



Automatic Passenger Counting Sensor

IRMA 6

Interface: Switch

IRMA6-SENSOR-HD-00-SWITCH[-IO]-00[-R]

Product Data Sheet

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Product

Sensor	Product	Part no.	Description
IRMA 6	IRMA6-SENSOR-HD-00-SWITCH-00	5300_05	APC sensor for use with Ethernet switch
	IRMA6-SENSOR-HD-00-SWITCH-IO-00	5300_04	APC sensor for use with Ethernet switch, variant with door contact option (IO unit)
	IRMA6-SENSOR-HD-00-SWITCH-00-R	5300_11	APC sensor for use with Ethernet switch – railway application (R)
	IRMA6-SENSOR-HD-00-SWITCH-IO-00-R	5300_10	APC sensor for use with Ethernet switch, variant with door contact option (IO unit) – railway application (R)

Function

Automatic passenger-counting (APC) sensor with 76,800 px **Time-of-Flight-technology (ToF)** for **vehicle and railway** application.

Consisting of a **sensor unit** and **an interface unit**, mounted above vehicle door-entries. Generates **real-time counting data** for further processing via Ethernet to on-board computers.

Contact

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Disclaimer

The information contained in this document is based on product data resulting from the development and approval phases as well as the production of initial samples. These specifications do not claim to be error-free and will need to be updated or corrected. Such modifications may be made by iris-GmbH without notice. Characteristic or typical values given are based on our experience and are approximate values to be expected; they are by no means guaranteed by iris-GmbH.

Symbols used in this document

	Important		Recommendation
	Caution		Additional information
	See attachment		Reference
	Configure		Note down
	Contact		Website resource

Components

Sensor unit



Figure 1: Sensor unit front view (IRMA 6)



Figure 2: Sensor unit back view (IRMA 6)

Field of view

Mounting height	Maximal covered door width
1,800 mm	1,250 mm
1,900 mm	1,400 mm
2,000 mm	1,550 mm
2,100 mm	1,700 mm
2,200 mm	1,850 mm
2,300 mm	2,000 mm
2,400 mm	2,150 mm
2,500 mm	2,300 mm

The above values are **standard values**. In most cases wider ranges can be covered. For further support, please contact: service@iris-sensing.com

Interface unit



Figure 3: Interface unit – connectors

Sensor variants:

IRMA6-SENSOR-HD-00-SWITCH-00
 IRMA6-SENSOR-HD-00-SWITCH-00-R

Sensor variants with door contact option:

IRMA6-SENSOR-HD-00-SWITCH-IO-00
 IRMA6-SENSOR-HD-00-SWITCH-IO-00-R

Connector		Connector	
1	Power supply	1	Power supply
2	N/A	2	Door clear/door contact
3	Ethernet interface	3	Ethernet interface
4	Ethernet interface	4	Ethernet interface

Outlets

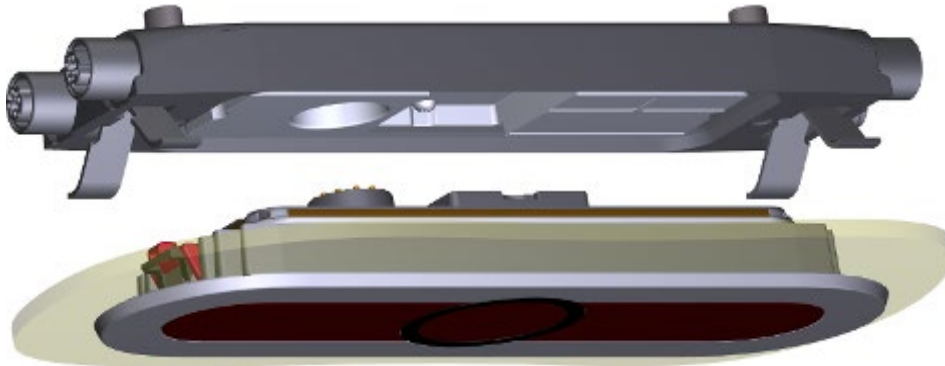
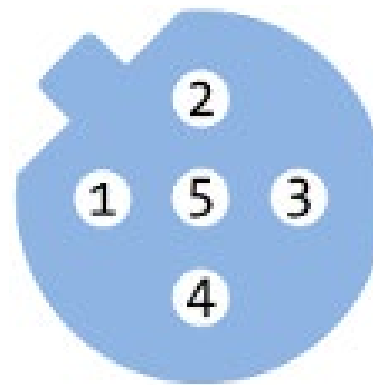
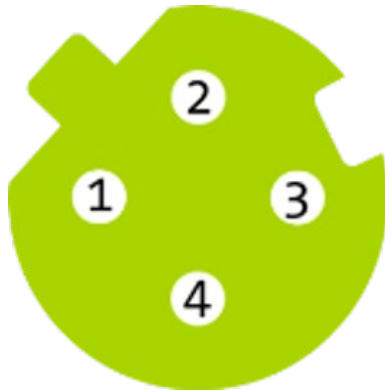


Figure 4: View – sensor unit and interface unit

Product	Part no.	Outlet 1	Outlet 2	Outlet 3	Outlet 4
IRMA6-SENSOR-HD-00-SWITCH-00	5300_05	Power supply, male (m), M12, A-coded, 5 pin	N/A	Ethernet, female (f), M12, D-coded, 4 pin	Ethernet, female (f), M12, D-coded, 4 pin
IRMA6-SENSOR-HD-00-SWITCH-00-R	5300_11				
IRMA6-SENSOR-HD-00-SWITCH-IO-00	5300_04	Power supply, male (m), M12, A-coded, 5 pin	Door contact/ DoorClear, female (f), M12, B-coded, 5 pin	Ethernet, female (f), M12, D-coded, 4 pin	Ethernet, female (f), M12, D-coded, 4 pin
IRMA6-SENSOR-HD-00-SWITCH-IO-00-R	5300_10				

Connections

The following table lists the **pin assignments** of the **interface unit**.



M12 Ethernet (female, d-coded)		M12 GPIO (female, b-coded, 5 pin)		M12 power supply, 24 V (male, a-coded, 5 pin)	
Pin	Signal	Pin	Signal	Pin	Signal
Pin 1	TD+	Pin 1	Door signal +	Pin 1	Not connected
Pin 2	RD+	Pin 2	Door signal -	Pin 2	VCC
Pin 3	TD-	Pin 3	Door clear +	Pin 3	GND
Pin 4	RD-	Pin 4	Door clear -	Pin 4	Not connected
Pin 5	N/A	Pin 5	Not connected	Pin 5	Not connected

Technical data

General

Parameter	Value	Note
Weight sensor unit	280 g ±2 %	
Weight interface unit	223 g ±2 %	
Weight total	503 g ±2 %	Sensor unit + interface unit
Weight interface unit (door contact variant)	240 g ±2 %	
Weight total (door contact variant)	520 g ±2 %	Sensor unit + interface unit (with IO-connector)
Resolution	320 x 240 px	
Housing material	Aluminium die cast	
Material of optical openings	Polycarbonate	
Color coding of sensor	RAL 9005	Sensor front outer surface with pearl structure
Backcover	Glass fibre reinforced plastic	
Protection class of housing	IP65	According IEC 60529, when mounted
Field of view	69° x 52° (longitudinal x lateral)	
Mounting height	min. 1.80 m – max. 2.50 m	Passengers need to be able to walk upright below the sensor to ensure accurate counting.
Relative humidity	max. 95 %	
IK protection class	IK06	
Required scene illumination	None	



All measures **without packaging**.

Operating conditions

Parameter	Min	Max	Note
Operating temperature range (TB)	-25 °C	55 °C	According to EN 50155:2017
	-13 °F	131 °F	
Mean Time Between Failures (MTBF)	1.25 x 10 ⁶ h		Condition: 25 °C / 77 °F

Transport and storage

Parameter	Min	Max	Note
Temperature range	-40 °C	85 °C	According to EN 50155:2017
	-40 °F	185 °F	

Power supply

Power supply interface (according to EN 50155:2017): M12 A-coded, 5 pin, male

Parameter	Value		Note
Power supply DC (U _{Vp+}) external	min. 16 V	max. 57 V	Typical: 24 V
Typical power consumption (P _{avg})	4 W (counting inactive)		Supply voltage: 24 V Ambient temperature: 25 °C (77 °F)
	6 W (counting active)		
Max power consumption (P _{avg_max})	5.5 W (counting inactive)		Supply voltage: 24 V Ambient temperature: 25 °C (77 °F)
	7.5 W (counting active)		
Peak power consumption (P _{peak})	13 W (counting inactive)		Max. duration of P _{Peak} : 1.37 ms Supply voltage: 24 V Ambient temperature: 25 °C (77 °F)
	34 W (counting active)		

Integrated Ethernet switch

Ethernet interface: M12 D-coded, 4 pin female (f)

Parameter	Value	Note
Interface transmission rate Ethernet	max. 100 Mbit/s	
Switch ports	2	
Number of sensors that can be daisy chained	12	



Note:

Avoid cluttering the sensor chain's bandwidth through other devices.

When building up a daisy chain of sensors, the streaming of the sensor's 3d data is limited to one sensor at a time.

Door signal input

Applicable to the following sensor variants:

IRMA6-SENSOR-HD-00-SWITCH-IO-00 (5300_04)

IRMA6-SENSOR-HD-00-SWITCH-IO-00-R (5300_10)

Parameter	Value	Note
Input		Bipolar (+/-)
Input level low	-6 V ... +6 V	
Input level high	-60 V ... -9V, +9 V ... +60 V	Protection limit: 60 V
Switching frequency	20 Hz	
Galvanical insulation against I/O	60 V	
Current (24 V _{Supply})	8 mA	R _{in} : 2,800 Ω

Parameter	Value	Note
Galvanical insulation against V_{supply} and chassis ground	500 VAC	

Dimensions

Dimensions outer part (visible)	4 mm x 62 mm x 192 mm (H x W x L)
Dimensions inner part (covered)	28.5 mm x 52.82 mm x 211 ±2 mm (H x W x L)
Dimensions inner part below door panel	(28.5 mm – thickness of door-panel) x 52.82 mm x 211 ±2 mm (H x W x L)

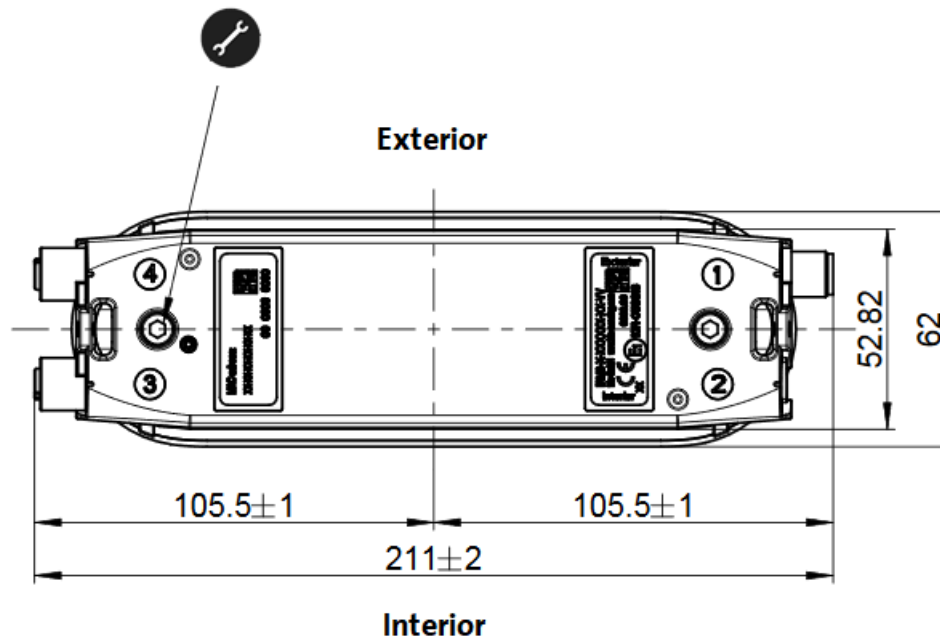


Figure 5: Dimensions – bottom view (all measures in mm)



M5 screws, max. assembly tightening torque: 3 Nm

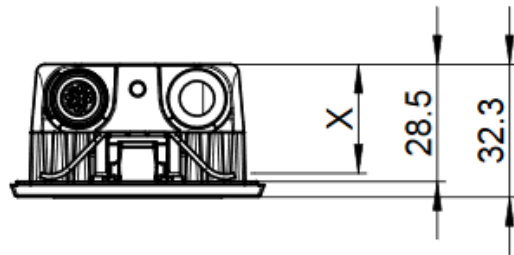


Figure 6: Dimensions – Side view (height)

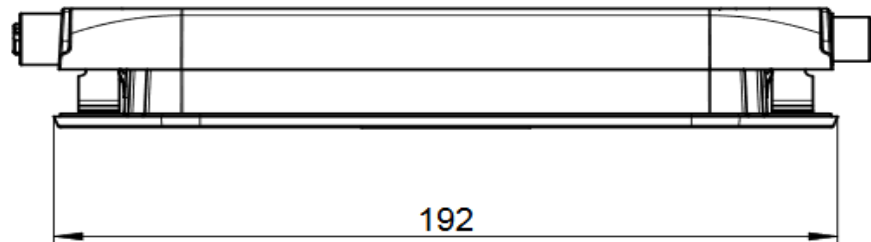


Figure 7: Dimensions (length)

Communication protocols

Communication protocols: DHCP, HTTP, HTTPS, MQTT, SNMP, mDNS, DNS-SD, TCP/IP/UDP

Application communication protocols:

UIP^{RETROFIT}:

UIP^{RETROFIT} is a minimal implementation of IRMA MATRIX legacy protocol UIP for use in retrofit projects. All functionalities of UIP are implemented except image streaming and parameter/firmware update. Image streaming and firmware updates can be performed with the QIP protocol.

IBIS-IP (beta version available):

IBIS-IP (VDV 301) standard provides an IP-based service-oriented successor standard for the IBIS Wagenbus defined in VDV 300. IRMA 6 sensors implement Passenger Counting, Device Management and Door State services. The communication is managed via HTTP XML-formatted messages.

IBIS-IP is recommended for following market regions: Germany, Austria, Switzerland.

Please refer to the VDV association website for specifications: <https://www.vdv.de/ip-kom-oev.aspx>

ITxPT (under development):

ITxPT is a European standard defining a service-oriented IT architecture for public transportation. IRMA 6 sensors implement the APC service and Module Inventory service and are able to interact with other services of the vehicle communication architecture, such as the Time, FMSToIP, VehicleToIP or AVM services.

Two profiles are available:

1. The in-vehicle profile where communication is managed via HTTP XML-formatted messages within the vehicle's IP network.
2. The over-the-air profile, where the counting data is pushed via MQTT.

Please refer to the ITxPT website for specifications: <https://itxpt.org/technology/itxpt-specifications/>

QIP (beta version available):

The QIP or Quick Integration Protocol is the default IRMA 6 communication protocol. It is a simple HTTP-based protocol offering required functions for operating the sensor. It is recommended for all projects that do not require ITxPT or IBIS-IP. Data is exchanged in XML format and offers different levels of compliance with ITxPT. It is also possible to configure the sensor to push its APC counting data via MQTT.

Compliance with standards and device testing

The following details are design goals. Reports and certifications are available at serial launch.

EMC

Standard	Note
EN 50121-3-2:2017	Electromagnetic compatibility (railway application)
EN 50155:2017 Pkt. 5.1.1.4, Cl. S2 Pkt. 5.1.3, Cl. C1	Immunity to variations of voltage supply/interruption of voltage supply (railway application)
2014/30/EU	EU directive relating to electromagnetic compatibility
AK EMV Regulation no. EMV 06:2019-05 (Electromagnetic Compatibility)	Technical Rules on Electromagnetic Compatibility of the German Federal Railway Authority. The Federal Railway Authority is the German supervisory, licensing, and safety authority for railways and railway undertakings.
ECE R 10:2017-02-17	<i>Regulation No 10 of the Economic Commission for Europe of the United Nations (UN/ECE) – Uniform provisions concerning the approval of vehicles with regard to electromagnetic compatibility</i>

Climatic standards

Standard	Railway application	Note
EN 50155:2017	EN 50155:2017	EN 50155:2017 – <i>Railway applications - Rolling stock - Electronic equipment</i> ; German translation: DIN EN 50155:2018-05 – <i>Bahnanwendungen - Elektronische Einrichtungen auf Schienenfahrzeugen</i>
IEC 60068-2-1	OT1 (4) IEC 60068-2-1, -2-2: 2008	Cold
EN 50155:2017	EN 50155:2017 item 13.4.4	Test Ad (function)

EN 50155:2017	EN 50155:2017 item 12.2.14	Test Ab (storage)
IEC 60068-2-2	IEC 60068-2-2	Dry heat
EN 50155:2017	EN 50155:2017 item 12.2.4	Test Be (function) and Test Bb (storage +85°C, 185°F)

Mechanical standards

Standard	Railway application	Note
IEC 60068-2-6	IEC 60068-2-6: 2007	
IEC 60068-2-64	IEC 60068-2-64, -2-27: 2008	
IEC 60721-3-5	IEC 60721-3-5: 1997	
EN 50155:2017	EN 50155:2017 item 12.2.11/	Vibration, broad band noise, endurance test – Test Fh
IEC 61373	IEC 61373:2010 item 9, Cl. B, Cat. 1/	
IEC 60068-2-64	IEC 60068-2-64	
EN 50155:2017	EN 50155:2017 item 12.2.11/	Shock test – Test Ea
IEC61373	IEC61373 item 10, Cl. B, Cat.1/	
IEC 60068-2-27	IEC 60068-2-27	
EN 50155:2017	EN 50155:2017 item 12.2.11 /	Vibration, broad band noise, functional test – Test Fh
IEC 61373	IEC 61373 item 8, Cl. B, Cat. 1/	
IEC 60068-2-64	IEC 60068-2-64	
IEC 60721-3-5	IEC 60721-3-5 Tab. 6, Cl. 5M3/	Vibration, random – Test Fh
IEC 60068-2-64	IEC 60068-2-64	
IEC 60721-3-5	IEC 60721-3-5 Tab. 6, Cl. 5M3/	Vibration, sinusoidal – Test Fc
IEC 60068-2-6	IEC 60068-2-6	
IEC 60721-3-5 IEC 60068-2-27	IEC 60721-3-5 Tab. 6, Cl. 5M3/ IEC 60068-2-27	Shock test - Test Ea (spectrum 1), (spectrum 2) without external shock loads

Insulation

Standard	Railway application	Note
EN 50155:2017	EN 50155:2017 item 12.2.9	

Protection class

Standard	Railway application	Note
IEC 60529	IEC 60529: 1989 + A1: 1999 ++ A2:2013	
IEC 60529	IEC 60529 §13.4	Shock hazard protection test
IEC 60529	IEC 60529 §14.2.5	IP65 test

Eye safety

Standard	Railway application	Note
EN 60825-1:2014	EN 60825-1:2014	Safety of laser products, class 1

Fire protection

Standard	Railway application	Note
DIN EN 45545-2:2016-02	DIN EN 45545-2:2016-02	Fire protection on railway vehicles

Spare parts

IRMA6-SENSOR-HD-00-SWITCH-00 (5300_05)

Part no.	Product	Component
5400_00	IRM6-S-HD-00	Sensor unit
5500_05	IRM6-I-SWITCH-00	Interface unit

IRMA6-SENSOR-HD-00-SWITCH-IO-00 (5300_04)

Part no.	Product	Component
5400_00	IRM6-S-HD-00	Sensor unit
5500_04	IRM6-I-SWITCH-IO-00	Interface unit

IRMA6-SENSOR-HD-00-SWITCH-00-R (5300_11)

Part no.	Product	Component
5400_01	IRM6-S-HD-00-R	Sensor unit
5500_11	IRM6-I-SWITCH-00-R	Interface unit

IRMA6-SENSOR-HD-00-SWITCH-IO-00-R (5300_10)

Part no.	Product	Component
5400_01	IRM6-S-HD-00-R	Sensor unit
5500_10	IRM6-I-SWITCH-IO-00-R	Interface unit