

The manufacturer  
may use the mark:



**Reports:**

MSA 12-02-040 R001 V1R1  
IEC 61508 Assessment  
Ultima XA, XE, XIR

MSA 08-03-14 R005 V1R1  
SafetyCase Review Ultima  
XA, XE, XIR

MSA 04-11-09 R001 V2 R2  
FMEDA Ultima XE

MSA 04-11-09 R003 V2 R2  
FMEDA Ultima XIR

MSA 04-11-09 R004 V2 R2  
FMEDA Ultima XA

**Validity:**

This assessment is valid for  
the Ultima XA, Ultima XE,  
Ultima XIR Gas Monitors

This assessment is valid until  
May 01, 2015.

Revision 1.1 February 25, 2015



# Certificate / Certificat Zertifikat / 合格証

MSA 1202040 C001

*exida* hereby confirms that the:

## Ultima XA, Ultima XE, and Ultima XIR Gas Monitors

**Mine Safety Appliances  
Pittsburgh, PA  
USA**

Has been assessed per the relevant requirements of:

**IEC 61508 Parts 1, 2, 3**

and meets requirements providing a level of integrity to:

**Systematic Integrity: SIL 2 Capable**

**Oxygen, Catalytic Combustible, IR Gas Applications  
Random Integrity: SIL 2 @ HFT=0**

**Toxic Gas Applications  
Random Integrity: SIL 1 @ HFT=0  
Random Integrity: SIL 2 @ HFT=1**

Safety Function:

The Ultima XA, Ultima XE, and Ultima XIR Gas Monitors measure hazardous gas concentrations and subsequently communicate this level to a logic solver via an analog 4-20mA signal.

Application Restrictions:

The unit must be properly designed into a Safety Instrumented Function per the Safety Manual requirements,



Product Assessor

Auditor

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MSA 1202040 C001

**Systematic Integrity: SIL 2 Capable**  
**Oxygen, Catalytic Combustible, IR Gas Applications**  
**Random Integrity: SIL 2 @ HFT=0**  
**Toxic Gas Applications**  
**Random Integrity: SIL 1 @ HFT=0**  
**Random Integrity: SIL 2 @ HFT=1**

Ultima XA, Ultima XE, and  
 Ultima XIR Gas Monitors  
 Mine Safety Appliances  
 Pittsburgh, PA  
 USA

SIL 2 Capability:

The product has met manufacturer design process requirements of Safety Integrity Level (SIL) 2. These are intended to achieve sufficient integrity against systematic errors of design by the manufacturer.

A Safety Instrumented Function (SIF) designed with this product must not be used at a SIL level higher than the stated without "prior use" justification by end user or diverse technology redundancy in the design.

## IEC 61508 Failure Rates

Device	$\lambda_{SD}$	$\lambda_{SU}$	$\lambda_{DD}$	$\lambda_{DU}$	SFF
Ultima XA Series Gas Monitors, Oxygen, 4-20mA output	0 FIT	139 FIT	4956 FIT	459 FIT	91.8%
Ultima XA Series Gas Monitors, Oxygen, relay output	0 FIT	201 FIT	4965 FIT	458 FIT	91.9%
Ultima XA Series Gas Monitors, Toxic, 4-20mA output	0 FIT	151 FIT	3337 FIT	2103 FIT	62.7%
Ultima XA Series Gas Monitors, Toxic, relay output	0 FIT	213 FIT	3346 FIT	2101 FIT	62.9%
Ultima XA Series Gas Monitors, Catalytic, 4-20mA output	0 FIT	190 FIT	5029 FIT	435 FIT	92.4%
Ultima XA Series Gas Monitors, Catalytic, relay output	0 FIT	214 FIT	5023 FIT	429 FIT	92.4%
Ultima XE Series Gas Monitors, Oxygen, 4-20mA output	0 FIT	139 FIT	4956 FIT	459 FIT	91.8%
Ultima XE Series Gas Monitors, Oxygen, relay output	0 FIT	201 FIT	4965 FIT	458 FIT	91.9%
Ultima XE Series Gas Monitors, Toxic, 4-20mA output	0 FIT	151 FIT	3337 FIT	2103 FIT	62.7%
Ultima XE Series Gas Monitors, Toxic, relay output	0 FIT	213 FIT	3346 FIT	2101 FIT	62.9%
Ultima XE Series Gas Monitors, Catalytic, 4-20mA output	0 FIT	190 FIT	5029 FIT	435 FIT	92.4%
Ultima XE Series Gas Monitors, Catalytic, relay output	0 FIT	214 FIT	5023 FIT	429 FIT	92.4%
Ultima XIR Infrared Gas Detector, 4-20mA output	0 FIT	369 FIT	862 FIT	98 FIT	92.6%
Ultima XIR Infrared Gas Detector, relay output	99 FIT	393 FIT	715 FIT	92 FIT	92.9%

SIL Verification:

The Safety Integrity Level (SIL) of an entire Safety Instrumented Function (SIF) must be verified via a calculation of  $PFD_{avg}$  considering redundant architectures, proof test interval, proof test effectiveness, any automatic diagnostics, average repair time and the specific failure rates of all products included in the SIF. Each subsystem must be checked to assure compliance with minimum hardware fault tolerance (HFT) requirements.

\* FIT = 1 failure /  $10^9$  hours



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Form	Version	Date
C61508	2.01	July 2008