

CONTAMINATION MONITORING PRODUCTS

**INSTALLATION,
SERVICE AND
MAINTENANCE MANUAL**

ICU
INLINE
CONTAMINATION
MONITOR



EN

PASSION TO PERFORM



PRODUCT OVERVIEW

ICU - Inline Contamination Monitoring Unit

The ICU automatically measures particulate contamination levels in various hydraulic fluids and is designed for industrial applications.

It is designed to be manifold mounted directly to systems, where ongoing measurement or analysis is required, and where space and costs are limited.

Features & Benefits

- Manifold mounting
- 3 channel contamination measurement
- Measures ISO 4406
- Robust design and construction
- Pressure max. 350 bar
- Environmental protection IP65/67 versatile
- 4-20mA analogue output





DECLARATION OF CONFORMITY

Declaration of Conformity

The products included in this Declaration are all variants of the following:

- Compatible with mineral oil / synthetic fluids.

For part codes see the Designation & Ordering Code (section 4.8)

Product Manufacturer:

MP Filtri UK Ltd
Keep House
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WR11 1LB
01386 258500
sales-uk@mpfiltri.com

The products described are in conformity with the following directives:

2014/30/EU Electromagnetic Conformity

Certification Testing that has been carried out is in accordance with:

- DEF STAN 00-35 Part 3 issue 4 Environmental Test Methods
- BS EN 60068 range of standards covering environmental conditions
- BS EN 60529: 1992 + A2:2013 Degrees of Protection provided by enclosures (IP Code)
- BS EN 62262:2002 Degrees of Protection Provided for Electrical Equipment against External Mechanical Impacts (IK Code)
- BS EN 60721-3-4: 1995 Part 3: Classification of Groups of Environmental Parameters and their severities, Section 3.4

Date: September 2024

Signed:

Kris Perks (Engineering Director) on behalf of MP Filtri UK Ltd





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1. General warnings and information for the operator

1.1 General safety warnings

Do not operate, maintain or carry out any procedure before reading this manual. Any individual operating the unit shall wear the following Personal Protective Equipment:

- Protective eyewear
- Safety shoes
- Gloves
- Overalls (or other suitable protective clothing)

Before carrying out any machine installation procedures and/or before use, one should scrupulously follow the instructions listed in this manual. Moreover, it is necessary to comply with the current regulations related to occupational accident prevention and safety in the workplace.

Notices aimed at the prevention of health hazards for personnel operating the machine are highlighted in this document with signs having the following meaning:

It relates to important information concerning the product, its use or part of this documentation to which special attention must be paid



NOTE

It means that failure to comply with the relevant safety regulations may result in mild injury or property damage.



CAUTION

It means that failure to comply with the relevant safety regulations may result in death, serious injury or serious property damage.



DANGER

Failure to comply with the relevant safety regulations may result in death, serious injury or serious property damage.

GENERAL WARNINGS

To allow rapid identification of the employees who must read this manual, definitions have been used with the following meaning:

OPERATOR	This is any individual whose task is to use the machine for production purposes. The operator is aware of all the measures taken by the machine manufacturer in order to eliminate any source of injury risk in the workplace and takes into account the operational constraints.
PERSONNEL INVOLVED IN SLINGING AND HOISTING OPERATIONS	This is any individual whose task is to handle the machine or parts of it. Personnel involved in slinging and hoisting operations are aware of the issues regarding the safe transfer of machinery or parts of it and, therefore, uses appropriate lifting equipment, following the instructions provided by the product manufacturer.
MACHINE SETTER	This is any individual whose task is to set up the machine for its operation. The machine setter is aware of the measures taken to eliminate all sources of injury risks in the workplace and takes into account the operational constraints. The machine setter takes all the appropriate precautions in order to operate in utmost safety conditions.
MAINTENANCE TECHNICIAN	This is any individual whose task is to carry out maintenance activities on the machine. The maintenance technician is aware of the possible danger situations that may arise and takes the appropriate precautions in order to eliminate the risks of accidents in the workplace.
ELECTRICIAN	This is any individual whose task is to carry out maintenance activities on the electrical wiring of the machine. The electrician is aware of the possible danger situations that may arise and takes the appropriate precautions in order to eliminate the risks of accidents in the workplace.

The unit shall be taken out of service and/or dismantled in accordance with the current regulations in force in the country where the machinery is installed



1.2 Dangers and hazards that cannot be eliminated

- Risk of hydraulic injection injury
- Burn risk because of high temperatures
- Accidental oil leaks with consequent risk of slipping
- Hose breakage and resulting lubricant loss
- With oil temperatures exceeding 40/45 °C (100/115 °F), it is vital to be extremely careful when handling the unit. Avoid direct contact with hot oil.

AFTER USE - ALL EQUIPMENT SHOULD BE ALLOWED TO COOL PRIOR TO HANDLING

1.3 Personal protective equipment

When operating the unit, personnel must be wearing safety shoes, gloves and goggles/safety glasses. In general, the PPEs to be used according to the activities on the machinery are listed in the following table:

ACTIVITY	PPE
Ordinary operation	Shoes, gloves, goggles, overall
Planned maintenance	Shoes, gloves, goggles, overall



2. Transportation and Storage

2.1 Transportation and handling conditions

The unit is shipped in a cardboard box with appropriate protective packaging and these should be recycled accordingly where possible. The packed weight of the ICU and accessories is 1.5 kg (3.3 lbs)

2.2 Storage

The unit should be stored in a suitable location away from the production area when not in use. The unit should be stored with the caps provided on the ports. This location should not impede any other production or personnel.

WARRANTY

3. Warranty, Limitations and Disclaimers

MP Filtri warrants that the products that it manufactures and sells will be free from defects in material, workmanship & performance for a period of 12 months from the date of shipment.

Hardware/Firmware

Should the hardware prove defective during the warranty period, MP Filtri, at its discretion, will either repair the defective product or replace it with an equivalent product in exchange for the defective unit without charge for parts, labour, carriage and insurance.

Software

MP Filtri warrants that software will operate substantially in accordance with its functional specification for 12 months from date of shipment provided that the integrity of the operating environment has not been compromised through misuse, inappropriate handling, abnormal operating conditions, neglect or damage (unintentional or otherwise) or the introduction of third party product (software or hardware) that in any way conflicts with the MP Filtri product.

Eligibility

This warranty extends to the original purchaser only or to the end-user client of a MP Filtri authorised affiliate.

How to obtain service?

To obtain service under the terms of this warranty, the customer is required to notify MP Filtri before the expiration of the warranty period and to return the item in accordance with MP Filtri product return policy. Any product returned for warranty repair must be accompanied by a full fault report specifying the symptoms and the conditions under which the fault occurs. Should MP Filtri incur additional cost as a result of a failure to complete the appropriate paperwork, an administrative charge may be levied.

Exclusions

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate care. MP Filtri shall not be obligated to provide service under this warranty if:

- a) Damage has been caused by a failure to make a full and proper inspection of the product (as described by the documentation enclosed with the product at the time of shipment) on initial receipt of the product following shipment;
- b) Damage has been caused by the attempts of individuals, other than MP Filtri staff to repair or service the product;
- c) Damage has been caused by the improper use or a connection with incompatible equipment or product including software applications.

Charges

Under cover of this warranty, MP Filtri will pay the carriage and insurance charges for the shipment of defective product back to site of manufacture and for its return to the client's original site of despatch except when:

- a) MP Filtri product return policy has not been followed.
- b) Product failure is caused by any of the exclusions described above, when the customer will be liable for the full cost of the repair (parts and labour) plus all carriage and insurance costs to and from MP Filtri premises.
- c) The product is damaged in transit and a contributory cause is inadequate packaging. It is the customer's responsibility to ensure that the packaging used to return equipment to MP Filtri is the same, or has equivalent protective qualities, to that used to ship the product to the customer in the first instance. Any damage resulting from the use of inadequate packaging will nullify MP Filtri

obligations under this warranty. Should the customer's product be damaged in transit following a repair at MP Filtri site, a full photographic record of the damage must be obtained (packaging and the product) to support any claim for recompense. Failure to present this evidence may limit MP Filtri obligations under this warranty.

THIS WARRANTY IS GIVEN BY MP FILTRI IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY, NON INFRINGEMENT OR FITNESS FOR A PARTICULAR PURPOSE. MP FILTRI LTD SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES (INCLUDING LOSS OF DATA), WE SPECIFICALLY DISCLAIM ANY AND ALL WARRANTIES TO CUSTOMERS OF THE CUSTOMER. THE CUSTOMER'S SOLE REMEDY FOR ANY BREACH OF WARRANTY IS THE REPAIR OR REPLACEMENT, AT MP FILTRI DISCRETION, OF THE FAILED PRODUCT.

MP Filtri Ltd maintains a policy of product improvement and reserves the right to modify the specifications without prior notice.

3.1 Warranty on Recalibration

The ICU is guaranteed for 12 months upon receipt of the product, subject to it being used for the purpose intended and operated in accordance with this User Guide.

MP Filtri will only verify the accuracy of the ICU if the unit is recalibrated every 12 months.

MP Filtri will not be held responsible for any items returned as such.

Ensure that the ICU is packed appropriately for transportation.

PRODUCT DOCUMENTATION

3.2 Download Area

Please scan the QR codes below to get updated electronic version of the related document.

CONTAMINATION MONITORING PRODUCTS General catalogue




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CMP View Software Quick Guide




Select your language and download PDF

Scan or click me!

CMP View Software Software multilingual

Download Software



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4. Technical Specification

4.1 Performance

Technology	LED-based Light Extinction Automatic Optical Contamination Sensor
Particle Sizing	>4, 6, 14 µm
Analysis range	ISO 4406
Calibration	Each unit individually calibrated with ISO Medium Test Dust (MTD) based on ISO 11171, on equipment certified by I.F.T.S. ISO 11943
Accuracy	±1/2 ISO code for 4, 6, 14 µm

4.2 Electrical interface

Supply Voltage	24v DC +/- 20%
Supply Current	2.65A
Power Consumption	<2.2W
Test Time	180 seconds as standard
Communication Options	4-20mA

Please note Comms protocols are covered in Section 5.

TECHNICAL SPECIFICATION

4.3 Physical attributes

Dimensions	93 mm / 3.6 inches (W) x 50 mm/ 1.9 inches (D) x 80 mm / 3.1 inches (H)
Hydraulic connection	Manifold Mounting
Net weight	1.4 kg (3lbs)
IP Rating	IP67; Impact Protection IK04

4.4 Fluid characteristics

Fluid compatibility	M version - mineral oils, synthetic fluids and diesel
Viscosity	≤ 1000 cSt
Fluid temperature	From +25°C (+77°F) to +80°C (+176°C)
Operating flow rate	200 ml/minute controlled by the Flow Control Valve
Minimum pressure	0.5 bar (7 PSI)
Maximum pressure	350 bar (5076 PSI)

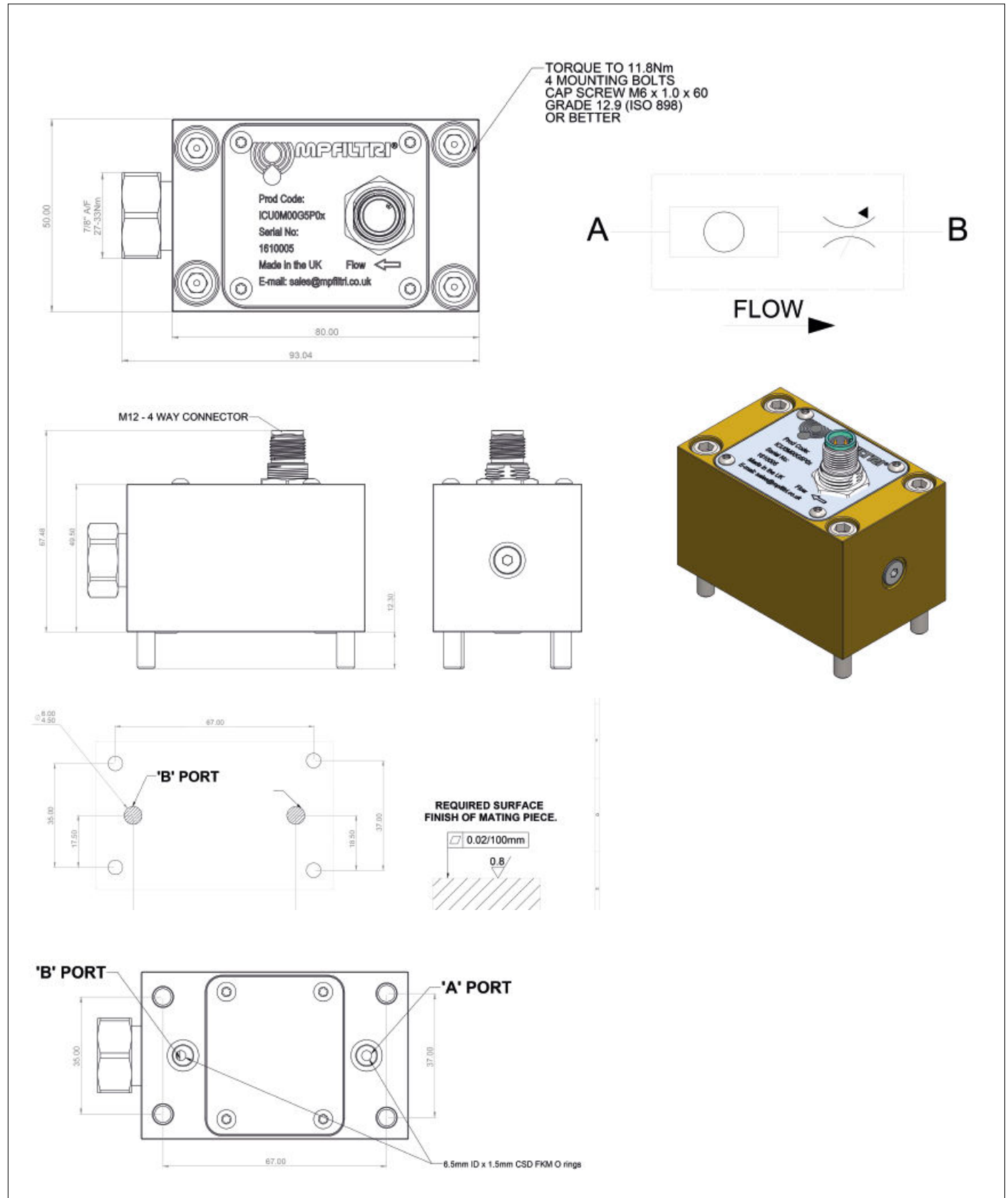
4.5 Environment

Ambient working temperature	From 0°C (+32°F) to +60°C (140°F)
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4.6 Wetted Parts

M version	M - C46400 Cu alloy, 316 stainless steel, PTFE, FR4, Sapphire, FPM
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4.7 Dimensions



TECHNICAL SPECIFICATION

4.8 Designation & Ordering code

ICU AUTOMATIC CONTAMINATION MONITORING UNIT							
Contamination Monitoring Product		Configuration example:					
ICU Inline Contamination Monitoring Unit			ICU	0	M	0	0
Sensor options							
0 Standard							
Fluid compatibility							
M Mineral oil and synthetic fluids							
Communication protocol							
0 4-20mA							
Electric connection							
0 M12 4pin							
Port Options							
G5 Bespoke port design							
Design Ref							
P04 ICU Mk2 version							

5. Product Installation and General Operation

5.1 Installation

Each ICU supplied consists of the following:

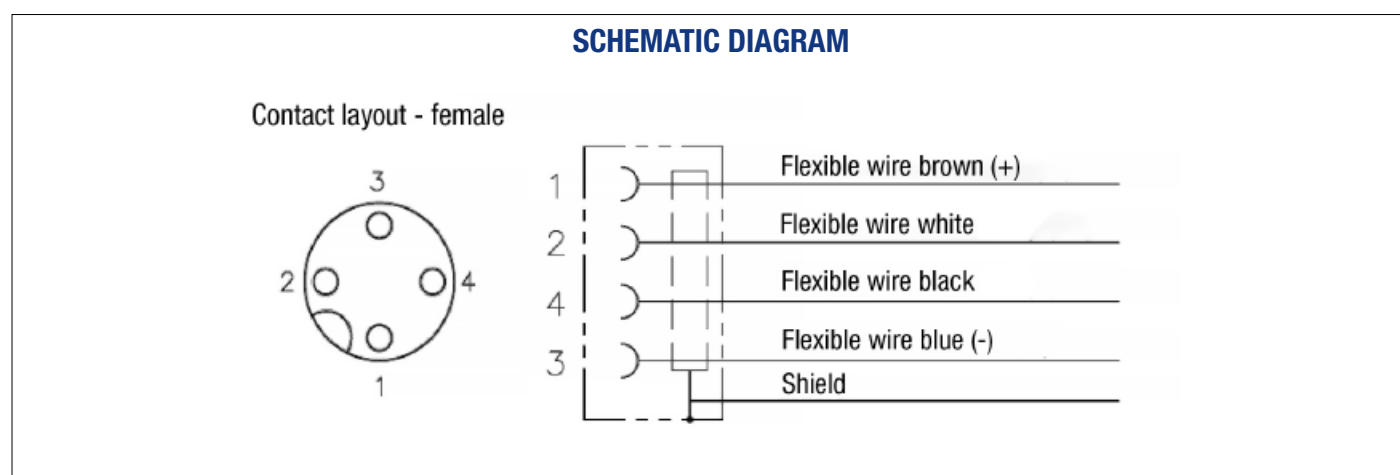
- 1 x ICU0M00G5P04

1 x Installation kit, containing:

- 4 x M6x1.0x60mm long fixing bolts
- 2 x 6.50 ID x 1.5 CSD FKM O-ring seals
- 2 x Hard copy of calibration certificate
- 1 x Datastick with installation guide and user manual

5.2 Industrial Version: 4-20mA installation

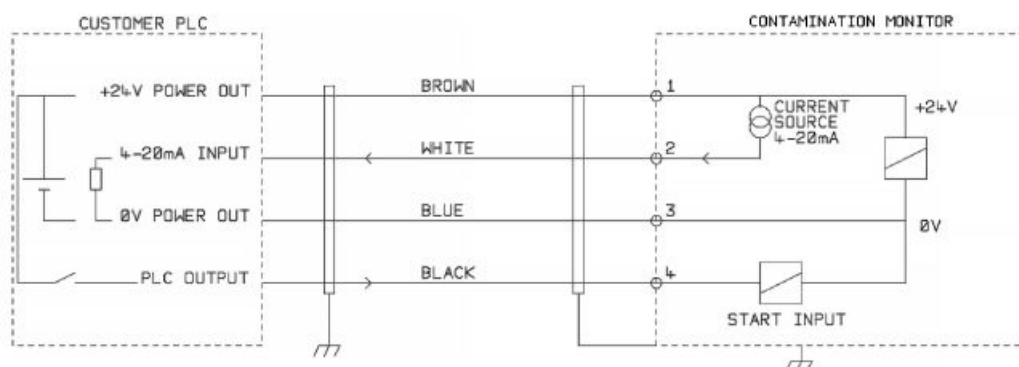
Connectors are 4pin M12, “A-Coded”. The connector on the device has the male pins. The diagram below is a view from end of the cable plug not the ICS socket.



The 0V is connected internally to the case as well as the shield.

Signal	Pin	Colour	Comment
+24V	1	Brown	DC POWER
4-20mA	2	White	CURRENT SOURCE
0V	3	Blue	0V is internally connected to the metal block by design
START+	4	Black	Connect to +24 during test time

PRODUCT INSTALLATION



The cable + connector needs to be a shielded 4way, A-coded, female pin type. An example could be TE 2273099-1. Alternatively a rewirable type can be used.

5.3 Customer PLC Program Example

The customer PLC communicates with the unit by energizing a switched START signal and reading the results result from a 4-20mA current signal

- The START signal duration controls the test period
- The 4-20mA signal is time-multiplexed, that is, the parameters are output in a timed sequence

We report the 4, 6 and 14µm ISO codes. We also include a function to report the status of the unit (OK, ERROR, TESTING etc) but decoding this is optional. An example test sequence is shown below, the highlighted sections may not be required for the application.

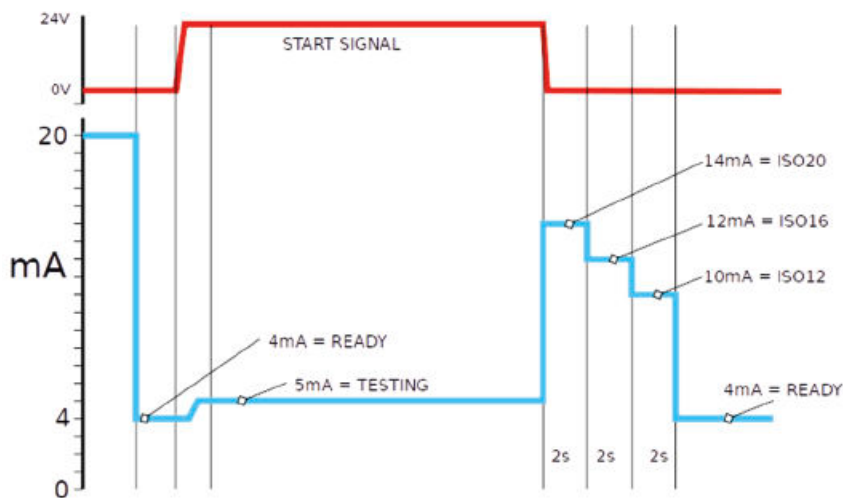
5.3.1 Sequence

If pump not running

- Turn on pump
- Wait until flow is stable and piping flushed, perhaps 60 seconds

If ICS not powered

- Turn on ICU power
- Wait >3 seconds
- Option: read status signal
- Turn on START signal
- Wait 300 seconds for testing (example)
- Option: check status
- Turn off START signal
- Wait 1 second
- Read 4-20mA signal. $ISO4 = (mA \times 2) - 8$
- Wait 2 seconds
- Read 4-20mA signal. $ISO6 = (mA \times 2) - 8$
- Wait 2 seconds
- Read 4-20mA signal. $ISO14 = (mA \times 2) - 8$
- Option: check status
- Wait 2 seconds
- Read status



PRODUCT INSTALLATION

Optional

- The customer program can also read and decode the STATUS signal
- The flow can be continuous
- The power can be continuous

5.3.2 Detailed Sequence

Duration (seconds)	Device Action	START Signal	4-20 mA	PLC Responsibility
	Power off	OFF		Start pumps, flow etc.
	Power on	OFF		Apply power
<3	(ICS starts up, self tests)	OFF		
	Output status value	OFF	STATUS	Optional: Check status
>10 s if required perhaps 60 seconds		OFF	STATUS	If flow is not continuous, ensure machine operation is stable, and there has been time for old fluid to be flushed from the system
	Start testing	ON	TESTING	Turn on START signal Start test timer
Customer defined, perhaps 300 seconds	Count particles	ON	TESTING	Test timer running
< 0.1s	Calculate result codes	OFF		Test timer finished Turn off START signal Start 1.0 second timer
2.0 s	Output 4 µm result	OFF	ISO (4um)	Timer finished: Read 4 µm result Start 2.0 second timer
2.0 s	Output 6 µm result	OFF	ISO (6um)	Timer finished: Read 6 µm result Start 2.0 second timer
2.0 s	Output 14 µm result	OFF	ISO (14um)	Timer finished: Read 14 µm result Start 2.0 second timer
	Output status	OFF	STATUS	
				Start another test or wait or power off etc

5.3.3 ISO Coding

$$\text{ISO CODE} = 2 \times (\text{mA} - 4) = (2 \times \text{mA}) - 8$$

$$(\text{reverse: mA} = 4.0 + \text{ISO}/2)$$

CODE	Nominal Current (mA) +/- 0.2mA
0	4.0
1	4.5
2	5.0
3	5.5
4	6.0
5	6.5
6	7.0
7	7.5
8	8.0
9	8.5
10	9.0
11	9.5
12	10.0
13	10.5
14	11.0
15	11.5
16	12.0
17	12.5
18	13.0
19	13.5
20	14.0
Saturation	17.0
No value	18.0
Reserved	19.0
Reserved	20.0

Note: any value above 14.0 up to but not including the 17.0

PRODUCT INSTALLATION

5.3.4 Status Values

- It is optional to read these
- These functions may be changed or removed before final project release

STATUS	Nominal Current (mA) +/- 0.2mA	When Output
OK – Ready	4	After power-up or after test
Testing	5	During test
Fault: LED fail or blocked	6	After power up or during test or after test
Not ready	20	During power-up and self- test
	11-19	Reserved for future use

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