

ARC1 – Arc Detector 2.0



P/N: A1-2-SC-00

P/N: A1-2-DC-00

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Contents

1	Preamble	4
1.1	Intended use and operation	4
1.2	Warranty and liability disclaimer	5
1.3	Basic safety notes	5
2	Product Introduction	6
3	Interface Description	7
4	Status Display	8
5	Control Buttons.....	8
6	Control Signals Interface	9
7	Optical Interfaces	9
8	Electrical Interfaces	10
9	Device Configuration	11
10	Installation and Initial Start	12
11	Safety Notes	13
12	Conformity	14
13	Contact Address	15

1 Preamble

1.1 Intended use and operation

This manual addresses user personnel, who is in charge of the duties for installation, operation, maintenance and operational staff, which is responsible for the system operation. The operating company has the obligation to:

- Supply and access this manual to user personnel and operational staff at any time.
- Train personnel, concerning the use of AFT products including safety notes.

A precondition for the intended operation is the understanding of the manual and the recommended maintenance notes. Non-compliance can cause damages to the product as well as danger to personnel and equipment installations. Safety items should not be disabled, or modified, or used contrary to their intended operation.

The customer is responsible for operating the product in its intended manner! The product is intended to be operated in an industrial, scientific research laboratory or production company and should not be used in a way which can cause damage to personnel or installations.

The customer assumes responsibility for use of the product outside its intended operation or in disregarding the instructions of the manufacturer.

The manufacturer will assume no responsibility for misuse of the product. The intended operation is obtained when the product is operated according to this manual, the technical specifications and any additional supplied document. The use of the product requires special knowledge. The customer is responsible to ensure that only operational staff and well trained personnel with appropriate capabilities are using this product.

1.2 Warranty and liability disclaimer

The contractually agreed warranty expires immediately if the product is changed, operated incorrectly not according to the intended operation or intentionally or negligently damaged. The warranty does not apply to natural wear and tear.

Warranty or liability claims concerning personal injuries or installation damages are forfeit if one or more of the following causes are involved:

- Improper mounting, setting up, use or maintenance of the product.
- Use of the product with non-operational, improper or defective protection and safety equipment.
- Disregard of the notes in this manual concerning transportation, mounting, setting up, use and maintenance of the product.
- Non-approved modifications of the intended installation of the product.
- Mechanical damage from foreign objects or force majeure.
- Non-intended operation of the product.

1.3 Basic safety notes

- Installation and connecting the product have to be done by qualified electrical user personnel, only.
- The use of the product requires special knowledge and a high degree of concentration during use.. Otherwise, a high degree of risk to personnel and installation exists. The customer should assign appropriate qualified personnel for the use of the product.
- Check prior to setting up of the product that all protective measures are installed in a proper way and are working. Use the product only, if all safety and security measures are fully operational.
- Never remove a safety installation or other parts of the product while it is in use. Misuse can cause personnel injury and installation damage from electrical shock, or mechanical force.

2 Product Introduction

The **ARC1 2.0** arc detector is a compact electrical device for very fast and highly sensitive light and arc detection, using wide-spectrum photo diodes. It is designed to effectively protect high-power RF equipment from damage due to unwanted electrical breakdown, corona discharge and arcing. The single (dual) channel version of ARC1 2.0 provides one (two) optical arc detector input ports (FSMA), CH1 (and CH2). Arcs are signaled in three ways: (1) visually indicated by bi-colored LEDs at the front panel, (2) via a digital electrical output signal (TTL or Open Collector, OC), and (3) via an optical output signal. A global arc output signal (GLBARC) offers a system interlock signal by applying a logical OR combination of both arc channels. Function keypads at the front panel as well as a D-SUB 15 remote control interface allow testing, resetting and customizing the device. The testing of the device is offered in two ways: (1) an internal self-test and (2) an optical test signal for external use. Analog outputs allow access to the photo voltages of the detectors for monitoring and analysis purpose.

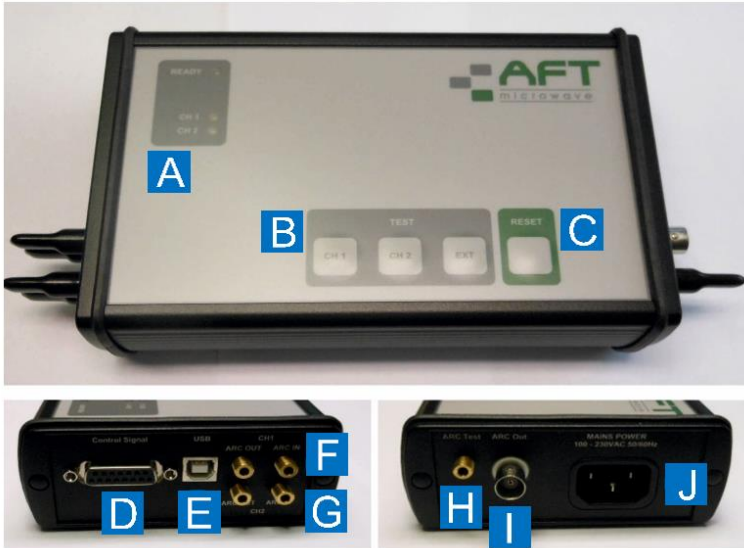
As an option to be ordered separately, the *ARC1 – USB Interface Access 2.0* sets up a serial terminal connection via USB and enables the adjustment of light sensitivity (threshold voltage) and auto-reset time. It also allows coincidental arc detection by using an AND logic in the dual-channel operation mode. See separate manual for details on configuration.

For full technical specification see data sheets A1-2-SC-00 and A1-2-DC-00.

Scope of Supply:



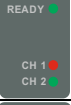

- ARC1 2.0 detector box
- Mounting brackets with 2 mounting holes $\varnothing = 4.4\text{mm}$
- IEC power cable 2m
- D-SUB 15 male connector kit

3 Interface Description

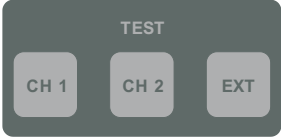



Element	Interface	Description
A	Status display	LED status indicators red (Arc) / green (OK)
B	TEST	<i>CH1</i> , <i>CH2</i> and <i>EXT</i> test buttons
C	RESET	Reset button
D	Control Signals	Control and output signals, D-SUB 15
E	USB	USB COM port (optional use)
F	CH1 ARC IN/OUT	Channel 1 optical input/output, FSMA
G	CH2 ARC IN/OUT	Channel 2 optical input/output, FSMA (option)
H	ARC Test	Optical test signal output, FSMA
I	ARC Out	Electrical arc output signal, BNC
J	Mains	Mains power connector, IEC-600320-C14

4 Status Display

LED-Status	Description
	<p>Ready LED flashes red</p> <p>During switch-on time: Initialization procedure (~10s). During operation: In case of device failure (power fail or data error).</p>
	<p>Ready LED, CH1 LED and CH2 LED flashes green</p> <p>Ok status, no errors exist. Device is ready for arc detection, no arcs are detected.</p>
	<p>CH1 LED flashes red</p> <p>Light is detected at CH1 ARC IN (CH1 is triggered). CH1 electrical & optical outputs are set until reset.</p>
	<p>CH2 LED flashes red</p> <p>Light is detected at CH2 ARC IN (CH2 is triggered). CH2 electrical & optical output are set until reset.</p>

5 Control Buttons

BUTTON	Description
	<p>TEST CH1: Manual trigger for the internal optical self-test function of arc channel CH1.</p> <p>TEST CH2: Manual trigger for the internal optical self-test function of arc channel CH2.</p> <p>TEST EXT: Manual trigger for the external optical test function. Light is sent to the optical ARC Test output by a high-power LED at 600nm, 100 μs pulse length.</p>
	<p>RESET: Manual reset of all arc output signals.</p> <p>To activate the autoreset option refer to section 9. The default auto reset time is set to 1000ms.</p>

6 Control Signals Interface

Pin	Signal Description	Signal Level
1	CH1 arc output signal	Open Collector (OC)
2#	CH2 arc output signal	Open Collector (OC), for dual CH only
3	Power/system failure	Open Collector (OC)
4	CH1 arc output signal	TTL
5#	CH2 arc output signal	TTL, for dual CH only
6#	GLBARC	TTL or OC, same as ARC Out, for dual CH only
7	CH1 photo diode	mV output, 4V max. (saturation)
8#	CH2 photo diode	mV output, 4V max. (saturation), for dual CH only
9	+5V supply voltage	+5 V output, 100 mA max.
10	Test CH1, remote input	5 V, 10 mA, 0.5 s
11#	Test CH2, remote input	5 V, 10 mA, 0.5 s, for dual CH only
12	Test EXT, remote input	5 V, 10 mA, 0.5 s
13	Reset, remote input	5 V, 10 mA, 0.5 s
14	GND remote*	ground for remote inputs Pin 10..13*, galvan.
15	GND	internal device ground

#Pin 2, 5, 6, 8, 11 used for dual channel version only

7 Optical Interfaces

Interface	Description	Type
CH1	Channel 1	
ARC IN	CH1 optical input	FSMA
ARC OUT	Channel 1 optical output, driven by an IR LED at 880nm. ARC OUT emits light, when there is no light/arc detected by ARC IN. In case of an arc, the ARC OUT LED is switched off.	FSMA
CH2	Channel 2	
ARC IN	CH2 optical input	FSMA
ARC OUT	Channel 2 optical output, driven by an IR LED at 880nm. ARC OUT emits light, when there is no light/arc detected by ARC IN. In case of an arc, the ARC OUT LED is switched off.	FSMA
ARC Test	Optical test signal, high-power LED at 600nm, 100 μs pulse length	FSMA

8 Electrical Interfaces

Interface	Description	Type
ARC Out	A digital arc output signal that is configurable to OC (default) or TTL with normal or inverted (default) polarity. See notes below. For the dual channel version <i>ARC Out</i> is considered as the global arc signal <i>GLBARC</i> , with GLBARC := (CH1) OR (CH2) .	BNC female
USB	A COM interface used in connection with the optional ARC1 – USB Interface Access	USB 2.0 B
Mains	ARC1 is designed for mains power supplies 100-240VAC, 50/60Hz universal. There is an internal fuse 1A, time delay.	IEC-60320-C14

Polarity settings for electrical arc output signals:

Normal: **TTL** signal is low (0V) for no arc, and it high (5V) in case an arc is detected.
OC stage is non-conducting (hi-Ohm) for no arc, and it is conducting (0 Ohm) for an arc.

Inverted (default): **TTL** signal is high (5V) for no arc, and it goes low (0V) in case an arc is detected.
OC stage is conducting (0 Ohm) for no arc, and is non-conducting (hi-Ohm) for an arc.

9 Device Configuration

Menu	Button	LED-Display	Description
„ON“			<p>Enter the configuration menu:</p> <p>Keep RESET button pressed for > 5 s until all LEDs are red. After releasing it, the colors of the blinking LEDs indicate the stored configuration, see next page.</p>
„OFF“			<p>Exit the configuration menu:</p> <p>Press RESET button once. All changes are stored.</p> <p><u>Note:</u> The configuration menu will exit automatically, 20 sec after the last key action.</p>

How to Change the Configuration				
	Button	Configuration of		
	CH1	Arc-Signal OC/ TTL for ARC Out & GLBARC		
	CH2	Polarity normal/ inverted		
	EXT	Autoreset ON/ OFF		
How to Read the Stored Configuration				
<p>Autoreset OFF ON</p> <p>Arc-Signal CH 1 OC TTL</p> <p>Polarity CH 2 NORMAL INVERTED</p>	Function	Signal	Green	Red
	Autoreset	READY	OFF	ON
	Arc-Signal	CH1	OC	TTL
	Polarity	CH2	normal	inverted
Default settings are highlighted with colors.				

10 Installation and Initial Start

- Move the device into its mounting position. It can be fixed to a support structure by using the applied mounting brackets (with 2x hole 4.4mm) clamped to the housing.
- All optical FSMA ports *ARC IN*, *ARC OUT*, and *ARC Test* are covered with lightproof black protection caps. Remove a protection cap prior to connect a fiber optic cable. All unused ports must remain covered by a cap to ensure correct operation of the device.
- Connect AFT fiber optic cables to the optical ports *ARC IN*, and *ARC OUT* if used.
- Use the electrical *ARC Out* (BNC) or the *Control Signals* (D-Sub 15) port to access the digital arc output signals (TTL or OC) for interlocking your high-power RF-source. The interlock signal shall be hard-wired to the RF source or system control unit.
- Connect the *Control Signals* (D-Sub 15) port to allow remote control and to access all output signals including photo-detector voltages. See data sheet for pin assignment.
- Connect a fiber optic cable to port *ARC Test* (FSMA) for making use of the external optical test function.
- Switch-on the device by connecting the supplied AC mains cable or a cable adapted to your electrical socket. After an initialization procedure the device is **ready for operation**, indicated by **green** light LEDs for **READY**, **CH1** and **CH2**.
- Prior to operation read the safety notes in the following section.

11 Safety Notes



Please read the following safety notes prior to operate the device.

- The arc detector does not avoid arcing, but it effectively helps to limit the energy of arcs by sensitive light detection and by providing an output signal(s) within a few microseconds. The customer has to hard-wire the digital arc output(s) to the interlock of the RF source while providing a response time of about 10 μ s. Under these conditions permanent damage to costly RF equipment can be effectively limited or even avoided.
- Always operate in correct READY mode for arc detection indicated by all LEDs in green. Otherwise the device is not ready for triggering and does not allow safe system operation.
- Use AFT low-loss fiber optic cables only. The quality of the cables as well as the positioning of the arc viewport at the RF waveguide significantly affect the sensitivity of arc detection.
- ARC1 can only deploy its full capability of fast arc detection, if the arc viewport (observation point) is spot most close to a critical location. Even though in many cases the high light sensitivity allows the coverage of more than just a single spot, we always recommend to provide a separate arc viewport for each critical area. This may include more than one viewport per microwave component.
- Never disconnect the fiber optic cable while the high-power RF source is in operation.
- Regularly check the technical functionality and safety of the product by checking ready status, all cables and connectors.
- In the event of obvious malfunction or visual damage discontinue use of the product and secure it against unwanted operation by a third party. Disconnect the AC power supply.
- In case of damage to the arc detector, please do not attempt to do an on-site repair. Please contact AFT for service and repair options.
- AFT does not accept responsibility for any damage to RF equipment even if the arc detector is operated properly.

12 Conformity

We confirm that the products

A1-2-SC-00 ARC1 – Single Channel Arc Detector 2.0 and
A1-2-DC-00 ARC1 – Dual Channel Arc Detector 2.0

fulfills the following requirements and directives of the EC:

2014/35/EU	Low Voltage
2014/30/EU	EMC
2011/65/EU and (EU) 2015/863	RoHS

The following harmonized standards have been applied:

EN 61010-Part 1	Safety requirements
EN 61326-Parts	EMC

CE declarations of conformity are available as a separate documents

13 Contact Address

For open questions on the understanding and use of the product, for trouble shooting assistance, and repair service options please contact our factory. Please always ask for a return material authorization (RMA) prior to start a return shipment.

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