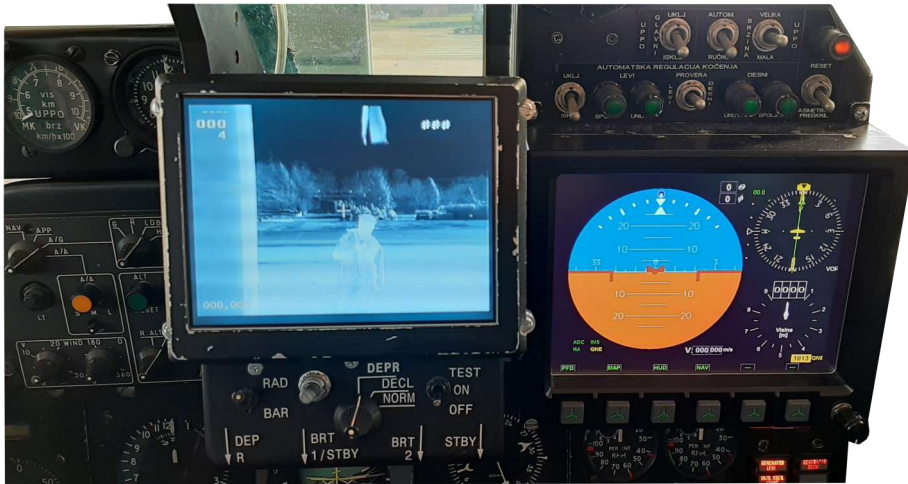
The modernization set significantly improved the aircraft's capabilities in night conditions of use at distances up to 30 km.

The basis of the visualization system of the modernized set is avionics with two Head-Down Displays in the front and rear cabin, on which the Primary Flight Display, navigation and aiming modules are realized.

During the work on the development of the system, "Teleoptik-Gyroscopes" developed several types of monitors (6 ", 8 ", 10 ", 12 ", 15 "), mission computers and software for Fire Management Systems, which have found application in air and ground combat systems. They are completely a product of our company.



MODERNIZATION OF "ORAO" AIRCRAFT



◀ Front Cabin Displays



Rear Cabin Displays ▶

GROUND BASED SYSTEMS

Gun Fire Control System consisting of computer, integrated Electro Optical aiming subsystem and two 10.4" TFT Displays is a highly reliable, ruggedized information system presenting an ideal solution for military vehicle turrets with integrated 20/30 mm gun.

The System is optimized for application within harsh environment of Military armored vehicles with limited available installation/integration space.

Naval – 20/30 mm is an open architecture military ruggedized Fire Control System enabling integration of wide scope of user defined components such as gun actuation/positioning system, gun operator command devices for sensor and fire control suites, additional monitoring devices, ...



The System is opened for implementation of user defined ballistics of various 20/30 mm bullets.

Naval – 20/30 mm Gun Fire Control System is operated through two 10.4" TFT touch screen and bezel supplied monitors enabling the users to carry out tasks such as:

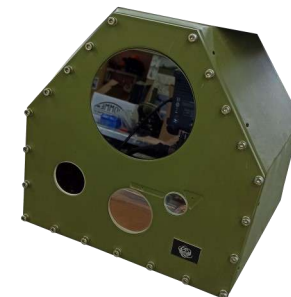
- Target aiming and acquisition within all phases of armored vehicle mission,
- Execution of the monitoring/control functions of Fire Control and gun actuation/positioning systems,
- Recording mission execution in order to play it back within debriefing session.

Detailed information about RSUV-30 Fire Control System integrating/expanding capabilities are available on customer request.

NAVAL- Electro optical Fire Control System 20/30 mm



Processor and Interface Characteristics	
Processor & Memory & SSD	Intel Core i5 1.9Ghz Quad Core, 4/8, 256GB
Operation System	Windows 7, 8, 10 / VxWorks
UARTS	4x RS - 232, 3x RS - 422
CAN BUS / Ethernet	2 Independent isolated channels / 1 channel
Discrete Input/Output (5V)	32 programmable defined
Analog Inputs / Outputs	16 single ended / 8 differential / 2 ($\pm 10V$ with modulated amplification)
Analog VIDEO Input	2 independent channels (625/25 PAL & 525/30 NTSC)
Display Output / AUDIO Output	1xHDMI/DVI + 1xVGA / 1 Audio output
User Controls	28x Bezel buttons, 3x Encoders, OSD, Day/Night Switch
I/O User Options	1xRS422 Bezel control + 1xRS232 TS
Optical & Visualization	
Viewable Area	10.4" Diagonal; 210.4mm x 157.8mm
Display Type	TFT LCD w/ LED Backlight
Resolution	1024 x 768
Contrast Ratio	1000:1
Brightness	1500 nits
Viewing angle	+88°-88°(H), +88°-88°(V)
Touch Screen	Resistive
Environmental and Mechanics	
Dimensions	
Weight	
Connectors	Circular MIL-38999 serial
Enclosure	Aluminium (No openings)
Temperature, Vibration, Shock	MIL-STD-810G
EMI/EMC	MIL-STD-461/464
Power	24VDC, 2.7A



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System description

BVP-M80A Fire Control System main subsystems/ components are:

PC 104 based ballistic computer containing:

Processor	Intel Core i5 1.9 GHz Quad Core
Memory	4/8 Gb
Disk	256 Gb
Operating System	Windows 7, 8, 10 / VxWorks
UARTS	4x RS – 232, 3xRS – 422
CAN BUS /Ethernet	2 independent isolated channels / 1 channel
Discrete input/output (5V)	32 programmable defined
Analog Inputs/Outputs modulated amp.)	16 single ended/8 differential ($\pm 10V$ with
Analog Video input NTSC)	2 independent channels (625/25 PAL & 525/30
Display output	1xHDMI/DVI + 1xVGA
Audio output	1x
Sensor block managing micro-controlling card.	



BVP-M80A FIRE CONTROL SYSTEM

Electro Optical/Laser aiming subsystem integrating:

Cooled termovision camera with 640x512 pixel resolution and 12000 m detection, 5000 m recognition and 2500 m identification distances,

Television video camera with 640x512 pixel resolution, 25 Hz refreshment rate and 15000 m detection, 7000 m recognition and 5000 m identification distances,

Class 1 safe for eyes 1550 nm wave length laser range finder, operational range for 2.3x2.3 target > 5000 m, range accuracy ± 5 m,

Inertial system, gyro range ± 3000 /sec, accelerometer range $\pm 4g$, pitch/bank angle accuracy 0.3° , direction angle accuracy (dynamic) 0.3° with GPS, 0.5° without GPS, position accuracy ± 2 m.

Elevation encoder, 58mm diameter, 14-bit single-turn resolution, BISS, SSI interface, max rotational speed 10000 RPM, 24 V DC power supply.

Communication/Video multiplexer.

Video to Ethernet converter.

8" TFT LCD w/LED Backlight touch screen display, contrast 1000:1, horizontal view angle ± 600 , vertical view angle $+650 \div -550$, 20 Bezels, 3x Encoders, OSD, Day/Night selection switch, temperature operating range $-25 \div +55^\circ\text{C}$.

Operator control stick (on user demand).

Power supply with Hold-Up functions.

Activating panel and cables and connectors set.



System operation

System start-up through activation panel,

Fire Control System management through 8" TFT display and operator control stick,

Initial adjustment of Fire Control System software functions,

Armament selection (20 mm and 7.62 mm gun, ABG or 2T5),

Fire Control System monitoring,

Gun tube motion monitoring,

Continuous control of Television camera zoom and focus,

TV camera view angles predefined on the basis of armament selection,

Small adjustments of TV camera view angle,

8" TFT display light adjustment,

Correction of 8" TFT display sharpness,

Cold/Hot target selection,

Operator control stick button activation of laser distance measurement,

Entering the blocking of laser measured distance,

Target tracking, aiming and acquisition,

Armament firing command,

Recording mission execution in order to play it back within debriefing session

System options

User defined system expansion.

GROUND BASED SYSTEMS - PERISCOPE

* Commander periscope is an optical device that is mounted on top of the turret armored combat equipment.

Mirror periscope can lead fixed in two positions as follows:

- Operating position can be adjusted for height and capture the desired viewing angle
- Passive position when the scope is not used.

Periscope is filled with inert gas and supplied the system to prevent fogging and freezing part of the periscope which is exposed to weather conditions.



Commander periscope

Periscope driver is an optical device that attaches to the cab armored combat assets.

Normal field of view:

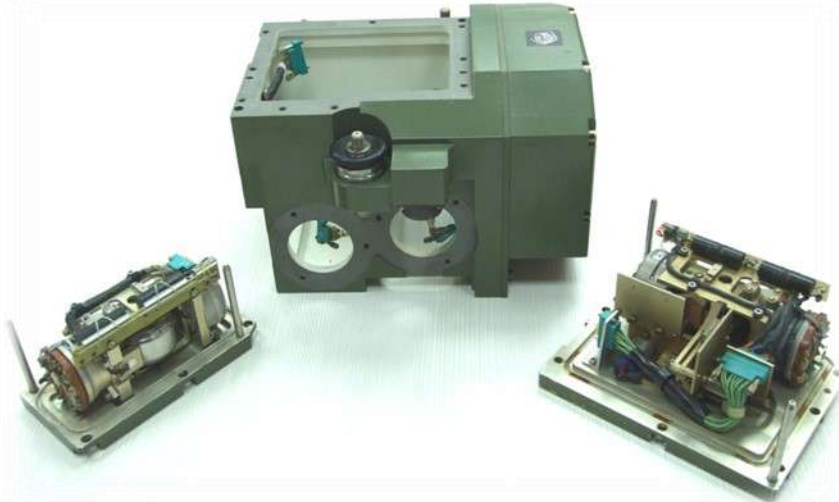
- the width of the horizontal field of view 78°
- the width of the vertical field of view 26°

The power of resolution: 20"

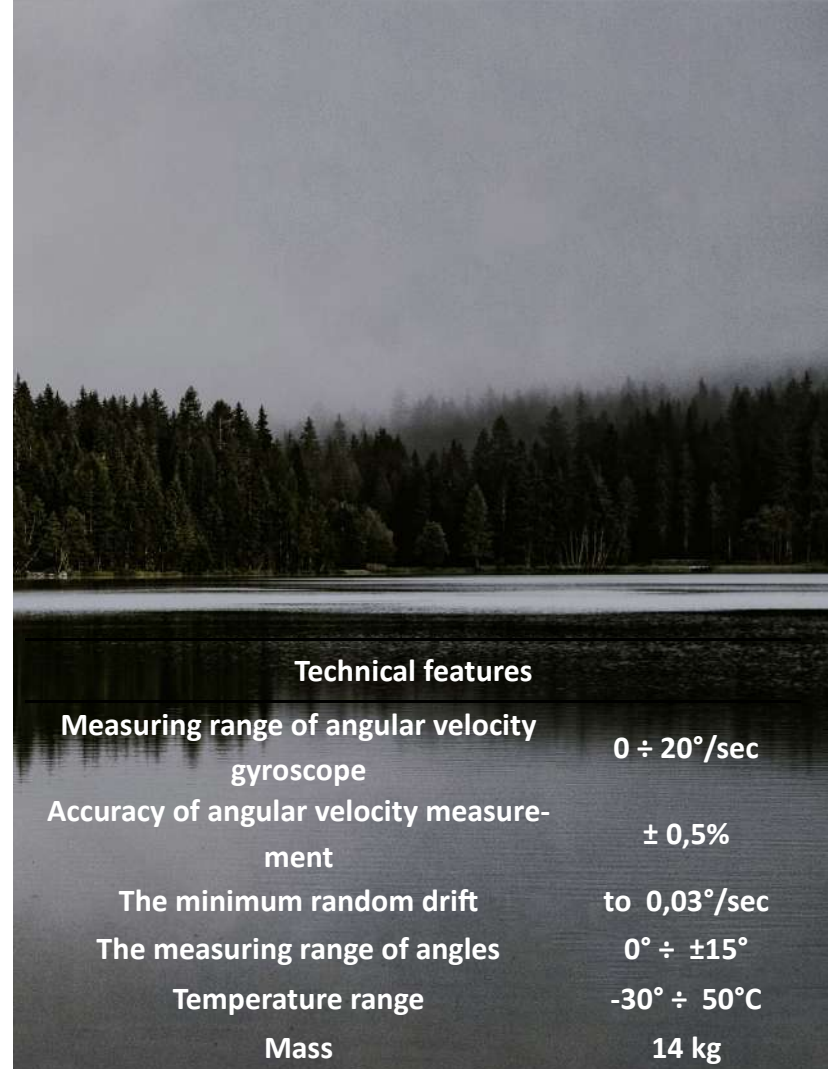


Periscope driver

GYROBLOCK



- It can be used for measuring the angular velocity tank gun tube about three mutually vertical axis and the inclination angle measuring longitudinal axis and transverse axis of the cannon vehicle relative to the horizontal plane
- Previous application: tanks T-55A , M-84, M-84A.



Technical features	
Measuring range of angular velocity gyroscope	$0 \div 20^\circ/\text{sec}$
Accuracy of angular velocity measurement	$\pm 0,5\%$
The minimum random drift	to $0,03^\circ/\text{sec}$
The measuring range of angles	$0^\circ \div \pm 15^\circ$
Temperature range	$-30^\circ \div 50^\circ\text{C}$
Mass	14 kg

System for Close Air Defense MTU-4



Air defense system for immediate defense. It is equipped with 4 Strela 2M missiles or with two Strela 2M missiles and two Iгла missiles. It's a rocket stand with a man stand.

The system is mounted on the NTV (new off-road vehicle) of Zastava and can receive data on the location of the target via radio connection so that the shooter has an indication of where to aim. The shooter is aimed at a thermal camera with a variable field of view (43 and 132).

Range: 2-3 km

Our equipment:

- 10 " monitors with microcontroller (monitor & computer)
- Thermal camera
- tablet



Tactical Computer Terminal System for mobile howitzer Gvozdika



As this is a precision howitzer, a system to control precise instruments and to provide with secure communication and display of firing information was required. This is created in form of Tactical Computer Terminal which consists of:

Vehicle computer

10`` Commanders touchscreen

8`` Aiming assistant display

System is interconnected with several crucial units on the vehicle and digital radio system. Data is gathered and calculated on board and placed as aiming instructions for the gun operator, commander can initiate all commands to the system using touchscreen controls or the built in keyboard, thus speeding up operations in MRSI fire arrangement.

Main features of the system is multiple standard communication busses, double monitor output, ethernet connection, and USB data input. All of this is controlled from a single point which is 10`` monitor, either through touchscreen or built in bezel keyboard. System is quite versatile and can be installed on any platform, and used in many different applications.

With options like built in UPS, additional communication interfaces or higher end i7 based CPU, system can accommodate any foreseeable application. System is fully compliant with MIL-STD—810G and MIL-STD-461F therefore safe for any environment.

#	Name	Type
1	CPU	Intel Atom E3845
2	RAM	8GB
3	SSD	256GB
4	COMM RS422 1Mb/s	2
5	COMM RS232 full	2
6	COMM RS232 rx/tx	1
7	Ethernet 100Mb	1
8	USB 2.0	2
9	VGA	1
10	HDMI	1
11	Voltage	6V – 36V
12	Current	3A MAX

TELEOPTIK-GYROSCOPES

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