iris INTELLIGENT SENSING

www.iris-sensing.com

Automatic Passenger Counting

IRMA 6

Product Data Sheet

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

Rev. 3.2 | 2023/01 | Released

Table of content

Contact information

iris-GmbH infrared & intelligent sensors

Schnellerstrasse 1–5
12439 Berlin
Germany

Phone: +49 30 5858 14-0
E-mail: service@iris-sensing.com
Web: www.iris-sensing.com

Disclaimer

The information contained in the documentation of IRMA 6 is based on product data resulting from the development and approval phases as well as the production and field experience. These documents do not claim to be error-free and will be updated or corrected. Such modifications may be made by iris-GmbH without notice.

Customers of iris-GmbH are permitted to use the documentation or parts of it to create their own documents for the purpose of documenting the use of the product in their environment of use or project. iris-GmbH is not responsible for the correctness, completeness, or usability of such documents. Such documents are the sole responsibility of the creator.

iris-GmbH recommends to always keep a complete set of documentation and software available, as described in the *IRMA 6 System Overview* document, and to update this documentation and software regularly. iris-GmbH assumes no responsibility for documentations or software that are incomplete or outdated.

As part of the complete set as aforementioned, iris-GmbH provides firmware updates, which may include security updates. It is the sole responsibility of the users, owners or service providers to regularly update the software of the sensors to avoid compromising sensors or network. iris-GmbH assumes no responsibility for security gaps and resulting issues if these were made possible by the use of outdated software or firmware, regardless of whether it has not been updated or has been downgraded.

It is not permitted to make the Software or documentation, parts thereof, or documents that contain information taken from the documentation available to third parties without prior written consent from iris.

1 Product

1.1 Brief description

The IRMA 6 is an automatic passenger counting sensor working with 76.800 pixel ToF (Time-of-Flight)-technology. It is designed for vehicle and railway applications, and is mounted above doors.

IRMA 6 generates real-time counting data for further processing via Ethernet to on-board computer.

1.2 Product variants

IRMA 6 is available in 3 basic variants:

ETH variant: The interface is designed to be connected to an Ethernet installation via a switch or router. The sensor needs a power supply, typical 24 V from the vehicles on-board power supply.

POE variant: With PoE (Power over Ethernet), electrical power is supplied via the Ethernet cable, 48 V typical. A separate power supply is not needed.

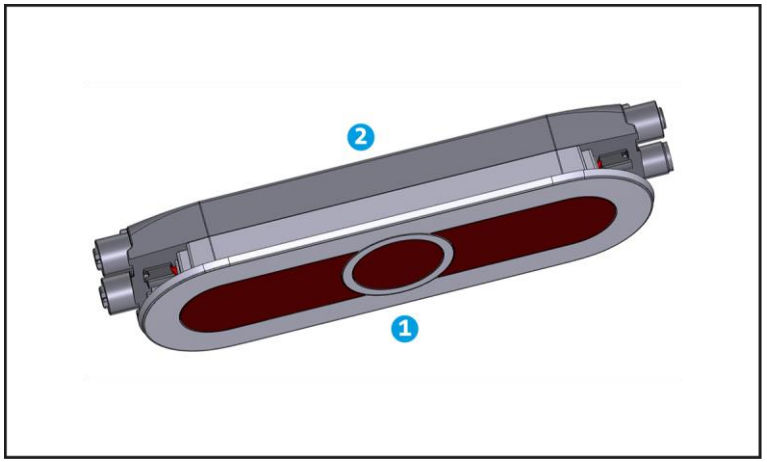
SWITCH variant: These sensors have an integrated 2-port ethernet switch. Up to 12 sensors can be daisy-chained to one ethernet connection at a switch or router.

All variants are available with an additional GPIO connector for door contact (IO-Option).

All sensor variants are available in versions complying with the different regulations for railway or automotive (bus, car) applications.

Product variant	Product name	Item number	Area of use	Description
IRMA 6 ETH	IRMA6-SENSOR-HD-00-ETH-IO-00-R	5300_06	Railway	Ethernet variant, with IO-Option, railway application
	IRMA6-SENSOR-HD-00-ETH-00-R	5300_07		Ethernet variant, railway application
IRMA 6 POE	IRMA6-SENSOR-HD-00-POE-IO-00-R	5300_08		POE variant, with IO-Option; railway application
	IRMA6-SENSOR-HD-00-POE-00-R	5300_09		POE variant, railway application
IRMA 6 SWITCH	IRMA6-SENSOR-HD-00-SWITCH-IO-00-R	5300_10		SWITCH variant, with IO-option, railway application
	IRMA6-SENSOR-HD-00-SWITCH-00-R	5300_11		SWITCH variant, railway application
IRMA 6 ETH	IRMA6-SENSOR-HD-00-ETH-IO-00	5300_00	Automotive	Ethernet variant, with IO-option, bus/car application
	IRMA6-SENSOR-HD-00-ETH-00	5300_01		Ethernet variant, bus/car application
IRMA 6 POE	IRMA6-SENSOR-HD-00-POE-IO-00	5300_02		POE variant, with IO-option, bus/car application
	IRMA6-SENSOR-HD-00-POE-00	5300_03		POE variant, bus/car application
IRMA 6 SWITCH	IRMA6-SENSOR-HD-00-SWITCH-IO-00	5300_04		SWITCH variant, with IO-option, bus/car application
	IRMA6-SENSOR-HD-00-SWITCH-00	5300_05		SWITCH variant, bus/car application

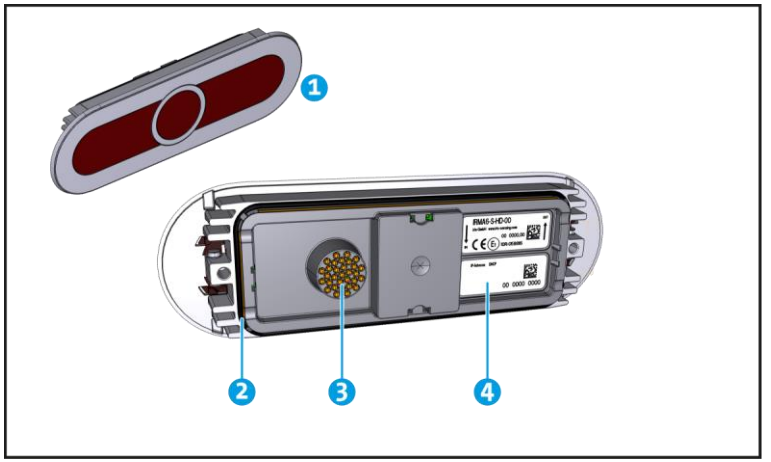
1.3 Components



IRMA 6 consistst of a sensor unit and an interface unit.

1. Sensor unit.
2. Interface unit

1.3.1 Sensor unit

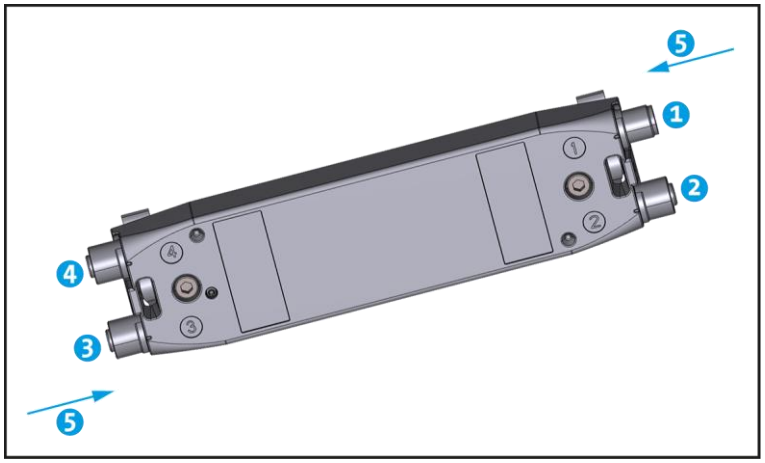


1. Functional sensor face – behind the protective windows laser emitter and time of flight sensors are located.
2. Sealing between sensor unit and interface unit.
3. Connector to interface unit
4. Labels

1.3.2 Interface unit

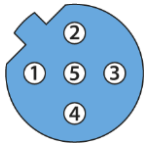
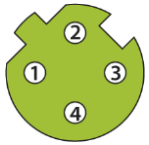
The interface unit connects the sensor to the network and power supply.
As an option, IO-Signals may be connected.

The picture shows the SWITCH variant of the interface unit with IO option..
The other variants look similar, except they have less connectors.



1. Power supply connector (at ETH and SWITCH variants)
2. IO connector (optional)
3. 2nd Ethernet connector (SWITCH variant only)
4. Ethernet connector

Connection table

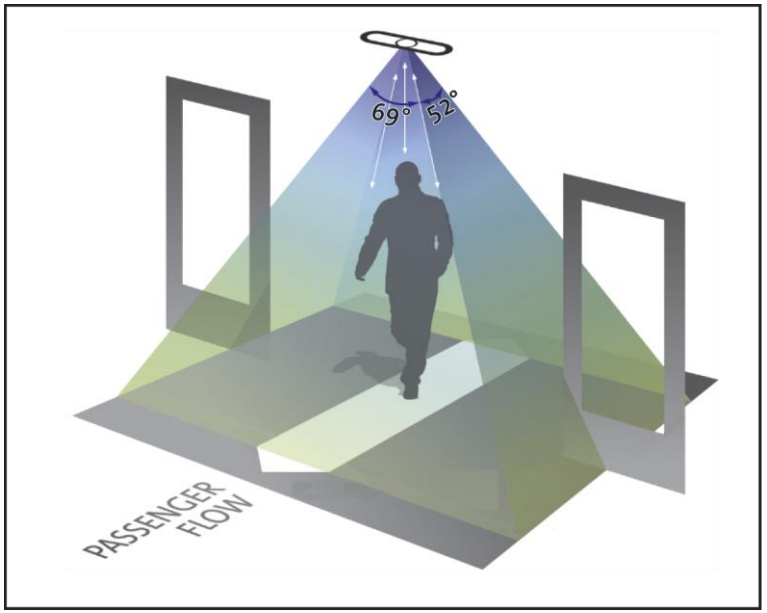
No.	Function	Variant: ETH	POE	SWITCH	Connector type[1]	PIN assignment: 1	2	3	4	5
1	Power supply	X	n/a	X	M12 plug, a-coded 		V_{CC}	GND		n/c
2	GPIO (IO option)	o	o	o	M12 jack, b-coded 	Door signal +	Door signal –	Door clear +	Door clear –	n/c
3	Ethernet	n/a	n/a	X	M12 jack, d-coded 	TD+	RD+	TD–	RD–	n/a
4	Ethernet	X	X	X						

X = existing; o = optional; n/a = not applicable; n/c = not connected

1 Viewing direction on connectors: See arrows 5 in image.

2 Technical Data

2.1 Field of view



The field of view is determined by the aperture angles of the emitted light from the sensor. With the aperture angles of 69° longitudinal and 52° lateral the covered door width results from the mounting heigth of the sensor as shown in the table

Parameter	Value	Note
Field of view	69° x 52°	
Mounting height	1.80 m to 2.50 m	Passengers need to be able to walk upright below the sensor to ensure accurate counting.

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

2.2 General Data

Parameter	Value	Note
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	
Ambient conditions		
Operating temperature range (TB)	−25 °C (−13 °F) to +70 °C (158 °F)	According to EN 50155:2017
Temperature range for transport, storage	−40 °C (−40 °F) to +85 °C (185 °F)	
Relative humidity	max. 95 %	
Protection class of housing	IP65	According to IEC 60529, when mounted
IK protection class	IK06	
Laser class	1	According to IEC 60825-1, for normal operation, set-up, maintenance
Required scene illumination	None	
Mean Time Between Failures (MTBF)	1.24 x 10^6 h	Condition: 25 °C, 77 °F
Ethernet	max. 100 Mbit/s	according to IEEE 802.3 For POE variant: according to IEEE 802.3af: Type 1, Class 0 (12.95 W), Mode A

2.3 Weight and dimensions

Parameter	ETH variant	POE variant	SWITCH variant
Weight sensor unit	280 g ±2 %	280 g ±2 %	280 g ±2 %
Weight interface unit	205 g ±2 %	191 g ±2 %	223 g ±2 %
Weight total	485 g ±2 %	471 g ±2 %	503 g ±2 %
Weight interface unit with IO option	221 g ±2 %	207 g ±2 %	240 g ±2 %
Weight total with IO option	501 g ±2 %	487 g ±2 %	520 g ±2 %
Length x Width x Height	211±2 mm x 62 mm x 32,3 mm	201.2±2 mm x 62 mm x 32,3 mm	211±2 mm x 62 mm x 32,3 mm
Length x Width x Height, with IO option		211±2 mm x 62 mm x 32,3 mm	

The sketches on the following page show the dimensions of IRMA 6

The view “A” shows a SWITCH variant with IO option. This is the only variant with 4 connectors (1 to 4).

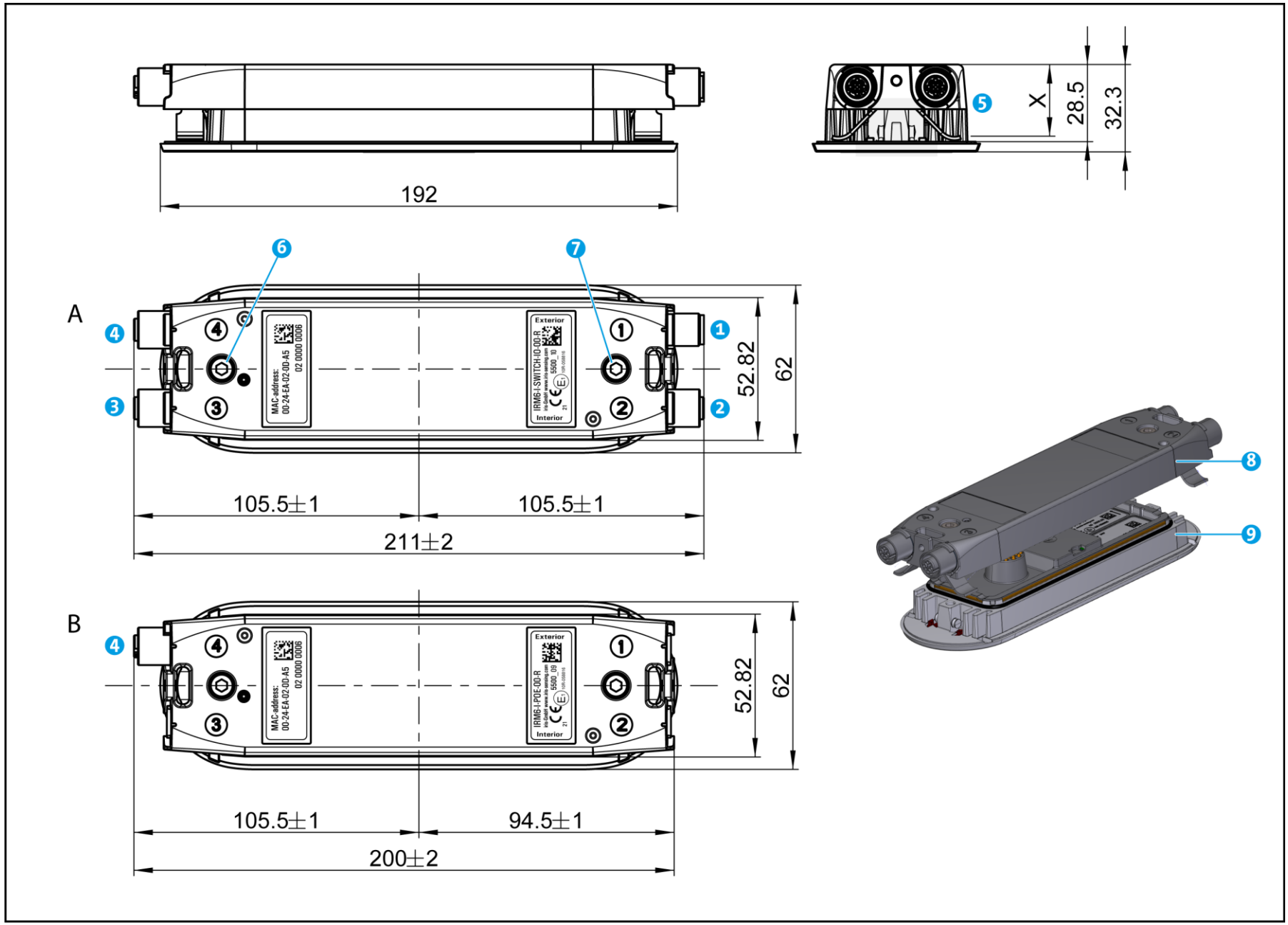
View “B” shows a POE variant without the IO option. This is the only variant without connectors on the “left” end. It only needs 1 connector 4.

As the variations in dimensions are only depending on the connectors, dimensions for all sensor variants can be taken from this drawings.

Dimension X in the side view 5 is the thickness of the interface unit behind the material, where IRMA 6 is mounted. It calculates as X = 28.5 mm – “thickness of material”.

Example: If IRMA 6 is mounted at a voute with a thickness of 4 mm, than X is 28.5 mm – 4 mm = 24.5 mm.

Mind that there also must be space to tighten the 2 M5x20 screws 6, 7 that fix the interface unit 8 to the sensor unit 9.


192
5
X
28.5
32.3
A
6
7
4
1
3
2
52.82
62
105.5±1
105.5±1
211±2
8
9
B
94.5±1
200±2

2.4 Power supply

Parameter		ETH variant	POE variant	SWITCH variant	Note
Power supply voltage	min.	16 V	n/s	16 V	POE variant: Power over Ethernet according to IEEE 802.3af: Type 1, Class 0 (12.95 W), Mode A (power over data lines)
	max.	57 V	57 V	57 V	
	typical	24 V	48 V	24 V	
Power consumption	P_{avg}, counting inactive	3 W	3 W	4 W	Ambient temperature 25 °C, 77 °F For ETH and SWITCH variants: • Supply Voltage 24 V • Max. duration of P_{Peak}: 1.37 ms
	P_{avg}, counting active[1]	5 W	5 W (V_{POE} = 54 V)	6 W	
	P_{avg_max}, counting inactive	3.5 W		5.5 W	
	P_{avg_max}, counting active[1]	7 W	6 W (V_{POE} = 48 V)	7.5 W	
	P_{Peak}, counting inactive	13 W		13 W	
	P_{Peak}, counting active[1]	30 W	15.4 W[2]	34 W	

1 Active mode: Counting active. Sensor is in operation mode and algorithms are running.
2 When planning the energy budget of the POE switch, its power supply has to deliver peak power according to IEEE 802.3af (15.4 W), taking into account compensation of cable losses of up to 2.45 W.

2.5 Door signal input

Parameter	Value	Note
Input		Bipolar (+/-)
Input level low	−6 V to +6 V	
Input level high	−60 V to −9V, +9 V to +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
Galvanical insulation against V_{Supply} and chassis ground	500 V_{AC}	

3 Security features

Sabotage detection

As the sensors are used in an environment with public access and must have a free field of view it is not possible to fully protect the surface against damage. The sensor detects and reports damages of the surface that are critical to the function.

4 Communication protocols

Network communication protocols

For network communication the following protocols are available:
DHCP, HTTP, HTTPS, MQTT, SNTP, SNMP, mDNS, DNS-SD, TCP/IP UDP

Application communication protocols

The table lists the available communication protocols for the APC application.

Protocol	Brief description
UIPRETROFIT	UIPRETROFIT 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	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	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	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.

5 Compliance with regulations and standards

The following tables list standards and regulations, that are applied on IRMA 6.

5.1 General

Regulation	Note
2014/30/EU	European directive relating to electromagnetic compatibility
2011/65/EU 2015/863/EU	European directive on the restriction of the use of hazardous substances in electrical and electronic components and equipment (RoHS)
2006/25/EC	European directive on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation)

Standard	Note
IEC 60068-1:2013	Environmental testing – Part 1: General and guidance
IEC 60068-2-6:2007	Environmental testing – Part 2-6: Tests – Test Fe: Vibration (sinusoidal)"
IEC 60068-2-27:2008	Basic environmental testing procedures – Part 2-27: Tests – test Ea and guidance: Shock"
IEC 60068-2-47:2005	Environmental testing – Part 2-47: Tests – Mounting of specimens for vibration, impact and similar dynamic tests
IEC 60068-2-64:2008	Environmental testing – Part 2-64: Tests – Test Fh : Vibration, broadband random and guidance

Standard	Note
IEC 61373:2010	Railway applications – Rolling stock equipment – Shock and vibration tests
IEC 60721-3-5:1997	Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities; Section 5: Ground vehicle installations"
IEC 60529:1989 + A1:1999	Degrees of protection provided by enclosures (IP code)
IEC 60825-1:2014	Safety of laser products - Part 1: Equipment classification and requirements

5.2 Railway application

Standard	Item	Note
EN 50121-3-2:2016/A1:2019		Railway applications – Electromagnetic compatibility – Part 3-2: Rolling stock – Apparatus
EN 45545-2:2020		Railway Applications – Fire protection on railway vehicles – Part 2
EN 50155:2017		Railway Applications – Rolling Stock – Electronic equipment
	13.4.9	Insulation test
	13.4.4 13.4.5 13.4.6	Tests according to IEC 60068-2-1:2007 – Environmental testing – Part 2-1: Tests – Test A: Cold
	13.4.7	Tests according to IEC 60068-2-2:2007 – Environmental testing – Part 2-2: Tests – Tests B: Dry heat
		Tests according to IEC 60068-2-30:2006 – Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic

5.3 Automotive application

Regulation	Note
UN/ECE-R 118	Regulation No 118 of the Economic Commission for Europe of the United Nations (UN/ECE) — Uniform technical prescriptions concerning the burning behaviour of materials used in the interior construction of certain categories of motor vehicles
UN/ECE R 10	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