IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification System for Explosive Atmospheres

for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.:	**IECEx TRA 17.0001X**	Page 1 of 4	Certificate history:
Status:	**Current**	Issue No: 3	Issue 2 (2019-08-02) Issue 1 (2018-08-16) Issue 0 (2017-07-14)
Date of Issue:	2021-04-30		

Applicant: **Controlled Systems Ltd**
Unit 1 Ryder Close
Swadlincote
Derbyshire DE11 9EU
United Kingdom

Equipment: **RugiCAM-IP Network Camera and RugiCAM-LED Lighting Unit**

Optional accessory:

Type of Protection: **Intrinsic Safety**

Marking: Ex ia I Ma IP66 (IP65 when using KROTT type connectors)

Ta -40°C to +60°C

Ta -20°C to +60°C (when using KROTT type connectors)

Approved for issue on behalf of the IECEx Certification Body: **Justin Gavranich**

Position: **Certification Authority**

Signature: (for printed version)

Date: 2021-04-30

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Certificate issued by:

Ex Testing and Certification Pty Ltd
1/30 Kennington Drive
Tomago NSW 2322
Australia

TESTING & CERTIFICATION

IECEx Certificate of Conformity

Certificate No.: **IECEx TRA 17.0001X**

Date of issue: 2021-04-30 Issue No: 3

Manufacturer: **Controlled Systems Ltd**
Unit 1 Ryder Close
Swadlincote
Derbyshire DE11 9EU
United Kingdom

Additional manufacturing locations:

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements.This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended

STANDARDS :
The equipment and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards

IEC 60079-0:2017 Explosive atmospheres - Part 0: Equipment - General requirements
Edition:7.0

IEC 60079-11:2011 Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
Edition:6.0

This Certificate **does not** indicate compliance with safety and performance requirements other than those expressly included in the Standards listed above.

TEST & ASSESSMENT REPORTS:
A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in:

Test Reports:

AU/EXTC/ExTR19.0020/00
AU/TRA/ExTR17.0008/00
GB/CML/ExTR15.0016/00
GB/CML/ExTR18.0163/00
GB/CML/ExTR21.0066/00

Quality Assessment Report:

GB/SIR/QAR07.0023/13

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EQUIPMENT:
Equipment and systems covered by this Certificate are as follows:

The RugiCAM-IP Network Camera comprises a small camera and associated electronic circuits installed within a rugged steel enclosure with a toughened glass window. Power is supplied to the Network Camera from an external power supply or a Power over Ethernet (PoEx) supply via the LAN connector. The Network Camera may communicate via a WiFi interface as an alternative to the LAN connection. It may interface to other equipment via a RS485 Comms port. It may interface to LED Lighting Units, when mounted adjacently, optionally by daisy chained control and supply connections.

The RugiCAM-LED Lighting Unit comprises either white LEDs or Infrared LEDs and associated circuitry installed within a rugged steel enclosure with a toughened glass window. Power is supplied to the LED Lighting Unit from an external power supply. It may interface to the Network Camera, when mounted adjacently, optionally by daisy chained control and supply connections.

Refer to Annexe for full description.

SPECIFIC CONDITIONS OF USE: YES as shown below:
Refer to Annexe for Conditions of Certification

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DETAILS OF CERTIFICATE CHANGES (for issues 1 and above)
Refer to Annexe for Details of Change

Annex:

IECEx TRA 17.0001X-03 Certificate Annexe FINAL.pdf

Description (Cont'd from certificate):

The Network Camera and LED Lighting Unit use a similar enclosure. When in use, they may be mounted adjacent to each other and in that case, the supply connections may be common, and the LED interface connections between the Camera and LED Lighting Unit may be daisy chained.

External connections to the equipment is via connectors on the rear of the enclosure.

The enclosure for both the Network Camera and the LED Lighting Unit can be manufactured from coated/painted steel or stainless steel to suit the application. It contains a glass window fixed in a window bezel that fixes to the main housing using hex screws and with an O-ring to provide ingress protection. The electronics are partly encapsulated and fitted inside the housing with a lid using hex socket head screws and with an O-ring to provide ingress protection.

Camera Unit

LED Unit

For the Network Camera Unit, the electronics consists of several boards:

- PCB IP-BD1 that is encapsulated only on one side. It contains the safety components that allow use of an external uSD card slot, an external WLAN antenna, the reset switch and status LED's and the safety components that allow connection of the external power supply. The Ex-LAN board is mounted vertically on this, on the encapsulated side.
- PCB IP-BD2, fully encapsulated, that contains the contains the camera module, power supply sections of the electronics, and safety components for use of an external LED interface and RS485 communications
- The Ex-LAN board, fully encapsulated, that fits on the PCB IP-BD1 and contains the voltage limiting circuits for the power supply, and the safety components that allow connection of the external ethernet and power-over-ethernet

For the LED Lighting Unit, the electronics consists of several boards:

- PCB LED-BD1, encapsulated on one side, that contains the power supply sections of the electronics, including the voltage limiting circuits for the power supply, and the safety components that allow connection of the external power supply
- PCB LED-BD2, fully encapsulated, that contains the LED driver circuits, and the safety components that allow connection of the external high power LED's, and the external LED interface
- PCB LED-BD3, encapsulated on one side, that is used to mount the high power LED's and the Light Detection component

The equipment is suitable for use in Group I (underground coal mining) and has the following safety parameters:

Parameters to be taken into account when interconnecting in a system:

Network Camera Unit

12Vdc Power – Connector X1: 4-Pole M12 Connector
Pin 3 wrt Pin 4
(Internally, board IP-BD1 connector PL3 Pins 1, 2)

Ui (Vdc)	Ci (µF)	Li (mH)
15.4*	0	0

**Revised from 12.8V to 15.4V in Issue 3 of the certificate*

RS485 COMMS – Connector X1: 4-Pole M12 Connector
Pin 1 wrt Pin4, Pin 2 wrt Pin 4
(Internally, board IP-BD2 connector PL3 Pins 1, 2)

Ui (V)	Uo (V)	Io (mA)	Po (mW)	Ci (µF)	Li (mH)
7.2	5.88	111	163	0	0

The capacitance and either the inductance or inductance to resistance ratio (L/R) of the load connected to the output terminals must not exceed the following values.

Capacitance (µF)	Inductance (mH)	L/R Ratio (µH/Ω)
1000	9.55	1436

LED Interface - Connector X2: 4-Pole M12 Connector
Pin 1 wrt Pin 4, Pin 2 wrt Pin 4
(Internally, board IP-BD2 connector PL5 Pins 1, 2, 3)

Ui (V)	Uo (V)	Io (mA)	Po (mW)	Ci (µF)	Li (mH)
15	5.88	52	76	0	0

The capacitance and either the inductance or inductance to resistance ratio (L/R) of the load connected to the output terminals must not exceed the following values.

Capacitance (µF)	Inductance (mH)	L/R Ratio (µH/Ω)
1000	175.5	6154

WiFi Antenna – Connector X4: TNC Connector
(Internally, board IP-BD1 connector SK2)

Po (RF) (mW)
500

LAN (10/100 Ethernet) – Connector X5: 8 Pole M12 connector, alternatively RJ45 connector Pins 1 - 8
(Internally, board IP-BD1 connector PL1 Pins 1 to 10)

Ui (V)	Uo (V)	Io (A)	Ci (µF)	Li (mH)
15.4	5.88	2.18	0.48	0

**Revised from 12.8V to 15.4V in Issue 3 of the certificate*

Note Io = 2.18 is the total for the 4 signal lines on the one ethernet (TX+, TX-, RX+, RX- with each line providing 545mA).

The capacitance and either the inductance or inductance to resistance ratio (L/R) of the load connected to the output terminals must not exceed the following values.

Capacitance (µF)	Inductance (mH)	L/R Ratio (µH/Ω)
1000	97.9	145

If PoEx is used the parameters of the PoEx power supply must also be considered.
The 10/100 Ethernet port may be connected to any other equipment having appropriate entity parameters.

LED Lighting Unit

12Vdc Power – Connector X1: 4-Pole M12 Connector

Pin 3 wrt Pin 4

(Internally, board LED-BD1 connector PL1 Pins 1, 2)

Ui (Vdc)	Ci (µF)	Li (mH)
15.4	0	0

**Revised from 12.8V to 15.4V in Issue 3 of the certificate*

LED Interface – Connector X2 (to Network Camera): 4-Pole M12 Connector

Pin 1 wrt Pin 4, Pin 2 wrt Pin 4

(Internally, board LED-BD2 connector PL3 Pins 1, 2, 3)

Ui (V)	Uo (V)	Io (mA)	Po (mW)	Ci (µF)	Li (mH)
15	5.88	52	76	0	0

The capacitance and either the inductance or inductance to resistance ratio (L/R) of the load connected to the output terminals must not exceed the following values.

Capacitance (µF)	Inductance (mH)	L/R Ratio (µH/Ω)
1000	175.5	6154

LED Interface – Connector X3 (to other LED Interfaces): 4-Pole M12 Connector

Pin 1 wrt Pin 4, Pin 2 wrt Pin 4

(Internally, board LED-BD2 connector PL5 Pins 1, 2, 3)

Ui (V)	Uo (V)	Io (mA)	Po (mW)	Ci (µF)	Li (mH)
15	5.88	52	76	0	0

The capacitance and either the inductance or inductance to resistance ratio (L/R) of the load connected to the output terminals must not exceed the following values.

Capacitance (µF)	Inductance (mH)	L/R Ratio (µH/Ω)
1000	175.5	6154

Specific Conditions of Use pertaining to Issue 0 of this Certificate:

1. Versions of the enclosure can be manufactured from aluminium (part number includes AA – Anodised Aluminium). The aluminium version is not permitted in Group I (underground coal mining) applications.
2. If the enclosure is coated or painted it must be installed in such a manner that the danger of ignition of flammable dust due to propagation brush discharges is avoided

Drawing list pertaining to Issue 0 of this Certificate:

Manufacturer's Documents

Title:	Drawing No.:	Pages	Rev. Level:	Date:
IP CAMERA BOARD 1 CIRCUIT DIAGRAM	RUGICAM-IP-BD1	1	1	2015-02-03
IP CAMERA BOARD 2 CIRCUIT DIAGRAM	RUGICAM-IP-BD2	1	2	2017-06-16
M12 X-CODE CONNECTOR FLEX (10/100 with PoEx) CIRCUIT DIAGRAM	M12-FLEX-FE	1	1	2014-06-27
RUGICAM-IP-BD1 ARTWORKS	RUGICAM-IP-BD1 PCB	1	1	2015-02-11
RUGICAM-IP-BD2 ARTWORKS	RUGICAM-IP-BD2 PCB	1	2	2017-06-16
M12-FLEX-FE ARTWORKS	M12-FLEX-FE PCB	1	1	2015-02-11
IS ETHERNET I/F CIRCUIT DIAGRAM	CSL ExLAN	1	2	2017-06-16
ExLAN ARTWORKS	ExLAN-PCB	1	2	2017-06-16
RUGICAM LED1 BOARD CIRCUIT DIAGRAM	RUGICAM-LED1	1	2	2017-06-26
RUGICAM LED BOARD 2 & 3 CIRCUIT DIAGRAM	RUGICAM-LED2	1	1	2014-08-18
RUGICAM-LED-BD1 ARTWORKS	RUGICAM-LED-BD1 PCB	1	2	2017-07-05

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Annexe

Annexe for Certificate No.:	IECEx TRA 17.0001X	Issue No.:	3

Title:	Drawing No.:	Pages	Rev. Level:	Date:
RUGICAM-LED-BD2 ARTWORKS	RUGICAM-LED-BD2 PCB	1	1	2015-02-12
RUGICAM-LED-BD3 ARTWORKS	RUGICAM-LED-BD3 PCB	1	1A	2015-02-11
CSL RugiCAM-IP Camera + LED Unit Assembly Drawing	RugiCAM-IP ASSY	2	2	2017-06-16
RugiCAM-IP QLD IECEx Certification Label Drawing	RugiCAM-IP QLD IECEx Label	1	1	2017-04-27

Variations permitted by Issue 1 of this certificate:

This issue of the certificate permits the following variations:

1. To permit alternative camera and Wi-fi modules to be fitted to the existing RugiCAM-IP Network Camera.
2. To permit an integral Wi-Fi antenna 'Puck' to be fitted, as an alternative, to the existing TNC screw-on antenna. This involves using either a UFL connector or the existing MCX connector depending on application.
3. To permit the inclusions of three optional indicating LEDs at the rear of the enclosure in place of two connectors.
4. To permit the RS-485 parameters to be stated as individual lines for the TX/RX lines. This has reduced the current (Io) from 221mA to 111mA and the power (Po) from 325mW to 163mW. This is to bring the output into line with other similar equipment. NOTE: The parameter table on page 2 for the RS-485 port, connector X1, has been amended accordingly to reflect the revised Io and Po.
5. To permit various changes to the RugiCAM-IP-BD1, the RugiCAM-IP-BD2 and the RugiCAM-LED-BD1 circuit boards.

Specific Conditions of Use pertaining to Issue 1 of this certificate:

1. Versions of the enclosure can be manufactured from aluminium (part number includes AA – Anodised Aluminium). The aluminium version is not permitted in Group I (underground coal mining) applications.
2. If the enclosure is coated or painted it must be installed in such a manner that the danger of ignition of flammable dust due to propagation brush discharges is avoided.
3. If a WiFi puck is fitted, under certain extreme circumstances, the non-metallic parts incorporated in the enclosure i.e. the puck, may generate an ignition-capable level of electrostatic charge. Therefore, the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces.

This is particularly important if the equipment is installed in a zone 0 location. In addition, the equipment shall only be cleaned with a damp cloth.

Drawings Associated with the Issue 1 of this Certificate:

Manufacturer's Documents

Title:	Drawing No.:	Pages	Rev. Level:	Date:
IP CAMERA BOARD 1 CIRCUIT DIAGRAM	RUGICAM-IP-BD1	1	2	2018-04-30
IP CAMERA BOARD 2 CIRCUIT DIAGRAM	RUGICAM-IP-BD2	1	3	2018-07-05
RUGICAM-IP-BD1 ARTWORKS	RUGICAM-IP-BD1 PCB	1	2	2018-07-13
RUGICAM-IP-BD2 ARTWORKS	RUGICAM-IP-BD2 PCB	1	3	2018-07-06
RUGICAM LED1 BOARD CIRCUIT DIAGRAM	RUGICAM-LED1	1	3	2018-06-29
RUGICAM-LED-BD1 ARTWORKS	RUGICAM-LED-BD1 PCB	1	3	2018-07-10
CSL RugiCAM-IP Camera + LED Unit Assembly Drawing	RugiCAM-IP ASSY	3	3	2018-08-09

Variations permitted by Issue 2 of this certificate:

This issue of the certificate permits the following variations:

- The option of an aluminium enclosure has been removed from the product range.
- Alterations to the Specific Conditions of use.

Compliance has been provided in report AU/EXTC/ExTR19.0020/00.

Specific Conditions of Use pertaining to Issue 2 of this certificate:

- If the enclosure is powder coated or painted it must be installed in a manner that minimizes the risk from electrostatic discharge.

Drawings Associated with the Issue 2 of this Certificate:

Manufacturer's Documents

Title:	Drawing No.:	Pages	Rev. Level:	Date:
IP CAMERA BOARD 1 CIRCUIT DIAGRAM	RUGICAM-IP-BD1	1	2	2018-04-30
IP CAMERA BOARD 2 CIRCUIT DIAGRAM	RUGICAM-IP-BD2	1	3	2018-07-05
M12 X-CODE CONNECTOR FLEX (10/100 with PoEx) CIRCUIT DIAGRAM	M12-FLEX-FE	1	1	2014-06-27
RUGICAM-IP-BD1 ARTWORKS	RUGICAM-IP-BD1 PCB	1	2	2018-07-13
RUGICAM-IP-BD2 ARTWORKS	RUGICAM-IP-BD2 PCB	1	3	2018-07-06
M12-FLEX-FE ARTWORKS	M12-FLEX-FE PCB	1	1	2015-02-11
IS ETHERNET I/F CIRCUIT DIAGRAM	CSL ExLAN	1	2	2017-06-16
ExLAN ARTWORKS	ExLAN-PCB	1	2	2017-06-16
RUGICAM LED1 BOARD CIRCUIT DIAGRAM	RUGICAM-LED1	1	3	2018-06-29
RUGICAM LED BOARD 2 & 3 CIRCUIT DIAGRAM	RUGICAM-LED2	1	1	2014-08-18
RUGICAM-LED-BD1 ARTWORKS	RUGICAM-LED-BD1 PCB	1	3	2018-07-10
RUGICAM-LED-BD2 ARTWORKS	RUGICAM-LED-BD2 PCB	1	1	2015-02-12
RUGICAM-LED-BD3 ARTWORKS	RUGICAM-LED-BD3 PCB	1	1A	2015-02-11
*CSL RugiCAM-IP Camera + LED Unit Assembly Drawing	RugiCAM-IP ASSY (QLD)	3	4	2019-07-25

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Annexe

Annexe for Certificate No.:	IECEx TRA 17.0001X	Issue No.:	3

Title:	Drawing No.:	Pages	Rev. Level:	Date:
*RugiCAM-IP QLD IECEx Certification Label Drawing	RugiCAM-IP QLD IECEx Label	1	2	2019-07-25

*Note: An * is included before the title of documents that are new or revised.*

Variations permitted by Issue 3 of this certificate:

This issue of the certificate permits the following variations:

- Update the Standards to the latest edition IEC 60079-0:2017.
- To add alternative Krott Ethernet/Power 7-pin Connector SKK27P. This connector has IP65 ingress protection rating (compared to IP66 earlier) and the minimum ambient temperature is limited to -20°C (compared to -40°C earlier). The marking plate has been suitably modified.
- To add an internal microphone within the enclosure. The microphone is connected to the internal board in series with a fuse provided with an oversleeve. The fuse and oversleeve is located within the encapsulation.
- For the Network Camera Unit, the Input parameter Ui 12.8V on the Power (X1 Connector) and also for the LAN (X5 Connector) has been revised to Ui 15.4V.
- For the LED Lighting Unit, the Input parameter Ui 12.8V on the Power (X1 Connector) has been revised to Ui 15.4V.

Compliance has been provided in report GB/CML/ExTR21.0066/00. Drawings used in this certificate are identical to those in the aforementioned report except that only Group I options are retained (steel version of the enclosure is used, and marking label refers to this certificate number).

Specific Conditions of Use pertaining to Issue 3 of this certificate:

No change from earlier issue 2 of this certificate.

Drawings Associated with the Issue 3 of this Certificate:

Manufacturer's Documents

Title:	Drawing No.:	Pages	Rev. Level:	Date:
*IP CAMERA BOARD 1 CIRCUIT DIAGRAM	RUGICAM-IP-BD1	1	2A	2021-03-15

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Annexe

Annexe for Certificate No.:	IECEx TRA 17.0001X	Issue No.:	3

Title:	Drawing No.:	Pages	Rev. Level:	Date:
IP CAMERA BOARD 2 CIRCUIT DIAGRAM	RUGICAM-IP-BD2	1	3	2018-07-05
M12 X-CODE CONNECTOR FLEX (10/100 with PoEx) CIRCUIT DIAGRAM	M12-FLEX-FE	1	1	2014-06-27
RUGICAM-IP-BD1 ARTWORKS	RUGICAM-IP-BD1 PCB	1	2	2018-07-13
RUGICAM-IP-BD2 ARTWORKS	RUGICAM-IP-BD2 PCB	1	3	2018-07-06
M12-FLEX-FE ARTWORKS	M12-FLEX-FE PCB	1	1	2015-02-11
IS ETHERNET I/F CIRCUIT DIAGRAM	CSL ExLAN	1	2	2017-06-16
ExLAN ARTWORKS	ExLAN-PCB	1	2	2017-06-16
RUGICAM LED1 BOARD CIRCUIT DIAGRAM	RUGICAM-LED1	1	3	2018-06-29
RUGICAM LED BOARD 2 & 3 CIRCUIT DIAGRAM	RUGICAM-LED2	1	1	2014-08-18
RUGICAM-LED-BD1 ARTWORKS	RUGICAM-LED-BD1 PCB	1	3	2018-07-10
RUGICAM-LED-BD2 ARTWORKS	RUGICAM-LED-BD2 PCB	1	1	2015-02-12
RUGICAM-LED-BD3 ARTWORKS	RUGICAM-LED-BD3 PCB	1	1A	2015-02-11
*CSL RugiCAM-IP Camera + LED Unit Assembly Drawing	RugiCAM-IP ASSY (QLD)	3	5	2021-02-26
*RugiCAM-IP QLD IECEx Certification Label Drawing	RugiCAM-IP QLD IECEx Label	1	3	2021-03-31

*Note: An * is included before the title of documents that are new or revised.*