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Ai Vision Assist (AiVA)

AI Camera Datasheet

Revision History

Rev	Date	Changes/Details	Author
1	29 July 2021	Initial release	Murray Cox
2	28 Aug 2023	Addition of M-AIVA-WBE-10 and M-AIVA-LBE-10 models targeting BE truck installation	Murray Cox

Product Description

AiVA represents a breakthrough application of edge AI technology to address the very real need for improvement in pedestrian and worker safety in the Materials Handling Industry. The system comprises one or more AiVA cameras factory or aftermarket fitted to a powered industrial truck, able to continually observe the operating environment around the vehicle and detect risky pedestrian proximity. Dangerous pedestrian proximity policy breaches are automatically detected with high accuracy, and the pedestrian is immediately brought to the attention of the vehicle operator via clear and loud audio/visual alerts. In addition the system is able to output vehicle control signalling to take immediate avoidance actions such as engaging vehicle creep mode for the duration of the dangerous pedestrian proximity. Information from all events are logged and shared to the Speedshield cloud platform along with video snippets of the events themselves, allowing for true analytics and vision as to what is happening on the warehouse floor in real time and trended over a period, providing automatic near miss or dangerous practice reporting and feeding real safety culture change in an automatic and operator supportive manner.

Primary applications include vehicle fitment within industries such as Materials Handling, Mining, Aircraft Ground Services and Agriculture.

AiVA Hardware Features and Technical Function

Note – commercial arrangements and implementation specific details may preclude availability of some listed hardware features. This list is representative of hardware capability only.

Functional Characteristics

- High efficiency 6 core CPU and integrated NPU (Neural Processing Unit) processing platform

- Passively cooled thermal design for ambient up to 45 deg C

- Fully integrated IP66 compact package for industrial mounting in fixed situation or vehicle platforms

- Integrated sensor platform including dual wide angle camera stereo depth imaging, IR projection, 6 axis IMU movement sensing

- Camera depth sensing supports indoor / outdoor and a wide range of lighting conditions

- Integrated dual-band WiFi, internal self-contained antenna

- HDMI output for operator display (not required for operation)

- Optional internal LTE modem for additional connectivity beyond WiFi

- Internal microSD card storage or optional large capacity internal NVMe SSD storage

- Industrial DC wide VIN power supply ready for IC or BE vehicles, eliminates external components

- Onboard gigabit ethernet switch allows daisy chaining of multiple AiVA cameras for cooperation

- I/O for sensing and relay control allows lighting, speed limit control, external systems (2 relays, 2 protected inputs, 1 switched regulated 12V output for accessory supply)

- CANbus interface for data exchange with accessories and other systems

Optical Characteristics

- 105 degree effective Horizontal Field of View, 58 degrees Vertical Field of View (diagonal 121 degrees)

- maximum stereo resolution of 2560 x 720

- Depth map resolution of 1280 x 720

Electrical Characteristics

- DC input 6 to 120V DC (will function and maintain accessory output supply throughout ICE vehicle cranking). Typical power consumption of 11W per camera.

Mechanical Characteristics

- IP67 sealing

- dimensions (excluding connections) 161x127x71mm

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Part Numbering

Product Model	Description
M-AIVA-SDW-10	AiVA camera unit, SD card storage, dual band WiFi cloud link
M-AIVA-SDL-10	AiVA camera unit, SD card storage, dual band WiFi / LTE cellular cloud link
M-AIVA-WBE-10	AiVA camera unit, SD card storage, dual band WiFi cloud link (Battery Electric truck application)
M-AIVA-LBE-10	AiVA camera unit, SD card storage, dual band WiFi / LTE cellular cloud link (Battery Electric truck application)
M-AIVA-HDW-10	AiVA camera unit, NVMe SSD storage, dual band WiFi cloud link
M-AIVA-HDL-10	AiVA camera unit, NVMe SSD storage, dual band WiFi / LTE cellular cloud link
M-AIVA-OPR-10	AiVA Operator Remote user interface accessory

Connector Description

The AiVA camera system predominantly uses sealed M12 sensor connectors.

| POWER | GigE 1 | GigE 2 | HDMI (cover-plate removed) | I/O and CANbus |
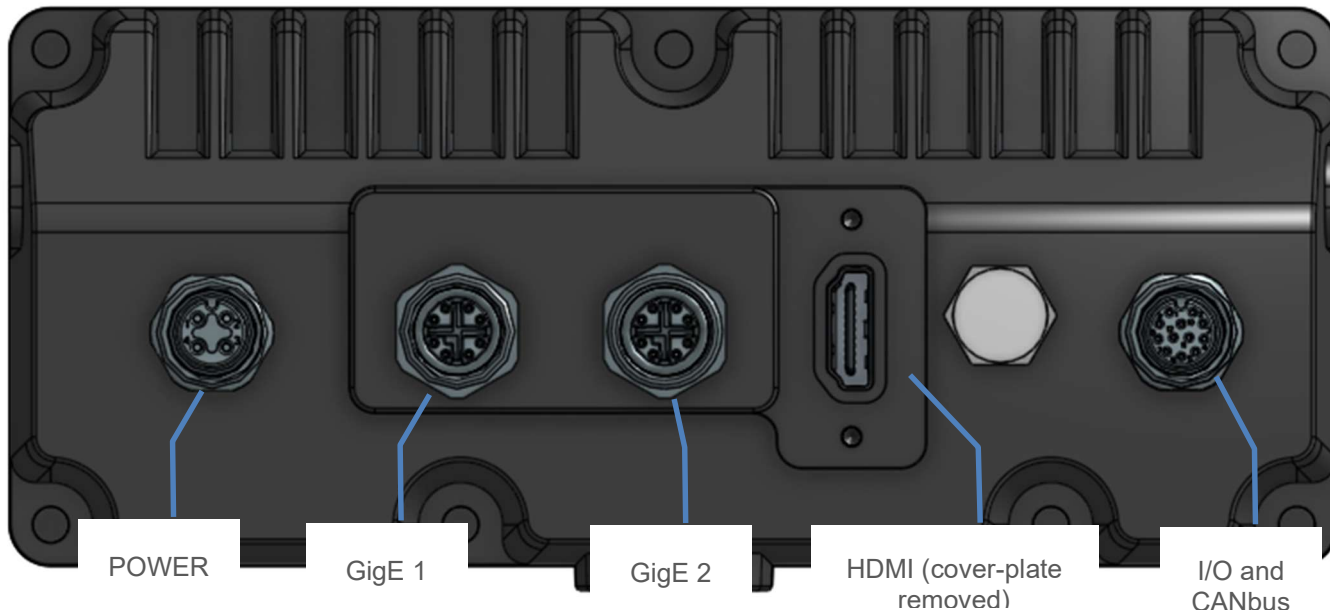
Note:
The AiVA enclosure and connector shells are not electrically connected to the Battery Supply Negative, thereby preserving chassis isolation for Battery Electric vehicles.

Connector	Camera side type	Mating cable side type	Description
Power	M12-L-S4 M12 4 pin female A-code	M12P-D-P4-0.5M-PVC plug right angle	DC power input to the camera (6-120V DC).
GigE #1	M12-L-SX8-1 M12 8 pin female X-code	M12-8D1-X-P/P-0.5M plug right angle	Gigabit Ethernet port 1
GigE #2	M12-L-SX8-1 M12 8 pin female X-code	M12-8D1-X-P/P-0.5M plug right angle	Gigabit Ethernet port 2
HDMI	HDMI female	HDMI plug / HDMI coverplate	Optional connection to external monitor
I/O and CANbus	M12-L-S12 M12 12 pin female A-code	M12-D-P12-0.5M-PVC plug right angle	Inputs: 2 protected general purpose inputs Outputs: 2 sets of output relay contacts, 1 x switched 12V regulated accessory supply Communications: 1 x CANbus, cable selectable bus termination

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Power Connector M12 4 pin A-Code Pin Functions

Pin	Function	Description
1	Battery / Supply Positive	Battery supply positive input 6 to 120V DC. Suitable for 12V to 80V battery systems including overhead for regenerative braking, and ICE vehicles without disruption to operation during vehicle crank
2	Battery / Supply Positive	Battery supply positive input 6 to 120V DC. Suitable for 12V to 80V battery systems including overhead for regenerative braking, and ICE vehicles without disruption to operation during vehicle crank
3	Battery / Supply Negative	Battery supply negative
4	Battery / Supply Negative	Battery supply negative

Gigabit Ethernet Connectors M12 8 pin X-Code Pin Functions

Note, the 2 x GigE x-code connections utilise industry standard Ethernet x-code pinout

Pin	Function	Description
1	MX1_1_P	Orange/White to RJ45 pin 1
2	MX1_1_N	Orange to RJ45 pin 2
3	MX2_1_P	Green/White to RJ45 pin 3
4	MX2_1_N	Green to RJ45 pin 6
5	MX4_1_P	Brown/White to RJ45 pin 7
6	MX4_1_N	Brown to RJ45 pin 8
7	MX3_1_P	White/Blue to RJ45 pin 5
8	MX3_1_N	Blue to RJ45 pin 4
Shell	Shield	Shield braid

IO / CANbus M12 12 pin A-Code Connector Pin Functions

Pin	Function	Description
1	12VDC Switched Output	Regulated 12V accessory supply, overcurrent/short circuit protected, 640mA maximum
2	relay contact A1	Relay Contact (common side), matching pair to Pin 3. Rated 1A@30V DC resistive load, 2A maximum switching current
3	relay contact A2	Relay Contact (switch side), matching pair to Pin 2. Rated 1A@30V DC resistive load, 2A maximum switching current
4	relay contact B1	Relay Contact (common side), matching pair to Pin 5. Rated 1A@30V DC resistive load, 2A maximum switching current
5	relay contact B2	Relay Contact (switch side), matching pair to Pin 4. Rated 1A@30V DC resistive load, 2A maximum switching current
6	General purpose input 1	Protected input (digital, 3V switching threshold), maximum voltage 120V DC
7	General purpose input 2	Protected input (digital, 3V switching threshold), maximum voltage 120V DC
8	0V reference	0V reference (internally connected to Battery/Supply Negative)
9	CAN Shield	Cable shielding connection for CANbus
10	Terminator select	Cable selectable termination resistor option - link to pin 11 for bus termination
11	CAN (Accessory) Hi	Accessory / Peripheral CAN bus communication line.
12	CAN (Accessory) Lo	Accessory / Peripheral CAN bus communication line.

Electrical Characteristics

	Min	Typical	Max
Supply Continuous Operating Voltage	6V DC[1]	12V, 24V, 48V, 80V DC[2]	120V DC
Typical Power Consumption *(AiVA configured without NVMe SSD or MPCIe LTE modem, no peripheral devices connected to 12V output)*		11W	15W
General Purpose Input Voltage Range	0V DC	12V (switching threshold 3V)	120V DC
Relay contact current rating *(12 pin IO connector pins 2,3,4,5)*	Resistive Load		
	1A at 30 VDC		
Relay mechanical endurance	1×10^8 OPS		
Relay electrical endurance	1×10^5 OPS (AgNi + Au plated, 0.3A 125VAC, Resistive load, at 85°C, 1s on 9s off)		

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[1] Tolerates 6.5V cold cranking voltage indefinitely.

[2] Normal application is 12V internal combustion and battery electric vehicles up to 80V batteries

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Absolute Maximum Ratings

WARNING: Operation at or beyond Absolute Maximum Ratings may result in permanent damage to equipment.

Description	Value
Input Supply Pins	
Absolute maximum voltage	120V DC
Reverse Polarity Tolerance Maximum Voltage	-150V DC
General Purpose Sensor Input Pins	
Fault Protection Absolute Maximum Voltage Range (Constant)	±120V DC
CAN Communication Bus Pins (IO connector pins 11 and 12)	
Fault Protection Absolute Maximum Voltage Range (Constant)	±58V DC

Environmental and Mechanical Parameters

- Ingress protection to IP 67
- Storage temperature: -40 °C to +85 °C
- Nominal operating temperature: -40 °C to +45 °C using standard AiVA passive cooling. Operation in higher temperature environments may require additional system engineering measures to ensure airflow.

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LTE Cellular Modem Details (Option)

LTE cat 4

Worldwide LTE, UMTS/HSPA(+) and GSM/GPRS/EDGE coverage

GNSS receiver (software support pending)

Band support;

LTE-FDD: B1/B2/B3/B4/B5/B7/B8/B12/B13/B18/ B19/B20/B25/B26/B28

LTE-TDD: B38/B39/B40/B41

WCDMA: B1/B2/B4/B5/B6/B8/B19

GSM: B2/B3/B5/B

WiFi/BT Details

2.4GHz WLAN Standard IEEE 802.11a/b/g/n/ac WiFi compliant

> *Frequency Range 2.400 GHz ~ 2.497 GHz (2.4 GHz ISM Band)*

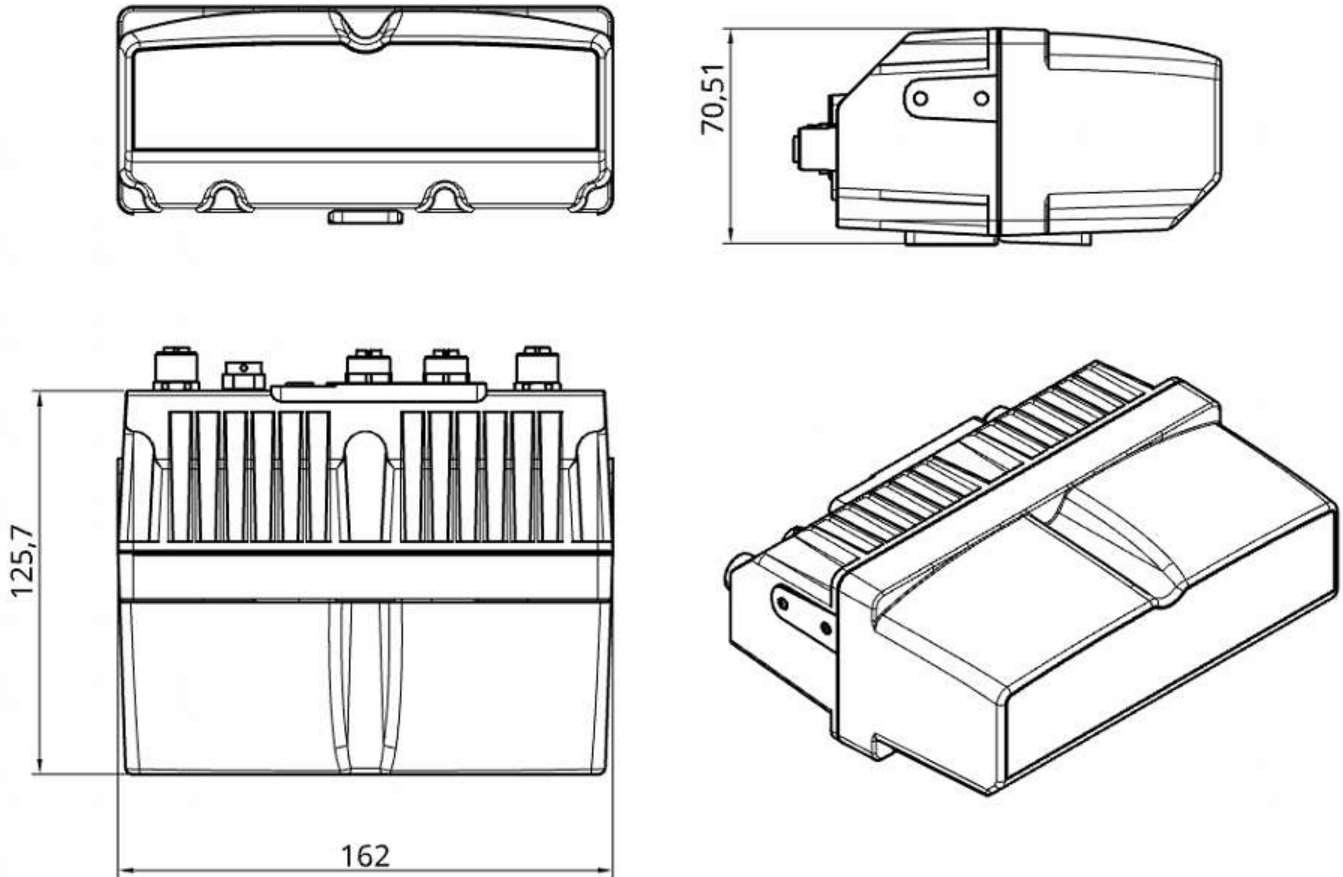> *Number of Channels 2.4GHz : Ch1 ~ Ch14*

5GHz WLAN Standard IEEE 802.11a/n 2x2, WiFi compliant

> *Frequency Range 4.900 GHz ~ 5.845 GHz (5.0 GHz ISM Band)*

Bluetooth V4.1 of 1, 2 and 3 Mbps

Product Dimensions

All Dimensions Shown in millimetres unless otherwise stated.

70,51

125,7

162

Compliance

C E   FC

This device complies with part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

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