Automatic passenger counting

IRMA – Infrared Motion Analyzer
5th generation

sCON-F-12-CC-E
Data sheet
Datasheet sCON-F-12-CC-E

Document information

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Applicable product variants

<table>
<thead>
<tr>
<th>Produkt</th>
<th>iris Art.-No.</th>
<th>Product name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRMA MATRIX</td>
<td>5002_03</td>
<td>DIST500.7-F07.OC030</td>
<td>IRMA MATRIX sensor, Flush mount version</td>
</tr>
<tr>
<td>IRMA MATRIX</td>
<td>5250_42</td>
<td>sCON-F-12-CC-E</td>
<td>Connector with Ethernet and two CAN interfaces for IRMA MATRIX sensors of the DIST500-F type (flush-mount variant)</td>
</tr>
<tr>
<td>IRMA MATRIX</td>
<td></td>
<td>DIST500.7-F07</td>
<td>Any IRMA MATRIX sensor of the flush mount version</td>
</tr>
</tbody>
</table>

Fig. 1: sCON-F-12-CC-E
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1 General

1.1 Trade names

Unless otherwise indicated, all brand and product names in this document are the registered trade names of their respective owners.

1.2 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.

1.3 Symbols/abbreviations/designations/product names

"Please note" The paragraph in question is given in italics.

M12CAN-CON-03
Connector (f)  iris product designation
Connector (m)  Female connector
CAN type M12 connector (m/f)  5-pole M12 connector (m/f) with A coding, see section 4.1, p. 9
ETH type M12 connector (m/f)  4-pole M12 connector (m/f) with D coding, see section 4.3, p. 9
Cable type CAN  Cable with 5-pole connectors (m/f), CAN type
Cable type ETH  Cable with 4-pole connectors (m/f), ETH type

sCON  Abbreviation of Connector for IRMA MATRIX sensors (sensor CONnector)
sCON-S  Connector (Standard) for IRMA MATRIX sensors of the flush and surface mount versions
sCON-F-12-(CC-E)  Connector for IRMA MATRIX sensors of the flush mount version with M12 connectors (m, f), (2 x CAN and 1x Ethernet interface)
x, y  Variable cable lengths or variables in general
-XX-  In the product designation: Cable available in different cable qualities
VP+ (CAN-VCC)  Power supply of sensor
VP- (CAN-GND)  Power supply of sensor (ground)
CAN-H/CAN-L  CAN BUS communication
CAN  CAN type interface

Rev. 1.3.1  17.04.2019
1.4 This document

The present document describes only the connector sCON-F-12-CC-E for IRMA MATRIX sensors for the flush mount version. It describes neither the function nor the installation of the IRMA MATRIX system as a whole (cables, data interface, etc.).

1.5 Scope of delivery: single product or assembly

Fig. 2: Components of sCON-F-12-CC-E

Fig. 3: sCON-F-12-CC-E and IRMA MATRIX (flush mount version)
<table>
<thead>
<tr>
<th>Version A/B</th>
<th>Product designation</th>
<th>Product No.</th>
<th>Brief description</th>
<th>Weight [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>sCON-F-12-CC-E</td>
<td>0250_42</td>
<td>Connector with Ethernet and two CAN interfaces for IRMA MATRIX sensors of the DIST500-F type (flush mount version) including two countersunk head screws and one cover cap</td>
<td>0.217</td>
</tr>
<tr>
<td>B</td>
<td>BG_D500R2F-BK_F-12</td>
<td>5200_40</td>
<td>Connector with Ethernet and two CAN interfaces two countersunk head screws and one cover cap IRMA MATRIX sensor of the DIST500.7-F07.OC030 type (flush mount version)</td>
<td>0.585</td>
</tr>
</tbody>
</table>
2 Brief description/Proper use

The sCON-F-12-CC-E connector is a connector by iris-GmbH. It connects the IRMA MATRIX sensors of the flush mount version of the DIST500-F type to other systems. The connector is designed for installation in coves\(^1\) of a material thickness of 1 to max. 8 mm. Its shape is flat and adapted to the sensor geometry which allows the housing to simultaneously provide for attachment and electrical connection of the sensors. The type of connection proven and tested for the standard connectors - clamping with two leaf springs - remains unchanged. The leaf springs are now part of the connector housing. The sCON-F-12-CC-E comes with the mounting screws required.

The following interfaces in the form of M12 connectors are available:

<table>
<thead>
<tr>
<th>No.</th>
<th>Interface</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CAN interface CANin/POWERin:</td>
<td>CAN BUS and sensor power supply in the form of an M12 connector (m) of the CAN type (5 poles, A coded)</td>
</tr>
<tr>
<td>2</td>
<td>CAN interface CANout/POWERout:</td>
<td>The supply lines and the CAN BUS are looped through on an M12 connector (f) of the CAN type for further connection of sensors so that couplers can be eliminated.</td>
</tr>
<tr>
<td>3</td>
<td>Ethernet interface type ETH</td>
<td>An Ethernet interface (ETH) in the form of an M12 connector (f) of the ETH type (4 poles, D coded)</td>
</tr>
</tbody>
</table>

The corresponding number of the connections is stamped on the rear of the housing.

3 Design and interfaces

Fig. 4: Connection diagram of the connector

\(^1\) A cove is a panelling in the vehicle, here in particular above the door, into which the sensor is to be fitted.
4 Pin assignment of the interfaces

4.1 Built-in connectors (female/male) of the CAN or ETH type

The metal housings serve as shield connection of the connecting cables.

<table>
<thead>
<tr>
<th>No. of connection on the housing</th>
<th>M12 connector (m) CAN type (CANin/POWERin)</th>
<th>Connection to</th>
<th>Signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td></td>
<td>Pin 1</td>
<td>unassigned</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pin 2</td>
<td>VP+ (CAN-VCC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pin 3</td>
<td>VP- (CAN-GND)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pin 4</td>
<td>CAN-H</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pin 5</td>
<td>CAN-L</td>
</tr>
</tbody>
</table>

Table 1: Pin assignment CAN / POWER interface of built-in connector (m) No. 1

<table>
<thead>
<tr>
<th>No. of connection on the housing</th>
<th>M12 connector (f) CAN type (CANout/POWERout)</th>
<th>Connection to</th>
<th>Signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>②</td>
<td></td>
<td>Pin 1</td>
<td>unassigned</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pin 2</td>
<td>VP+ (CAN-VCC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pin 3</td>
<td>VP- (CAN-GND)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pin 4</td>
<td>CAN-H</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pin 5</td>
<td>CAN-L</td>
</tr>
</tbody>
</table>

Table 2: Pin assignment CAN / POWER interface of built-in connector (f) No. 2

<table>
<thead>
<tr>
<th>No. of connection on the housing</th>
<th>M12 connector (f) of the ETH type (Ethernet)</th>
<th>Connection to</th>
<th>Signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>③</td>
<td></td>
<td>Pin 1</td>
<td>TD+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pin 2</td>
<td>RD+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pin 3</td>
<td>TD-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pin 4</td>
<td>RD-</td>
</tr>
</tbody>
</table>

Table 3: Pin assignment of Ethernet interface of built-in connector (f) No. 3
5 Connecting cables

All connecting cables must be manufactured with a 360° shield connection in order to meet the requirements of the applicable standards on EMC radiation.

The sCON-F-12-CC-E can be integrated with any existing M12 cabling without problems. The sCON-F-12-CC-E is connected to the supply lines and the CAN BUS via the built-in CAN-type M12 connectors (m) (connection No. ①).

- **K-M12CAN-XX-x**  
  M12 extension cable for CAN and power supply:  
  M12 connector (m) of the CAN type / M12 connector (f) of the CAN type

- **K-M12CAN-B-XX-x**  
  M12 connecting cable:  
  M12 connector (f) of the CAN type / 4 open wire ends

- **K-M12POW-B-xx-x**  
  M12 power supply cable  
  M12 connector (f), CAN type / 2 open wire ends

- **K-M12POW-B-oE-XX-x**  
  M12 power supply with  
  M12 connector (f), CAN type / 2 open wire ends

For the supply of further sensors and for the extension of the CAN BUS, an M12 extension cable can be installed directly from the M12 built-in connector (f) (CANout / POWERout) to the M12 built-in connector (m) (CANin / POWERin) of another sCON-F-12-CC-E.

⚠️ A crossover cable must be used for connecting two sensors in master/slave operating mode.

The cable required for this purpose is a

- **K-M12CAT5-S-S-co-XX-x**  
  M12 crossover cable with two M12 connectors (m), ETH type.

For examples see Fig. 11, page 17, and Fig. 13, page 19.

For connection to a switch, an Ethernet system cable with two M12 connectors (m) of the ETH type is connected to the built-in ETH type connector (f).

- **K-M12CAT5-XX-x**  
  M12 Ethernet system cable  
  two M12 connectors (m), ETH type
6 Dimensions

Fig. 5: Required mounting space taking into account the cable bending diameter

1 M12 connection 2 Supporting surface to sensor

The height dimension “31” can differ in mounted condition, depending on the material thickness of the cove (panel).

Fig. 6: Mounting depth required behind the cove depending on the cove (panel) material thickness

1 sCON-F-12-CC-E 3 IRMA MATRIX sensor E = 31 mm - material thickness of cove
2 Leaf spring 4 Cove Typical mounting depth = 29 mm (23 – 30 mm)
A = 31 mm
7 Attachment

The **sCON-F-12-CC-E** is designed for installation in coves with a material thickness of 1 to 8 mm.

The **sCON-F-12-CC-E** comprises the attachment set for the IRMA MATRIX sensor. It is attached to the IRMA MATRIX sensor using two screws, the system is clamped to the cove (panel) using the two leaf springs. The screws must be tightened repeatedly and alternatingly.

⚠️ After dismounting the **sCON-F-12-CC-E** it is not permissible to mount it into a cove (panel) of reduced thickness without having replaced the leaf springs. It may be the case that the spring pressure is not sufficient to ensure reliable attachment. New leaf springs can be retrofitted (please order retrofitting kit if required).

---

**Fig. 7:** Mounting with **sCON-F-12-CC E** – overview

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Allen countersunk head screw, Allen key size 3</td>
</tr>
<tr>
<td>2</td>
<td><strong>sCON-F-12-CC-E</strong></td>
</tr>
<tr>
<td>3</td>
<td>Leaf spring for clamping</td>
</tr>
<tr>
<td>4</td>
<td>Cove² (here e.g. 4 mm thick) with rectangular cutout</td>
</tr>
<tr>
<td>5</td>
<td>IRMA MATRIX sensor <strong>DIST500-F</strong> (flush mount variant)</td>
</tr>
</tbody>
</table>

---

² A cove is a panelling in the vehicle, here in particular above the door, into which the sensor is to be fitted.
8 Type designation and nameplate

Fig. 8: Nameplate

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Type designation</td>
</tr>
<tr>
<td>2</td>
<td>Product No.</td>
</tr>
<tr>
<td>3</td>
<td>Exterior: Information on the orientation of the sCON-F-12-CC-E. This side is to face towards the vehicle exterior.</td>
</tr>
<tr>
<td>4</td>
<td>Interior: Information on the orientation of the sCON-F-12-CC-E. This side is to face towards the vehicle interior.</td>
</tr>
</tbody>
</table>

8.1.1 Explanation of the type designation

**F**  sCON with flat housing

**12**  M12 connector

**CC**  1 x CAN/supply input, 1 x CAN/supply output

**E**  Ethernet interface

8.1.2 Placement of the nameplate

Fig. 9: Placement of the nameplate

⚠️ On mounting see to it that the "Exterior" and "Interior" indications on the nameplates of the connector and the sensor are correct.
9 Connection combinations

9.1 Power supply

The power supply of the sCON-F-12-CC-E connectors is ensured by the 5-pole built-in connector (m). This connection also provides for the CAN BUS. In the sCON-F-12-CC-E the CAN data and the supply lines are again joined into one connector via the printed circuit board. Thus another sCON-F-12-CC-E can be connected directly to the sCON-F-12-CC-E.

⚠️ The power supply must not be effected via the gateway, but is fed separately via an H coupler.

⚠️ It must be ensured that in the power supply the maximum load of the internal connecting lines and connectors is not exceeded. In an IRMA MATRIX installation (DIST500.7) no more than three more IRMA MATRIX sensors may be connected to an sCON-F-12-CC-E (a total of four connected in series). Any other sensors must be voltage supplied via a distributor. If another supply point is necessary, the supplyline VP+ must be opened between the segments (see section 9.2.3).

9.2 CAN cabling

A CAN BUS must be terminated with a 120 Ω terminating resistor (termination) at both ends. Branch lines must be as short as possible and are limited in length related to the transmission rate / protocols.

⚠️ The connection to the gateway must only be a data line; the voltage supply connectors must not be assigned.

This requirement is fulfilled by the adapter cables we offer for your system:

iris adapter cables to the A21 gateway without power, without termination

- **K-A21-M12CAN-oP-XX-32cm** M12 subD9 adapter cable, without power, without termination
  M12 connector (m) of the CAN type / subD9 connector (f)

For installations with just one supply line (up to 4 sensors) it may be useful to install an adapter cable to the gateway which is already fitted with a termination. This termination then forms the end of the CAN BUS, not a branch line (for an adapter cable as branch line see e.g. Fig. 10, page 16, for an adapter as the end of the CAN BUS see Fig. 11, page 17.)
iris adapter cable to the A21 gateway without power, with termination:

- **K-A21-M12CAN-TRoP-XX-32cm**  M12 subD9 adapter cable, without power, with termination
  CAN type M12 connector (m) / subD9 connector (f)

The sensors are connected among each other with M12 extension cables of the CAN type.

### 9.2.1 Sensor group in master/slave operating mode (CAN)

For the installation of a master/slave system on a wide door, both sensors are connected via the Ethernet connection so that they can exchange information on frames. It is only the master sensor which transmits counting data. A crossover cable is required for the connection of two sensors.

- **K-M12CAT5-S-S-co-XX-x**  M12 crossover cable with two M12 connectors (m) of the ETH type

For examples see Fig. 11, page 17, and Fig. 13, page 19.

### 9.2.2 Installation examples for CAN communication

The installation figures below are examples only and show just the main components.
Fig. 10: CAN installation with 4 sensors

**Legend**

1. M12 power supply cable
2. Branch line with M12 subD9 adapter cable, without power, **without termination**
3. Termination
4. CAN type M12 extension cable

**Description of the installation:**

- CAN BUS communication with on-board computer
- Adapter cable (branch line) without termination
- Separate termination
- No communication via Ethernet
- Separate power supply

Termination preferably with adapter cable including termination to gateway (K-A21-M12CAN-TRoP-XX-32cm)
Description of the installation:
- CAN BUS communication with on-board computer
- Adapter cable (branch line) without termination
- Separate termination
- Communication single and master/slave operation mode of the sensors (two sensors for wide doors)
- Separate power supply

Legend:
1. M12 power supply cable
2. No branch line!
   M12 subD9 adapter cable without voltage supply, with termination
3. Termination
4. CAN type M12 extension cable
5. Sensor group in master/slave layout for wide door
6. ETH type M12 crossover cable
Fig. 12: CAN installation with 8 sensors

Description of the installation:
- CAN BUS communication with on-board computer
- Adapter cable (branch line) without termination
- Separate termination
- No communication via Ethernet
- Separate power supply

Legend
1. M12 power supply cable
2. Branch line with M12 subD9 adapter cable, without termination
3. Termination
4. CAN type M12 extension cable
**Fig. 13:** CAN installation with 8 sensors (master/slave)

**Description of the installation:**
- CAN BUS communication with on-board computer
- Adapter cable (branch line) without termination
- Separate termination
- Communication single and master/slave operation mode of the sensors (two sensors for wide doors)
- Separate power supply

<table>
<thead>
<tr>
<th>Legend</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power supply</td>
</tr>
<tr>
<td>2</td>
<td>Branch line with M12 subD9 adapter cable <strong>without termination</strong></td>
</tr>
<tr>
<td>3</td>
<td>Termination</td>
</tr>
<tr>
<td>4</td>
<td>CAN type M12 extension cable</td>
</tr>
<tr>
<td>5</td>
<td>Master/slave layout (two sensors for wide doors)</td>
</tr>
<tr>
<td>6</td>
<td>ETH type M12 crossover cable</td>
</tr>
</tbody>
</table>

### 9.2.3 Additional voltage supply (CAN cabling)

Possibly an additional voltage infeed for a second segment can become necessary, and this feeding must be made at a distance from the voltage supply.

⚠️ For the voltage supply of a second segment the voltage supply line VP+ to the first segment must be opened, as otherwise different potentials may form due to the line length, which may cause transverse currents and disturbances.

A feeding switch can be used for the power supply of another segment. The feeding switch transmits the CAN signals and the reference potential VP- from the CAN connector (m) to the CAN/POW female connector. From the POW connector the supply line VP+ is only routed to the CAN/POW female connector. VP- is the reference potential of all three connectors.
Fig. 14: CAN installation with 8 sensors and second voltage infeed

Description of the installation:
- CAN BUS communication with on-board computer
- Adapter cable (branch line) without termination
- Separate termination
- No communication via ETH
- Power supply to two segments with feeding switch

Legend
1 M12 power supply cable
2 Branch line with M12 subD9 adapter cable without termination
3 CAN type M12 extension cable
4 Termination
5 Feeding switch
9.3 Ethernet cabling

In addition to the combined voltage supply connection and the CAN BUS, the sCON-F-12-CC-E is equipped with a female connector for Ethernet communication. In this installation version all sCON-F-12-CC-E are connected via a switch. For this purpose cables with the following designations are used:

- **K-M12CAT5-XX-xm** M12 Ethernet system cable
  - two ETH type M12 connectors (m)

Voltage is supplied via the cables given in section 5. If more than 4 sensors are installed, they need to be connected via a second voltage supply.

**Fig. 15: ETH installation with 4 sensors**

<table>
<thead>
<tr>
<th>Description of the installation:</th>
<th>Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>- ETH communication</td>
<td>1</td>
</tr>
<tr>
<td>- One-to-one communication of the sensors with the on-board computer</td>
<td>2</td>
</tr>
<tr>
<td>- No communication via CAN</td>
<td>3</td>
</tr>
<tr>
<td>- Separate power supply</td>
<td></td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1  M12 power supply cable</td>
<td></td>
</tr>
<tr>
<td>2  CAN type extension cable</td>
<td></td>
</tr>
<tr>
<td>3  ETH type M12 system cable</td>
<td></td>
</tr>
</tbody>
</table>
Fig. 16: ETH installation with 8 sensors

Description of the installation:
- ETH communication
- One-to-one communication of the sensors with the on-board computer
- No communication via CAN
- Separate power supply

Legend
- A1 Power supply 1
- A2 Power supply 2
- 1 M12 power supply cable
- 2 CAN type M12 extension cable
- 3 ETH type M12 system cable
10 Compliance with standards

Mechanical and EMC tests were performed to determine the compliance of the system comprising MATRIX sensor and connector with the relevant standards. The related test reports are on hand.

Dielectric strength and insulation resistance in connection with the IRMA MATRIX sensor were successfully tested according to EN 50155.

The printed circuit board was manufactured in accordance with EN 45545-2 and is color coated.

11 Technical data/properties

Table 4: Technical data

<table>
<thead>
<tr>
<th>Property</th>
<th>min.</th>
<th>typ.</th>
<th>max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mating cycles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- POWER / CAN</td>
<td></td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>- Ethernet</td>
<td></td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>- sCON</td>
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<td>75</td>
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<td>Ambient temperature</td>
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<tr>
<td>Storage</td>
<td>-40</td>
<td></td>
<td>+85</td>
<td>°C</td>
</tr>
<tr>
<td>Function</td>
<td>-25</td>
<td></td>
<td>+70</td>
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<td>Protection class</td>
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<td>IP54</td>
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<tr>
<td>Nominal voltage (VCC-GND)</td>
<td>24</td>
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<td></td>
<td>V</td>
</tr>
<tr>
<td>Voltage sustaining capability</td>
<td></td>
<td></td>
<td>2000</td>
<td>V</td>
</tr>
<tr>
<td>(surge, burst)</td>
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<tr>
<td>Insulation resistance</td>
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<td>VDC</td>
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<tr>
<td>max. current for sensor (rms, 70 °C)</td>
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<td>A</td>
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<tr>
<td>max. current for POWERout</td>
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