sames inocoat

Inocontroller

Control module

Instruction manual

DRT7134
C – 2022/12

The descriptions and characteristics mentioned in this document are subject to change without prior notice

Sames operating manuals are written in French and translated into English, German, Spanish, Italian and Portuguese.

The French version is deemed the official text and **Sames** will not be liable for the translations into other languages.

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Services

Certification and referencing

Sames is certified as a training center by the DIRRECTE of the Auvergne Rhône Alpes region under the number 84 38 06768 38.

Our company provides, throughout the year, training courses allowing you to acquire the essential know-how for the implementation and maintenance of your equipment in order to guarantee its performance in the long term.

A catalog is available on request.

www.sames.com/france/fr/services-training.html

Line audits

As part of a technical assistance program for our customers using **Sames** equipment, the line audits are intended to help you optimize and control your production tool.

Our network of experts is continuously trained and qualified to provide our customers with technical expertise on the liquid or powder installations in which our equipment is integrated. The global environment of the production lines is taken into account during this technical audit.

A brochure is available for download:

www.sames.com/france/fr/services-service-contract.html

Maintenance program

An annual maintenance program (including or not the consumables to be replaced during each intervention) can be considered with the partnership of **Sames**. It is associated with a preventive maintenance plan established during a first audit visit which details the control points necessary to guarantee the performance of the installed equipment.

www.sames.com/france/fr/services-service-contract.html

Hotline

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1. Health and safety instructions

1.1. Applicable standards
Inocontroller control module has been designed according to standards indicated below:

Canadian Standards:
- CSA C22.2 No. 61010-1:12
- CSA C22.2 No. 213:19
- CSA C22.2 No. 0:20
- CSA C22.2 No. 60079-31:15 as a guide
- EN 50177:09 / A1:13 as a guide
- EN 50500-2:18 as a guide

US Standards:
- FANSI/ISA-61010-1: 3rd Ed.
- FM3600: 2018
- FM3611: 2018
- FM 7260: 2018 as a guide
- UL60079-31:2nd Ed. as a guide

Installation:
- In **Canada**, the installation has to be in compliance with the Canadian Electrical Code C22.1 part I, standard safety for electrical installations.
- In the **USA**, the installation has to be in compliance with the National Electrical Code NFPA 70.

1.2. Marking
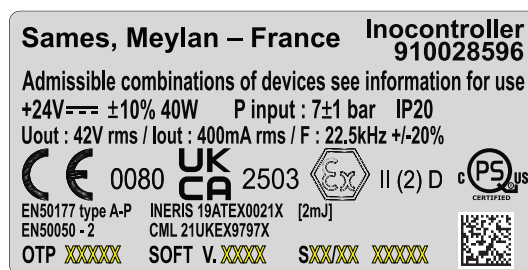
This marking indicates that this control module is an item of equipment that must be installed **outside of an EXplosive ATmosphere** and that it contributes to the safe operation of the equipment **Inogun A** or **Inogun M** installed in an **Explosive Atmosphere** that is connected to it. The operating procedure for the equipment is described in the user manual of the projector or of the spray gun.

The X sign placed after the EU type examination certificate number indicates that this equipment is subject to a special condition of use with regard to the ambient operating temperature, which must be between 0°C and 40°C.

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1.3. Meaning of pictograms

Warning electricity	**Warning Automatic start–up**	**Warning Hot surface**	**Warning Explosive material**	**General warning sign**
Warning High pressure	**Warning Crushing of hands**	**Warning for explosive atmospheres**	**Warning Flammable material**	**Warning Corrosive subtance**
Warning Toxic material	**Warning Harmful products**	**No access for people with active implanted cardiac devices**	**Wear ear protection**	**Wear a face shield**
Wear respiratory protection	**Wear safety footwear**	**Wear protective clothing**	**Wear protective gloves**	**Wear head protection**
Opaque eye protection must be worn	**General mandatory action sign**	**Connect an earth terminal to the ground**	**Refer to Instruction manual**	

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1.4. Precautions for Use

This document contains information that all operators should be aware of and understand before using the **Inocontroller** control module. This information highlights situations that could result in serious damage and indicates the precautions that should be taken to avoid them.

Before any use of the Inobox control module, check that all operators:

• have previously be trained by the company **Sames**, or by their distributors registered by them for this purpose.
• have read and understood the user manual and all rules for installation and operation, as laid out below.

It is the responsibility of the operators' workshop manager to ensure these two points and it is also his responsibility to make sure that all operators have read and understood the user manuals for any peripheral electrical equipment present in the powdering area.

1.5. Warnings

This equipment can be dangerous if not used in compliance with the safety regulations.

It is the customer's responsibility to verify which local fire and safety standards are applicable for use of the Inocontroller.

The control module Inocontroller must not be installed in an explosive atmosphere.

It is imperative that anyone wearing a pacemaker does not use the equipment and does not enter the projection area.
High voltage can cause the pacemaker to malfunction.

Equipment performance is only guaranteed if original spare parts distributed by Sames are used.

To guarantee an optimal assembly, spare parts must be stored in a temperature close to their temperature of use. Should the opposite occur, a sufficient waiting time must be observed before the installation, so that all the elements are assembled in the same temperature.

This equipment may be hazardous if it is not used, disassembled and reassembled in accordance with the rules indicated in this manual and in any applicable European Standard or national safety regulations.

- The control module is intended to be installed in category II (according to EN 61010-1) inside an electrical cabinet manufactured by **Sames,** which guarantees a basic level of product sealing relative to its environment (e.g. water spraying, dust pollution).
  All other cases of use are to remain under the user's liability (i.e. outside of the electrical cabinet or reliance on a cabinet not manufactured by **Sames**).

- The **Inocontroller** control module must not be installed outdoors.

- The ambient temperature around the **Inocontroller** module must be no greater than 40°C.

- The **Inocontroller** module must not be altered from its original condition.

- Only **Sames** spare parts, or a repair performed by the **Sames** repair department, are able to ensure and guarantee the operational safety of the **Inocontroller** module.

- Turn off the electrical power supply to the **Inocontroller** module before disconnecting the connectors from the module.

- Any repairs on the **Inocontroller** module with the power supply still on can only be performed by personnel certified and trained for electrical repairs.

An inviolability label is located on the side of the Inocontroller. Any damage to or absence of this label will result in the loss of the Sames manufacturer's guarantee.

2. Description

The **Inocontroller** is a control module for controlling the automatic **Inogun A** projector or the manual **Inogun M** spray gun. The **Inogun A** projector or the **Inogun M** spray gun have the function of projecting the electrically charged powder by means of a high voltage unit integrated into the barrel and delivering up to 100kV and 110 µA.

The **Inocontroller** manages, by microcontroller, the control of the high voltage unit and 3 proportional solenoid valves. In return, a reading of the voltage and high voltage current is performed, as well as the flow and current of the 3 proportional solenoid valves.

The **Inocontroller** is controlled by a PLC network or via a CAN link.
The **Inocontroller** is accessible for **Sames** maintenance via USB connection.

For instance:
Synoptic of an installation with an **Inogun A** projector

PLC   + 24VDC LPS

Network Communication   Air supply   Powder supply   Inogun A
Module
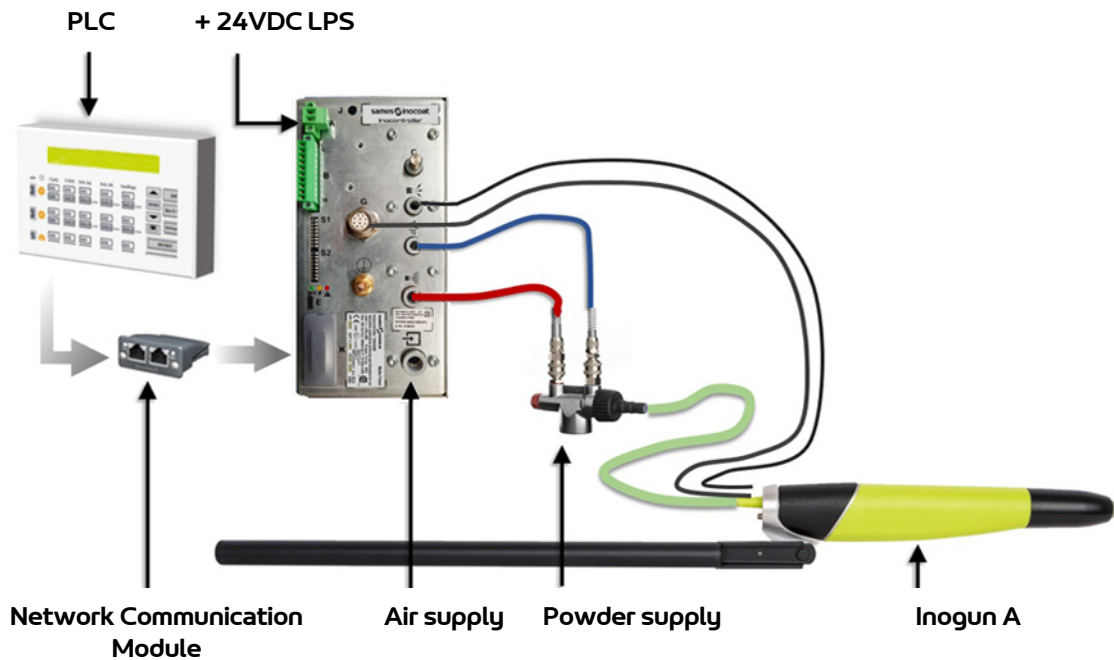
Front Face:
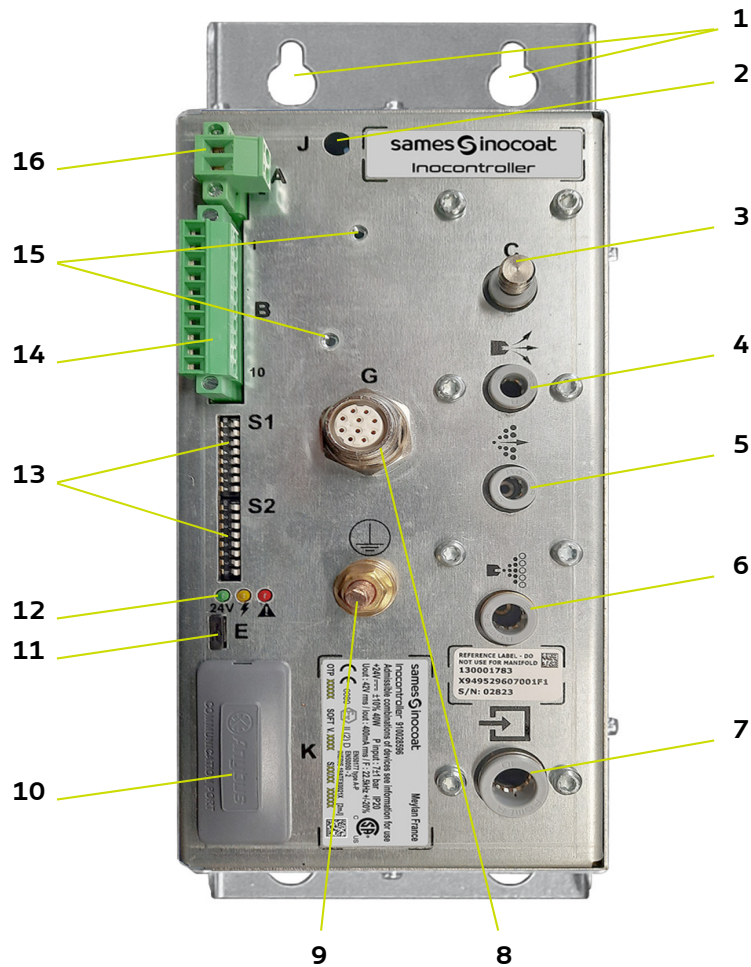
Item	Description
1	Fixing points
2	J: Wireless network antenna (optional)
3	C: not connected pneumatic output
4	Blowing electrode pneumatic output
5	Dilution pneumatic output
6	Injection pneumatic output
7	Main pneumatic supply
8	G: plug for powder projector connector
9	Ground connection terminal
10	K: network communication module location
11	E: micro USB type B port for maintenance
12	LED status
13	S1 and S2: micro switches for address, speed, communication and Bootloader configuration
14	B: I/O connector (Inputs / Outputs)
15	Location of cable shielding connections (jumpers supplied)
16	A: + 24VDC power supply connector

3. Characteristics

3.1. Mechanical characteristics

Dimensions	Width 105.2 mm x height 270 mm x depth 208 mm (without connector)
Weight	2840 g
Protection index	IP20 – Degree of pollution: 2 (1)
Box material	Galvanised steel
Ground shield	M6 brass pin
Fastening mode	M5 x 8 (qty 4)

(1): Level 2: Pollution either non-conducting or occasionally and temporarily conducting caused by condensation.
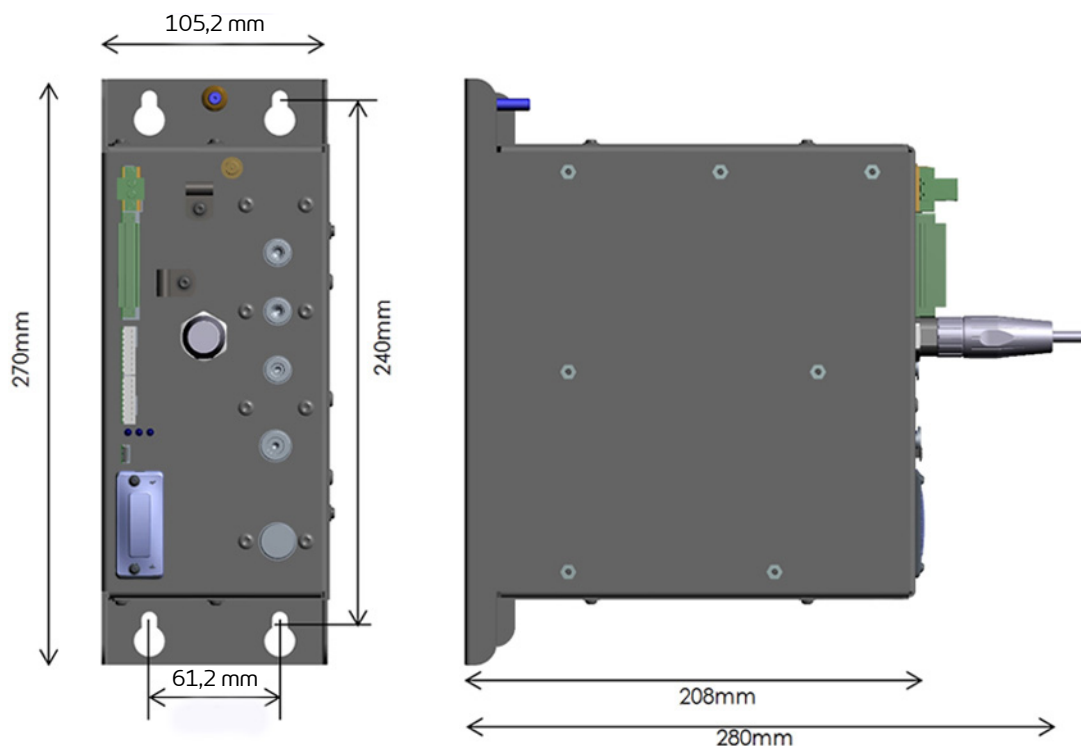
Ambient temperature during operations	0° C min. –> 40°C max.
Maximum storage / transport temperature	70°C max.
Maximum relative humidity	93% (4 hours)
Maximum altitude	2000 m

⚠️ **The Inocontroller module, the box in which it is mounted must be correctly connected to the installation ground by a cable or metal braid with a cross section greater than or equal to 6 mm^2.**
Electrical earth contacts must be free of paint or any form of more or less insulating surface.

3.2. Electrical characteristics

Using voltage: VLSV (2)	24 VDC (min. 21.6 VDC – max. 26.4 VDC)
Maximum Input Power (3)	40 W @ 24V DC
Maximum current (3)	1,7 A @ 24V DC
Protection circuit	Self–resettable, non–removable 3 A fuse Protective diode against polarity inversion 24V DC Internal limitation 30V
Max. output voltage (to projector)	42 V rms
Max. output current (to projector)	400 mA rms
Maximum frequency (to projector)	22,5 kHz +/–20% (min. 17 kHz / max. 27 kHz)
Maximum pressure supply	7 bar +/–1bar

(2): Very Low Safety Voltage: A +24 VDC LPS (Limited Power Source) supply is recommended to supply the **Inocontroller** module.
(3): The maximum power value is given all active functions simutaneously. (HV and Air).
Maximum current: **Inocontroller** module alone : 1.7A / Network communication module: 0,5A max (between 250mA and 0.5A depending on the type of network used). The **Inocontroller** control module is design to support a network of 0.5A .

3.3. Air compressed quality
Characteristics of compressed air supply according to the standard NF ISO 8573–1:

Maximum dew point at 6 bar (87 psi)	Class 4 i.e + 3°C (37°F)
Maximum particle–size of solid pollutants	Class 3 i.e 5 µm
Maximum oil concentration	Class 1 i.e 0,01 mg/m_0^{3*}
Maximum concentration of solid pollutants	Class 3 i.e 5 mg/m_0^{3*}

*: Values are given for a temperature of 20 °C (68 °F) at an atmospheric pressure of 1 013 mbar.

Non–compliance with these characteristics may result in incorrect operation of the"Inocontroller" control module.

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4. Operating principle of the Inocontroller

4.1. Pneumatical
The **Inocontroller** control module manages the powdering air (injection, dilution and electrode blowing) that supplies powder to the **Inogun A** projector or to the **Inogun M** spray gun.
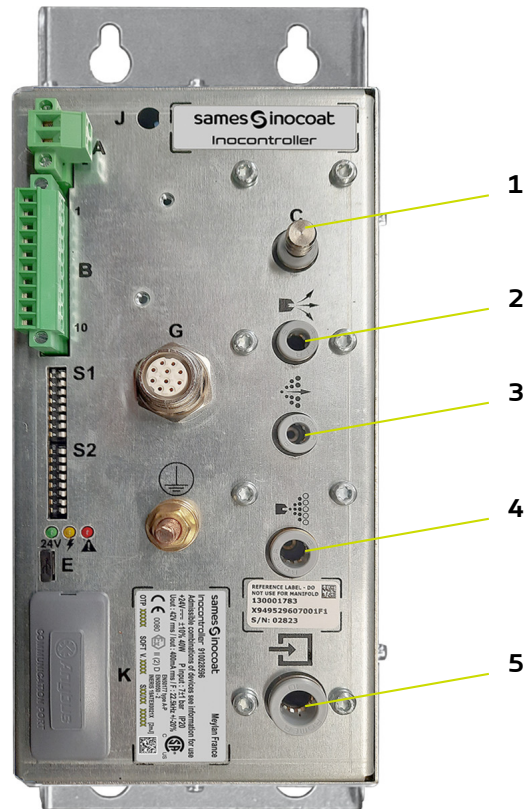
Item	Icons	Description	Characteristics
1	C	– (not connected)	–
2		Blowing air	Hose Dia.: 4/6 rilsan
3		Dilution air	Hose Dia.: 4/6 rilsan
4		Injection air	Hose Dia.: 6/8 rilsan
5		Air supply	Hose Dia.: 8/10 rilsan

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4.2. Startup
- Connect peripheral equipment (PLC, projector or spray gun, powder pump, etc.).
- Connect the air and powder supplies.
- Connect the +24V DC to the **Inocontroller** module.

The **Inocontroller** module is then ready to start.
The **Inocontroller** module is controlled by the PLC.

Remarks:
If the projector is not connected when the module is switched on, a " 37 – Spray gun or projector connector fault" is immediately triggered.
If the connected PLC does not request the control when the module is switched on, a "17 – Absence of control mode fault" is triggered after few seconds. As soon as the PLC requests the control, the fault will be immediately automatically reseted.

High voltage control and spraying:
The high voltage and spraying control can be done by the PLC connection or by a wired connection.
When using a wired control, for HV and spraying, the PLC must not request the high voltage control. (CAN control bit 2 to zero, see § 10.2.1 page 38).
This solution allows to save time in transmitting the work request.
The high voltage and spray settings must be set beforehand via the PLC.
When an **Inogun M** spray gun is connected, the HV trigger is controlled by the operator at the spray gun level, if the PLC authorizes it.
The operator can also modify the injection set-point using the spray gun keys, if the PLC does not prohibit it.

4.3. State of the Inocontroller
The state of the **Inocontroller** is displayed on the front panel by a series of three indicator lights (LEDs).

Symbol	Indicator	Status	Indication
24V	Green	Off	Absence +24 V power supply
		On	Presence +24 V power supply
⚡	Yellow	Off	No High voltage at projector output
		On	High voltage at projector output
		Blinking	Active Bootloader mode
⚠	Red	On	Fault present
		Blinking	Connected communication module not recognized

4.4. Configuration of the communication network

The **Inocontroller** has two microswitches S1 and S2 on its front panel to configure network addressing and network communication speed.

S1: Configuration	S2: Speed
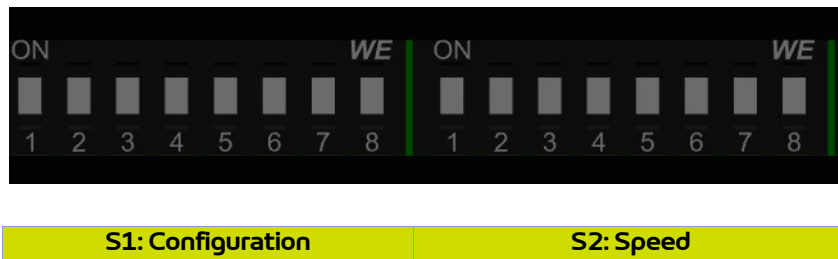
The microswitches must be properly configured before the module is powered up.

4.4.1. Network address

Micro-switches S1, from 1 à 8 allow the address configuration by binary code on 8 bits or 255 positions.
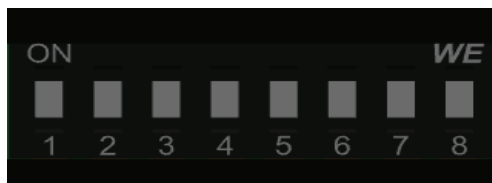
S1		#1	#2	#3	#4	#5	#6	#7	#8
	OFF	0	0	0	0	0	0	0	0
	ON	1	2	4	8	16	32	64	128

The least significant bit corresponds to micro-switch N°1.

Example : we want to configure the module at address 147, binary code: 10010011
Position of the micro-switches:

S1	#1	#2	#3	#4	#5	#6	#7	#8
	ON	ON	OFF	OFF	ON	OFF	OFF	ON

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4.4.2. Network speed

Micro-switches S2, from 1 à 4 allow the speed communication configuration by binary code on 4 bits or 16 positions. 3 microswitches 5 to 7 are in spare, the microswitch 8 is used for the Bootloader.

S2		#1	#2	#3	#4
	OFF	0	0	0	0
	ON	1	2	4	8

The least significant bit corresponds to micro-switch N°1.

4.5. Bootloader

Micro-switch S2#8 allows reprogramming the **Inocontroller** module via USB port.
This action can only be carried out by personnel trained by **Sames**.

Reprogramming is possible if the micro-switch S2#8 is ON (Boot Active)at startup and the yellow LED is flashing to indicate that the boot is active.
In that situation, no function of the **Inocontroller** module is active.

if the micro-switch S2#8 is OFF (Boot inactive), the **Inocontroller** module is active.

4.6. Inhibition of injection air flow monitoring
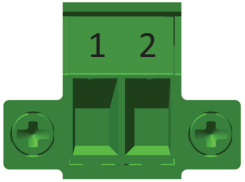
Micro-switch S2#7 is used to disable the monitoring of the injection air flow.

If the micro-switch is in the OFF position, monitoring is active (factory setting).

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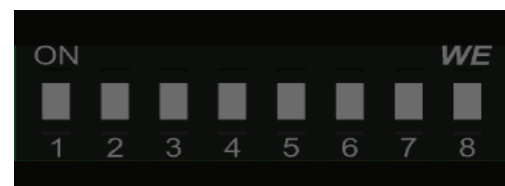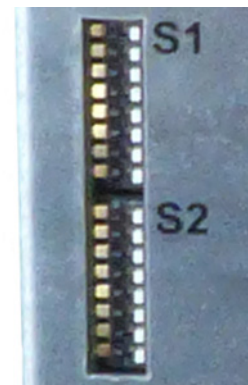
5. Connections

5.1. Connector A: +24 V DC power supply

Pin	Description	Designation	Characteristics	
1	+ 24 VDC	+ 24 VDC / 2A	Wire Terminal l 26–13AWG / 0,2– 2,5 mm^2	
2	0 VDC	0V common to the module and ground terminal		

5.2. Connector B – I/O (Input/Output)

Pin	Designation	Description	Characteristics
1	0 V TRIGGER	0V dry contact pilot for ON / OFF high voltage	Wire Terminal 26–16 AWG / 0,2 –1,5 mm^2
2	TRIGGER COM	Cathode input of the pilot optocoupler On / Off high voltage	
3	0 V CLEANING	0V for dry control contact On / Off cleaning	
4	CLEANING COM	Cathode input of the pilot optocoupler On / Off cleaning	
5	N.O FAULT RELAY	Output of the NO dry contact (normally open) of the fault relay	Wire Terminal 26–16 AWG / 0,2 –1,5 mm^2 Relay dry contact 6 A /250 V AC max Max. switching capacity: 1500VA
6	N.C FAULT RELAY	Output of the NC contact (normally closed) of the fault relay	
7	0 V	0 V	Wire Terminal 26–16 AWG / 0,2 –1,5 mm^2
8	CAN H	Data bus CAN signal H	Wire Terminal 26–16 AWG / 0,2 –1,5 mm^2
9	CAN L	Data bus CAN signal L	
10	0 V	0 V	

5.3. Low voltage connector to Inogun A projector or Inogun M spray gun

The high voltage unit of the projector or the spray gun is connected by a low voltage cable to the module **Inocontroller**. This cable is connected to the module via a circular connector.

5.4. Communication network

The **Inocontroller** is designed to be controlled by a communication network
To do this, it is necessary to install a communication module in the intended location (K) ().

Module installation:

- Remove the protective cover.

- Insert the module in its housing by pressing lightly down.

- Using a # 8 Torx screwdriver, lock the module by tightening the two screws to a torque of 0.25 N.m.
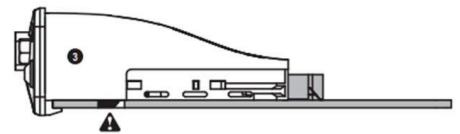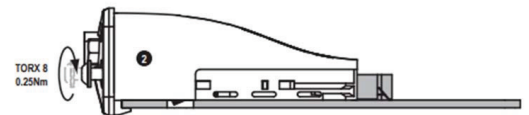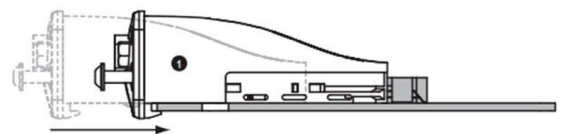
Uninstall:

- Using a # 8 Torx screwdriver, unlock the module by loosening the two screws

- Remove the module.

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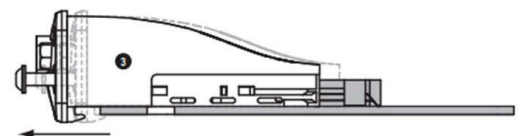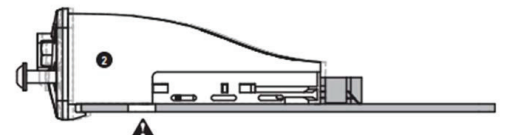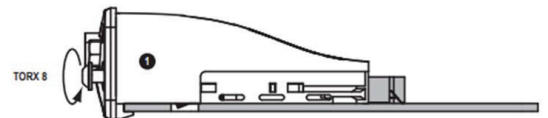
6. Cabling

6.1. Connector A: + 24 V DC

Function to be wired outside the module

Designation	Pin
+ 24 VDC	1
0 VDC	2

24 V DC

0 V

6.2. Connector B – I/O

Function to be wired outside the module
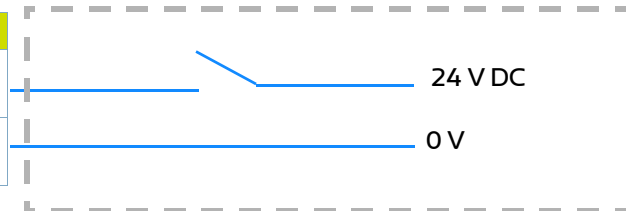
Designation	Pin
0 V TRIGGER	1
COM TRIGGER	2
0 V CLEANING	3
COM CLEANING	4
N.O FAULT	5
N.C FAULT	6
DEFAUT COMMUN	7
CAN H	8
CAN L	9
0 V	10

On / Off powdering trigger

On / Off cleaning

Fault
(Closed = present fault)

Communication CAN

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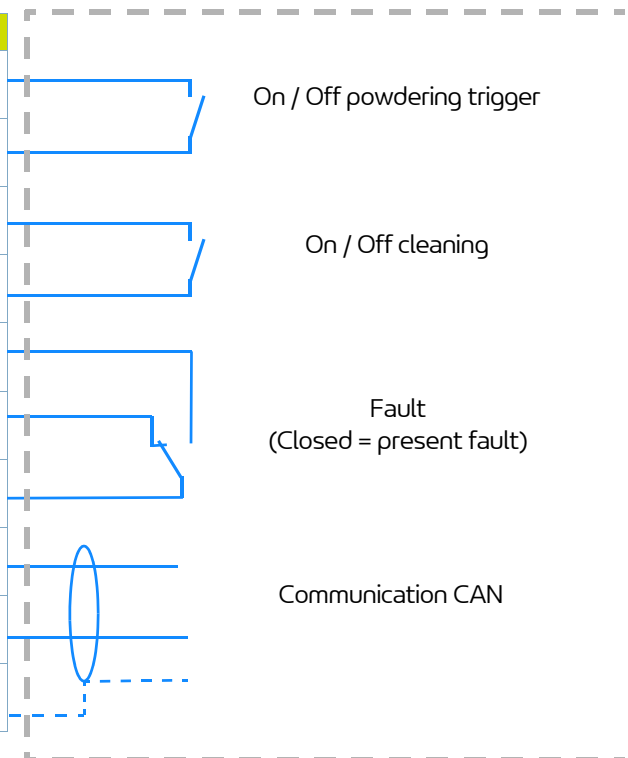
7. High voltage

7.1. Characteristics of projector output voltage and current

The **Inocontroller** module has a voltage and current mapping control that limits the operation according to curve 1.

Operator can set all the voltage / current value pairs that are including in this 100kV/110μA characteristic envelope.

For each UHT IR output current point corresponds to a maximum output voltage point, UR according to a mapping recorded in the HVU and not modifiable by the user.
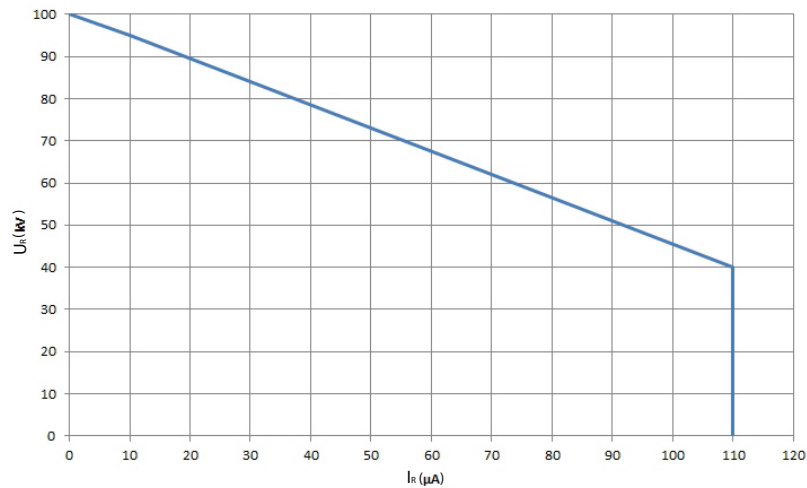
Curve 1

Example 1: 70kV / 30μA. The operating point is inside the curve, the voltage (70kV) and current (30μA) can be supplied if the system requires it.

Example 2: 70kV / 80μA. The operating point is outside the curve, current will be limited to 55μA. If electrical charge requires more current, voltage will be limited following the curve.

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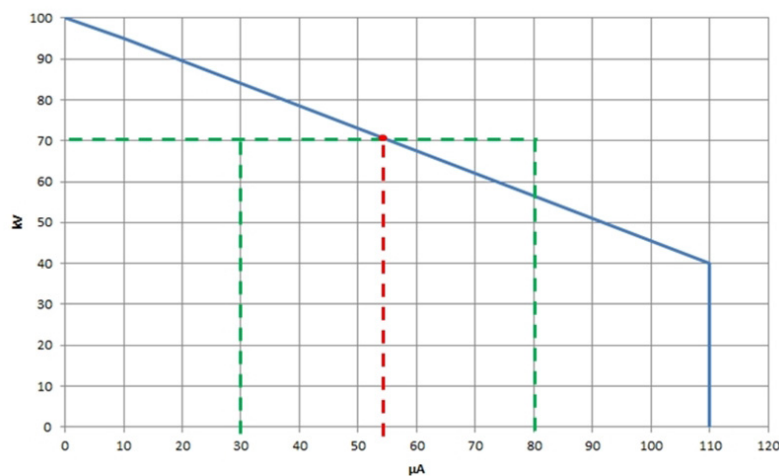
8. Fault management

There are two types of faults:
- Resettable faults by fault acknowledgment.
- Blocking faults that require a restart of the +24V DC supply of the **Inocontroller** module.

Whatever the type of fault triggered, the **Inocontroller** switches off the high voltage and powdering.
Fault relay and red LED (fixed light) are activated.
For a "network communication fault", the red LED is flashing

8.1. Fault list

Fault	Fault information
Communication module fault Only indicated by flashing red LED	The communication module plugged into slot K is not recognized or not allowed. This fault requires a power-up to be acknowledged.
1 – Program fault	Microcontroller module fault. This fault requires a power-on to be reseted.
2 – + 24 V power supply fault	The 24V power supply voltage has exceeded the authorized operating limits: 21 V < U < 28 V. This fault requires a power-on to be reseted.
5 – Voltage coherence fault	Voltage present on the bus without HV request. The fault requires a power-up to be acknowledged. HV request without voltage present on the bus. The fault can be reset by acknowledgment of the fault after 10 s of waiting.
17 – Absence of control mode fault	Communication is lost while the API is in control mode. The fault can be reset by acknowledgment of the fault The communication module is detected but the control is not activated. It is just necessary to activate the control of this module to acknowledge the fault.
21 – Bus power fault	The output power of the module or the inverter current has been exceeded. Resettable by Fault Acknowledgment.
22 – Safe shutdown fault	The maximum high voltage current or the supply current of the barrel has been exceeded. Resettable by acknowledgment of fault.
24 – Trigger request at startup	The external high voltage/powdering control trigger is controlled when the module is powered on. Resettable by Fault Acknowledgment
28 – Temperature fault	Maximum temperature overflow of the internal power supply of the module. Resettable by Fault Acknowledgment
29 – HVU link fault	The barrel is not or badly connected to the module. Resettable by Acknowledging Fault
30 – Internal BUS fault	Internal bus overvoltage (detected by hardware or software) Resettable by fault acknowledgment
32 – Injection fault	An injection control is activated without pressure feedback. Resettable by Fault Acknowledgment. See the position of micro switch S2#7 (see § 4.6 page 17).
33 – Dilution fault	A dilution control is activated without pressure feedback. Resettable by Fault Acknowledgment
34 – Blowing fault	A blowing control is activated without feedback from the activated valve. Resettable by Fault Acknowledgment
37- Spray gun or projector connector fault	No projector or spray gun connected Resettable by Acknowledgment Fault, unless the connected projector or spray gun is different from that at start-up

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8.2. Actions following a fault

Fault	Action to be performed
Communication module fault Only indicated by flashing red LED	Check the P/N of the module used for network communication, it must match a **Sames** number. Replace the network communication module
1 – Program fault	The microcontroller is faulty. If the problem persists, contact **Sames**.
2 – +24V power supply	Control power supply input on the module. It must be 24 V DC (min. 21,6 V DC / max. 26,4 V DC).
5 – Voltage coherence fault	Check the operation by changing the HVU. If the problem persists, contact **Sames**.
17 – Absence of control mode fault	The CAN Communication is lost while the PLC is in control mode. The fault can be reset by acknowledgment of the fault
21 – Bus power fault	The module delivers too much power or current at the output to the HVU. Check the connection between the module and the sprayer (G connector on the module). Check the internal connection of the sprayer and the condition of the HVU. None of these components must be damaged.
22 – Safe shutdown fault	The module delivers too much current at the output to the HVU. Check the connection between the module and the sprayer (G connector on the module) Check the internal connection of the sprayer and the condition of the HVU.
24 – Trigger request at startup	Check that the external trigger connection (connector B) is not activated, or the terminals are short-circuited. In the case of the manual spray gun, check that the trigger is not activated at power up
28 – Temperature fault	Check the ambient temperature as close as possible to the module. This temperature must not exceed 40 ° C.
29 – HVU link fault	Check the connection between the module and the sprayer (G connector on the module) Check the internal connection of the sprayer and the condition of the HVU.
30 – Internal BUS fault	The maximum level of the internal supply voltage to the module has been exceeded. If the problem persists, contact **Sames**.
32 – Injection fault	Check the air hose connections. Check the air pressure and flow rate at the module inlet and outlet. The injection fault can be disabled (see § 4.6 page 17)
34 – Blowing fault	Internal electrode blowing valve is not correct, if the problem persists contact **Sames**.
37– Spray gun or projector connector fault	Check the circular connector G on the back of the module

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9. Communication with PLC with optional module

In the network mode, a PLC manages the data display and / or the data control of the **Inocontroller** module.

It communicates with the module using the communication network module added on the **K** location on the **Inocontroller** module. This communication module specific to **Sames** exists in different protocols : Ethernet IP, Profinet, Ethercat, CClink, Profibus.
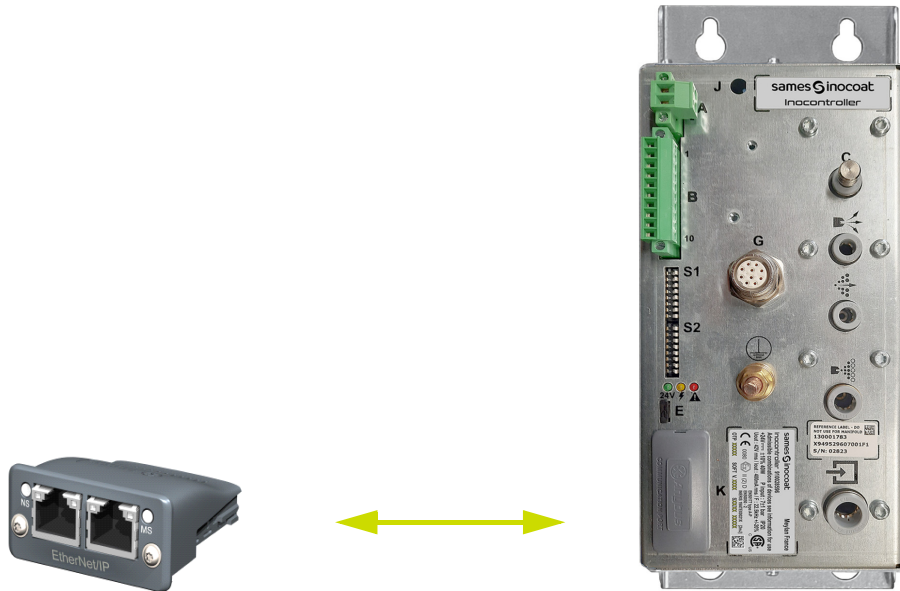
The network cable must be shielded and it is recommended to connect its shield closer to the connectors of the **Inocontroller** module.

9.1. Characteristics

9.1.1. Ethernet IP Module

9.1.1.1. Front view of the RJ45 module

#	Item	Connector
1	Network Status LED	Ethernet, RJ45
2	Module Status LED	
3	Link/Activity LED (port 1)	
4	Link/Activity LED (port 2)	

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9.1.1.2. Ethernet IP LED

'Network Status' Led (1)	Description
Off	No power or no IP address
Green	Online, one or more connections established (CIP Class 1 or 3)
Green, flashing	Online, no connection established
Red	Duplicate IP address, FATAL error
Red, flashing	One or more connections timed out (CIP Class 1 or 3)

'Module Status' Led (2)	Description
Off	No power
Green	Controlled by a scanner in Run state
Green, flashing	Not configured, or Scanner in idle state
Red	Major fault
Red, flashing	Recoverable fault(s). Module is configured, but stored parameters differ from currently used parameters.

LINK Activity Leds (3) and (4)	Description
Off	No link, no activity
Green	Link (100 Mbit/s) established
Green, flashing	Activity (100 Mbit/s)
Red	Link (10 Mbit/s) established
Red, flashing	Activity (10 Mbits/s)

9.1.1.3. Ethernet IP setting
For Ethernet IP, it is necessary to fix an IP address and a subnet mask.
The IP address should be in the same range as the IP address for the PLC system.
For Ethernet IP, the characteristics of a device are stored in an ASCII data file with the suffix EDS.
This file is used by the PLC configuration tools when setting up the network configuration
(**with Instance ID for PLC Input =100, and instance ID for PLC output =150**).
This configuration file can be downloaded from www.sames.com.

DHCP mode
The module supports the DHCP mode, which may be used to retrieve the IP settings from a DHCP-server automatically.
In this case all micro-switches of S1 must be in the ON position (value 255) and at least one of the first four microswitches of S2 (1 to 4) must be set to ON to activate this mode.

Addressing mode by micro-switches
At least one of the first four microswitches of S2 (1 to 4) must be set to ON to activate this mode.
By fault the IP address is 192.168.0.xxx where xxx is defined by S1 micro-switches and the SubNet mask is 255.255.255.0.
For example to fix IP4 to value 23, the micro-switches 1, 2, 3 and 5 of S1 must be put to the ON state and the others one to the OFF state.

Configuration mode via the RJ45 configuration utility
It is possible to change the entire IP address and subnet mask using a configuration utility such as IPConfig and connecting directly to the IP Ethernet module via an RJ45 cable.
In this case all micro-switches S1 and S2 must be put to OFF state.

9.1.2. Profinet Module

9.1.2.1. Front view of the RJ45 module

#	Item	Connector
1	Network Status LED	Ethernet, RJ45
2	Module Status LED	
3	Link/Activity LED (port 1)	
4	Link/Activity LED (port 2)	

9.1.2.2. Profinet LED

Led Network Status	Description	Comments
OFF	Offline	No power No connection with IO Controller
Green	On line (RUN)	Connection with IO Controller established IO Controller in RUN state
Green, 1 flash	On line (RUN)	Connection with IO Controller established IO controller in STOP state or IO data bad
Green, blinking	Blink	Used by engineering tool to identify the node on the network
Red	FATAL event	Major internal error (combined with a red Module Status Led)
Red, 1 flash	Station name error	Station Name not set
Red, 2 flashes	IP adress error	IP address not set
Red, 3 flashes	Configuration error	Expected identification differs from Real Identification

Module Status Led	Description	Comments
OFF	Not initialized	No power or Module in SETUP or NW_INIT state
Green	Normal operation	Module has shifted from the NW_INIT state
Green, 1 flash	Diagnostic event	Diagnostic event present
Red	Exception error or Fatal event	Device in EXCEPTION STATE or Major internal fault (combined with a red network Status Led)
Alternating Red / Green	Firmware update	Do NOT power off the module. Turning the module off during this phase could cause permanent damage

Link activity Led (3) and (4)	Description	Comments
OFF	No link, no activity	No link, no communication present
Green	Link	Link established, no communication present
Green, flickering	Activity	Link established, communication present

9.1.2.3. Profinet Settings

The module needs to be assigned a Station Name in order to participate on PROFINET.
The Station Name is SK-CMPP-xxx where xxx is defined on 3 digits by S1 micro-switches on the **Inocontroller**.

For example to fix the Station Name to SK-CMPP-023, the micro-switches 1, 2, 3 and 5 must be put to the ON state and the others one to the OFF state.
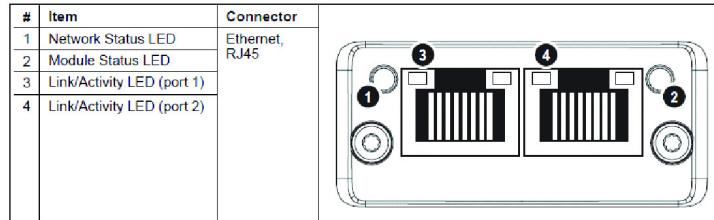
If all micro-switches are OFF, the station name is assigned by the configuration tool.

On PROFINET, the characteristics of a device are stored in an XML data file.
This file, referred to as the "GSD" file, is used by PROFINET engineering tools when setting up the network configuration. This configuration file can be downloaded from www.sames.com.

9.1.3. CC-Link module

9.1.3.1. Front view CC-Link module

#	Item
1	RUN LED
2	ERROR LED
3	CC-Link connector
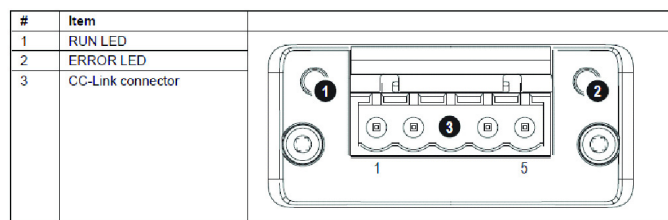
9.1.3.2. CC-Link LED

RUN LED (1)	Description
OFF	No network participation, timeout status (no power)
Green	Participating, normal operation
Red	Major fault (FATAL error)

ERROR LED	Description
OFF	No error detected (no power)
Red	Major fault (Exception or FATAL event)
Red, flickering	CRC error (Temporary flickering)
Red, flashing	Station Number or Baud rate has changed since startup (flashing)

9.1.3.3. CC-Link connector

Pin	Signal	Comments
1	DA	Positive RS485 RxD/TxD
2	DB	Negative RS485 RxD/TxD
3	DG	Ground signal
4	SLD	Cable shield
5	FG	Functional Earth

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9.1.3.4. CC-Link settings
On CC-Link, each device on the network must be assigned a unique Station Number.
The highest possible Station Number depends on the number of occupied stations.
Only one stations is occupied by the communication module.
CC-Link Version 2 is used with 2 extension cycles to have larger data size (32 bits and 8 words).
Only words are used for process data, but the last 16 bits of the bits area are used for
exchanging flags (& 9.2.1) in order to start the network.

The Station number is fixed by S1 micro-switches on the **Inocontroller** module.
For example to fix the Station Number to value 23, the switches 1, 2, 3 and 5 must be put to the ON state and the others one to the OFF state.

The module supports all common CC-Link baud rates up to 10Mbps.
The baud rate is defined by S2 micro-switches on the **Inocontroller** module :

- 0 –> 156 kbps (all micro switches are set to OFF)
- 1 –> 625 kbps
- 2 –> 2,5 Mbps
- 3 –> 5 Mbps
- 4 –> 10 Mbps

Each device on CC-Link is associated with a CC-Link Family System Profile (CSP+ file), which holds a description of the device and its functions.
This configuration file can be downloaded from www.sames.com.

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9.1.4. Profibus Module

9.1.4.1. Front view Profibus module

#	Item
1	Operation Mode
2	Status
3	PROFIBUS Connector, 9-pin female D-Sub
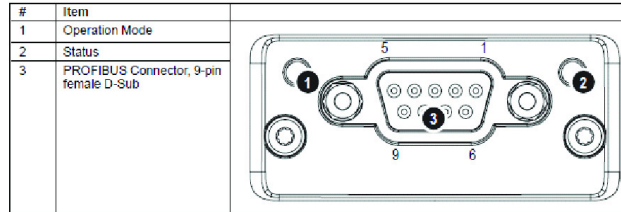
9.1.4.2. Profibus LED

1 – OPERATION Led	Description
OFF	Not online / No power
Green	Online, data exchange
Flashing green	Online, clear
Flashing Red (1 flash)	Setting error
Flashing Red (2 flashes)	Profibus configuration error

2 – STATUS Led	Description	Comments
OFF	Not initialized	Module in SETUP or NW_INIT state
Green	Initialized	The module has left the NW_INIT state
Flashing Green	Initialized, diagnostic event(s) present	Extended diagnostic bit is set
Red	Exception error	Module in exception

9.1.4.3. Profibus connector

Pin	Signal	Comments
1		
2		
3	B Line	Positive RS485 RxD/TxD
4	RTS	Request to send
5	GND Bus	Ground (isolated)
6	+ 5V Bus Out	+5 V terminaison power (isolated, short–circuit protected)
7		
8	A Line	Negative RS485 RxD/TxD
9		
	Cable shield	Internally connected to the Anybus protective ground via cable shield filters according to the Profibus standard

9.1.4.4. Profibus settings

The module must be assigned a unique Node address (a device address) in order to be able to communicate on the PROFIBUS network. The valid settings range is from 0... 125.

The Node address is fixed by S1 micro-switches on the **Inocontroller** module.
For example to fix the Node address to value 23, the switches 1, 2, 3 and 5 must be put to the ON state and the others one to the OFF state.

The baud rate is detected automatically by the module. The following baud rates are supported: :
9.6 kbps – 19.2 kbps – 45.45 kbps – 93.75 kbps – 187.5 kbps – 500 kbps – 1.5 Mbps – 3 Mbps – 6 Mbps – 12 Mbps.

On PROFIBUS, the characteristics of a device are stored in an ASCII data file with the suffix GSD.
This file is used by the PROFIBUS configuration tool when setting up the network (DP-V1).

Remarks: This configuration file can be downloaded from www.sames.com.

9.1.5. EtherCat Module

9.1.5.1. Front view EtherCat module

#	Item
1	RUN LED
2	ERROR LED
3	EtherCAT (IN port)
4	EtherCAT (OUT port)
5	Link/Activity (IN port)
6	Link/Activity (OUT port)
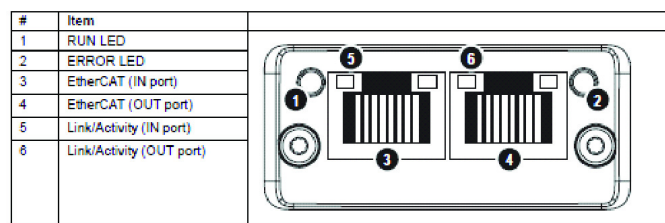
9.1.5.2. LED EtherCat

RUN Led	Description	Comments
OFF	INIT	EtherCAT device in 'INIT'-state (or no power)
Green	OPERATIONAL	EtherCAT device in 'OPERATIONAL'-state
Green, blinking	PRE-OPERATIONAL	EtherCAT device in 'PRE-OPERATIONAL'-state
Green, single flash	SAFE-OPERATIONAL	EtherCAT device in 'SAFE-OPERATIONAL'-state
Flickering	BOOT	The EtherCAT device is in 'BOOT' state
Red	Fatal event	If RUN and ERR turn red, this indicates a fatal event, forcing the bus interface to a physically passive state. Contact **Sames** technical support.

ERROR Led	Description	Comments
OFF	Not error	No error or no power
Red, blinking	Invalid configuration	State change received from master is not possible due to invalid register or object settings
Red, single flash	Unsolicited state change	Slave device application has changed the Ethercat sate autonomously
Red, double flash	Sync manager watchdog event	
Red	Application controller failure	Device in EXCEPTION STATE or Major internal fault (combined with a red RUN Led)
Flickering	Booting error detected	Firmware download failure

Link activity Led (5) and (6)	Description	Comments
OFF	No link	No link or no power
Green	Link sensed, no activity	Link sensed, no traffic detected
Green, flickering	Link sensed, activity	Link sensed, traffic detected

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9.1.5.3. Ethercat settings
The module supports the position addressing mode.

Each device on EtherCAT is associated with an EtherCAT Slave Interface (ESI) file in XML format, which holds a description of the device and its functions.
Remarks: This configuration file can be downloaded from www.sames.com.

9.2. Data exchange

9.2.1. Exchanging data flags for CC-Link only
The location of the system area is at the very end of the bit area. 16 bits are reserved for this use.

Bit	System area RX Inocontroller–> PLC	Description	Bit	System area RY PLC –> Inocontroller
15	(Reserved)		15	(Reserved)
14			14	
13			13	
12			12	
11	Remote Ready	Normal operation at 1 –for the initial setting: at the rising edge of the PLC flag "Initial Data Processing complete", – in operation if there is neither an "Error Status" nor an "Error reset request" nor an "Initial Data Setting Request". The **Inocontroller** module takes into account the data from PLC	11	Reserved
10	Error Status	Diagnostic events exist — This flag stays high until the PLC has acknowledged the event through the 'Error Reset Request'	10	Error Reset Request
9	Initial Data Setting Complete	The master PLC asks for an 'Initial Data Setting Request' Cleared at the falling edge of the PLC request	9	Initial Data Setting Request
8	**Initial Data Processing Request**	At startup, the **Inocontroller** module asks for an "Initial Data Processing Request". When it receives the response from the API, the module switches to the'Remote READY' state	8	**Initial Data Processing Complete**
7	(Reserved)		7	(Reserved)
6			6	
5			5	
4			4	
3			3	
2			2	
1			1	
0			0	

Before exchanging process data, the PLC must answer to the 'Initial Data Processing Request' by setting the 'Initial Data Processing Complete' to 1 in order the communication module of the **Inocontroller** switches in Remote READY state.
The **Inocontroller** module takes then into account the process data from the PLC.

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9.2.2. From PLC to the **Inocontroller** module
6 words are exchanged from PLC to the **Inocontroller** module.

Word	Label	Parameter description	Unit	Max.
0	PLC Command	Commands requested by the PLC (see the detailed description hereafter)	–	
1	PLC Current Setpoint	Current Setpoint requested by the PLC. This setpoint is applied only if the PLC_Control mode is active and the HV trigger is activated.	µA	110
2	PLC Voltage Setpoint	High Voltage Setpoint requested by the PLC. This setpoint is applied only if the PLC_Control mode is active and the HV trigger is activated.	kV	100
3	PLC injection Setpoint	Injection Setpoint requested by the PLC. This setpoint is applied only if the PLC_Control mode is active and the HV trigger is activated.	Points	100
4	PLC dilution Setpoint	Dilution Setpoint requested by the PLC. This setpoint is applied only if the PLC_Control mode is active and the HV trigger is activated.	Points	100
5	PLC blowing Setpoint	Blowing Setpoint requested by the PLC. This setpoint is applied only if the PLC_Control mode is active and the HV trigger is activated.	Points	30

Word 0	PLC Command	
15		
14		
13		
12		
11		
10		
9		
8		
7	On/OFF trigger	HV trigger start (set to 1)/ stop (set to 0) request. The request is only taken into account if the PLC control is enabled by the **Inocontroller** and if the HV pilot is requested. If a manual spray gun is connected, this request must be set to 1 to authorize control of the HV or acknowledgment of a fault by the spray gun trigger
6	Cleaning ON/OFF	Cleaning start (set to 1) / stop (set to 0) request. The request is only taken into account if the PLC control is enabled by the **Inocontroller** and if the cleaning pilot is requested
5	Fault acknowledgement	Request for acknowledgement of resetable faults. The request is only taken into account on rising edge if the PLC control is validated by the **Inocontroller** and if there is no longer a request for trigger operation or cleaning (by PLC or external)
4	Local setpoint prohibited	If a manual spray gun is connected, it is possible to prohibit the local injection set-point (set to 1) Otherwise the operator can modify the injection set-point by simultaneously pressing the trigger and activating the + or – keys.
3	Cleaning control request	The PLC asks to control the cleaning (active if set to 1), to 0 wired control. The request is only taken into account if the PLC control is enabled by the **Inocontroller**
2	HV control request	The PLC asks to control the HV (active if set to 1), to 0 wired control The request is only taken into account if the PLC control is enabled by the **Inocontroller** If a manual spray gun is connected, this request must be set to 1 to authorize control of the HV or acknowledgment of a fault by the spray gun trigger
1	Spare	
0	PLC control request	The PLC asks to control the **Inocontroller** (active if set to 1)

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9.2.3. From **Inocontroller** to PLC

7 words of feedback are exchanged from **Inocontroller** to PLC.

Word	Label	Parameter Description	Unit	Min.Max.
0	State	Status information (see description hereafter)	–	
1	Fault	Fault information (see description hereafter)	–	
2	HV output current		µA	110
3	HV output voltage		0,1*kV	1000
4	Injection flow		0,1*L/min	960
5	Dilution flow		0,1*L/min	610
6	Blowing flow		0,1*L/min	16

Word 0	State	State Informations
15	Init mode	Software in initialization step
14	Spare	
13	High voltage ON	High Voltage is effectively active
12	HV request OK	The HV request is taken into account by the **Inocontroller**
11	External cleaning	External cleaning is requested (1 on the input), it will be taken into account if the PLC has not requested cleaning control
10	External HV trigger	External HV trigger is requested (1 on the input), it will be taken into account if the PLC has not requested HV control
9	Cleaning request OK	The cleaning start request is taken into account by the **Inocontroller**
8	Cleaning in pogress	A cleaning is in progress (the air controls are at maximum, there is no controlled HV)
7	Manual spray gun	A manual spray gun is connected (if set to 1)
6	Fault with 24V cutoff	Resettable fault only after a 24V shutdown
5	Configured communication module	The communication module is configured
4	Fault	A fault is present
3	Wireless control – reserved	Control mode by wireless – reserved
2	CAN Control	Control mode by the CAN communication
1	USB Control – reserved	Control mode by the USB software – reserved
0	PLC Control	Control mode by the PLC (via the communication module)

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Word 1	Fault	Fault Informations
15	1 – Program fault	
14	2 – +24V power supply	
13	Spare	
12	17 – Absence of control mode fault	
11	Spare	
10	34 – Blowing fault	
9	33 – Dilution fault	
8	32 – Injection fault	
7	5 – Voltage coherence fault	see § 8.1 page 22
6	22 – Safe shutdown fault	
5	21– Bus power fault	
4	37 – Spray gun or projector connector fault	
3	28 – Temperature fault	
2	24 – Trigger request at startup	
1	29– HVU link fault	
0	30 – Internal BUS fault	

10. CAN Communication with PLC

10.1. Characteristics

In network mode, it is possible to communicate with the **Inocontroller** module in CAN (to be connected to connector B).

It is necessary to configure the address of the **Inocontroller** and the communication speed
The node address is set by microswitches S1 on the module.

For example, to set the node address to the value 23, microswitches 1, 2, 3 and 5
must be set to ON state and the others to OFF state.
The communication speed is defined by the first 4 microswitches of S2.

Speed in Kbits/s	S2	S2#1	S2#2	S2#3	S2#4
10	0	0	0	0	0
20	1	1	0	0	0
50	2	0	1	0	0
100	3	1	1	0	0
125	4	0	0	1	0
250	5	1	0	1	0
500	6	0	1	1	0
1000	7	1	1	1	0

It is a CAN2.0A version, standard format (11-bit identifier).
The CAN uses a linear bus terminated at each end by a 120 resistor ? (which is not integrated in the **Inocontroller** module).
The **Inocontroller** module must receive regularly, about every 100ms, an exchange otherwise a fault "17 – Absence of control mode fault" appears after 1s.

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10.2. Data exchange

10.2.1. From CAN to the **Inocontroller** module
8 bytes are exchanged from a CAN module to the **Inocontroller**

Byte	Label	Description	Unit	Max.
0	CAN Command	Commands requested by the CAN (see the detailed description hereafter)	–	
1	CAN Current Setpoint	Current set-point requested by the CAN. This set-point is applied only if the CAN_Control mode is active and the HV trigger is activated.	µA	110
2	CAN Voltage Setpoint	High voltage set-point requested by the CAN. This set-point is applied only if the CAN_Control mode is active and the HV trigger is activated.	kV	100
3	CAN Injection Setpoint	Injection set-point requested by the CAN. This set-point is applied only if the CAN_Control mode is active and the HV trigger is activated.	Point	100
4	CAN Dilution Setpoint	Dilution set-point requested by the CAN. This set-point is applied only if the CAN_Control mode is active and the HV trigger is activated.	Point	100
5	CAN Blowing Setpoint	Blowing set-point requested by the CAN. This set-point is applied only if the CAN_Control mode is active and the HV trigger is activated.	Point	30
6	Spare			
7	Spare			

Byte 0	CAN Command	
7	ON/OFF trigger	HV trigger start (set to 1)/ stop (set to 0) request. The request is only taken into account if the CAN control is enabled by the **Inocontroller** and if the HV pilot is requested. If a manual spray gun is connected, this request must be set to 1 to authorize control of the HV or acknowledgment of a fault by the spray gun trigger
6	Cleaning ON/OFF	Cleaning start (set to 1) / stop (set to 0) request. The request is only taken into account if the CAN control is enabled by the **Inocontroller** and if the cleaning pilot is requested
5	Fault acknowledgment	Request for acknowledgment of resetable faults The request is only taken into account on rising edge if the CAN control is validated by the **Inocontroller** and if there is no longer a request for trigger operation or cleaning (by the CAN or external)
4	Local set-point prohibited	If a manual spray gun is connected, it is possible to prohibit the local injection set-point (set to 1) Otherwise the operator can modify the injection set-point by simultaneously pressing the trigger and activating the + or – keys.
3	Cleaning control request	The CAN asks to control the cleaning (active if set to 1), to 0 wired control. The request is only taken into account if the CAN control is enabled by the **Inocontroller**
2	HV control request	The CAN asks to control the HV (active if set to 1), to 0 wired control The request is only taken into account if the CAN control is enabled by the **Inocontroller** If a manual spray gun is connected, this request must be set to 1 to authorize control of the HV or acknowledgment of a fault by the spray gun trigger
1		
0	CAN control request	The CAN asks to control the **Inocontroller** (active if set to 1)

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10.2.2. From **Inocontroller** to a CAN module
8 bytes of feedback are exchanged from **Inocontroller** to a CAN module

Byte	Label	Parameter Description	Unit	Max.
0	Status 1	Status information 1(see description hereafter)	–	–
1	Status 2	Status information 2 (see description hereafter)	–	–
2	Fault 1	Fault information 1 (see description hereafter)	–	–
3	Fault 2	Fault information 2 (see description hereafter)	–	–
4	HV ouput current		µA	110
5	HV ouput voltage		kV	100
6	Injection or Blowing	Bit 7 =0 Injection on 7bits in l/min Bit 7=1 soufflage on 7 bits in dl/min	L/min or dl/min	96 l/min and 16 dl/min
7	Dilution	Bit 7 =0 dilution on 7bits in L/min Bit 7 =1 Spare	L/min	61

Byte 0	Status 1	Status information 1
7	Init mode	Software in initialization step
6	Spare	
5	High voltage ON	High Voltage is effectively active
4	HV request OK	The HV request is taken into account by the **Inocontroller**
3	External cleaning	External cleaning is requested (1 on the input), it will be taken into account if the PLC has not requested cleaning control
2	External HV trigger	External HV trigger is requested (1 on the input), it will be taken into account if the PLC has not requested HV control
1	Cleaning request OK	The cleaning start request is taken into account by the **Inocontroller**
0	Cleaning in progress	A cleaning is in progress (the air controls are at maximum, there is no con-trolled HV)

Byte 1	Status 2	Status information 2
7	Manual spray gun	A manual spray gun is connected (if set to 1)
6	Fault with 24V cutoff	Resettable fault only after a 24V shutdown
5	Configured communication module	The communication module is configured
4	Fault	A fault is present
3	Wireless control – reserved	Control mode by wireless – reserved
2	CAN Control	Control mode by the CAN communication
1	USB Control – reserved	Control mode by the USB software – reserved
0	PLC Control	Control mode by the PLC (via the communication module)

Byte 2	Fault 1	Fault information 1
7	1– Program fault	
6	2– +24V power supply	
5	Spare	
4	17– Absence of control mode fault	
3	Spare	see § 8.1 page 22
2	34– Blowing fault	
1	33– Dilution fault	
0	32 – Injection fault	

Byte 3	Fault 2	Fault information 2
7	5– Voltage coherence fault	
6	22– Safe shutdown fault	
5	21–Bus power fault	
4	37 – Spray gun or projector connector fault	
3	28– Temperature fault	see § 8.1 page 22
2	24– Trigger request at startup	
1	29– HVU link fault	
0	30–Internal bus fault	

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11. Spare parts list

The spare parts are classified in 2 different types:

- **1st emergency parts**:

  The 1st emergency parts are strategic components which are not necessarily consumables but which in case of failure prohibit the operation of the equipment.

  Depending on the production line's commitment and the production rates imposed, the first emergency parts are not necessarily kept available in the customer's stock.

  Indeed, if an interruption of the production flow is possible, storage is not necessary.

  On the other hand, if the stop is not possible, the 1st emergency parts will be kept in stock.

- **Wearing parts**:

  Wearing parts are consumable components such as O-rings that undergo regular degradation over time during normal operation of the installation. It is therefore advisable to replace them according to a defined frequency and adapted to the operating time of the installation.

  The wearing parts must therefore be kept in the customer's stock.

To guarantee an optimal assembly, spare parts must be stored in a temperature close to their temperature of use. Should the opposite occur, a sufficient waiting time must be observed before the installation, so that all the elements are assembled in the same temperature.

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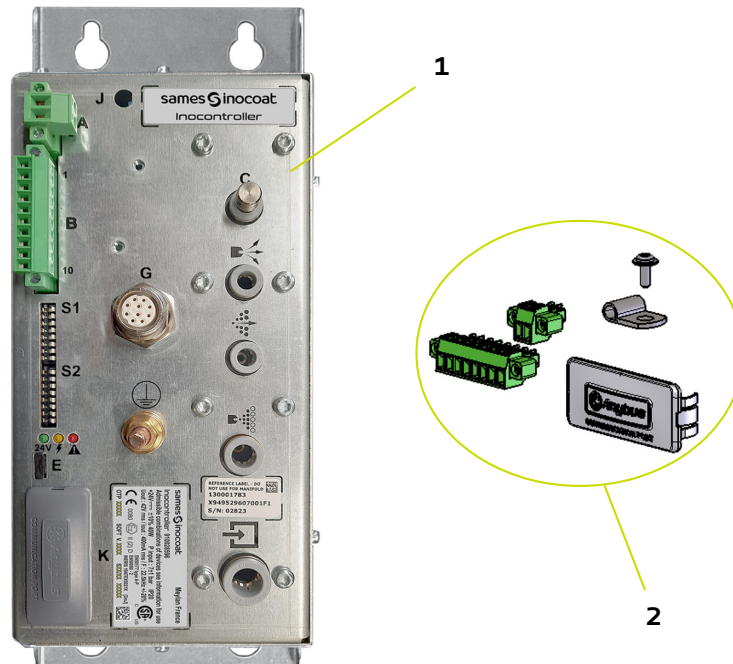
Item	Part Number	Description	Qty	Unit of sale	Level Spare parts (*)
1	**910028596**	**Inocontroller control module (Connection kit included)**	**1**	**1**	**–**
2	110002820	Connection kit for **Inocontroller** including	1	1	–
		2 pt connector (5.08 mm pitch)			
		10 pt connector			
		Screw			
		Shielding collar			
		Micro USB Dust Cap			
		Network module plastic cover			
		Other associated modules (not shown)			
	110002470	Ethernet IP communication module	1	1	–
	110002391	Profinet communication module	1	1	–
	110002472	CC-link communication module	1	1	–
	110002473	Profibus communication module	1	1	–
	110002640	Ethercat communication module	1	1	–

(*)
Level 1: 1st emergency parts
Level 2: Wearing parts

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12. Revision index History

Created by:		Checked by: H. Brochier–Cendre		Approuved by: S. Court	
Date	**By:**	**Index**	**Purpose of the modification and location**		
2020/03	S. Court	A	First Issue		
2020/09	S. Court	B	Addition of CSA marking + applicable standards, Addition of general characteristics and modification of CAN communication	§ 1. 3 § 10	
2022/12	O.Aubin	C	UKCA and QPS Marking Transfer of CSA certification to QPS Change of identity and logo Update of the graphic charter Added Inhibition of air flow monitoring Update of the fault management	§ 4.6 § 8.1	