

MD601Ex/MD611Ex Intrinsically Safe Heat Detectors

Introduction

The MD601Ex/MD611Ex Intrinsically Safe Heat Detectors form part of the M600Ex series of plug in detectors for ceiling mounting. The detector plugs into the 5BEx 5" Universal IS Base and is intended for two-wire operation with the majority of control equipment currently manufactured by the company.

Intrinsic safety

The detectors are for use in potentially explosive gas and dust atmospheres (zone 0 gas, zone 20 dust).

The detectors are designed to comply with EN/IEC 60079-0:2012+A11:2013 and EN/IEC 60079-11:2012 for Intrinsically Safe apparatus.

They are certified:

■ ATEX code:  II 1 GD



■ Certificate: BAS01ATEX1134X

■ Gas/Dust code:

- Ex ia IIC T5 Ga
- Ex ia IIIB T100 °C Da

■ IECEx Certificate: IECEx BAS 07.0056X

These detectors are designed and manufactured to protect against other hazards as defined in paragraph 1.2.7 of Annex II of the ATEX Directive 94/9/EC.

Detector use

It is recommended that the detector is used in conjunction with a suitable isolator or shunt diode safety barrier in a certified Intrinsically Safe system, i.e., System 620.

Special conditions of safe use

The apparatus has a polyester enclosure which constitutes a potential electrostatic hazard. The enclosure must be cleaned with a damp cloth and do not mount in a high velocity dust laden atmosphere.

Operating principle

The MD600Ex range of heat detectors includes both Rate-of-Rise and Static (fixed temperature) types. These detect abnormally high rates of rise of temperature and abnormally high temperatures respectively. One of each type is offered within the range to cater for differing applications. The basic operating principles and construction are described below.

Circuit description - EN54-5 classification A1R

A simplified block schematic of the Rate-of-Rise detector is given in Fig. 1.

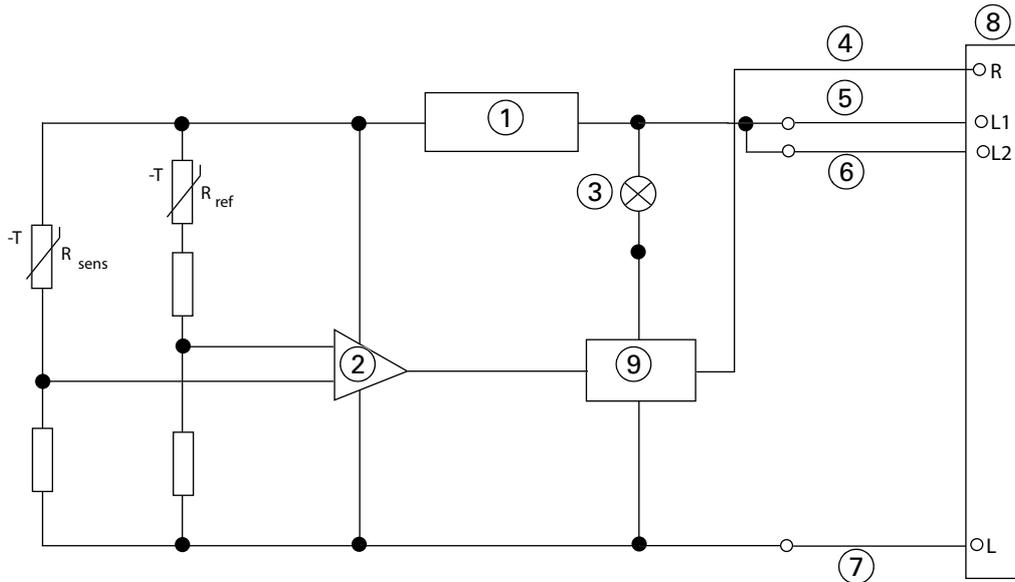


Fig. 1: Simplified Block Schematic Diagram

- 1– Voltage Regulator
- 2– Comparator
- 3– LED
- 4– Remote LED
- 5– LINE A IN +VE
- 6– LINE A OUT +VE
- 7– LINE B IN/OUT -VE
- 8– Base
- 9– Output Latch

Two negative temperature coefficient thermistors, R_{sens} and R_{ref} are used in a bridge configuration as shown. One thermistor, R_{sens} , is exposed to the air whilst the other, R_{ref} , is thermally lagged inside the detector body. If the temperature of the air around the detector rises quickly, a temperature difference will be established between R_{sens} and R_{ref} . The values of the bridge components are chosen such that, if a particular rate of change of temperature is sustained for sufficient time, the comparator will change state and the detector will signal an alarm condition.

If the rate of temperature increase is very slow, then the temperatures of the sensing and reference thermistors will be more nearly equal. Under these conditions the bridge components ensure that the comparator changes state when the predetermined fixed temperature is reached.

The Rate-of-Rise detector has a rate sensitivity and fixed (static) temperature setting to suit a particular type of application.

Fixed temperature EN54-5 classification A1S/CS

The Fixed Temperature detector MD611Ex 'A1S' is similar to the 'A1R' detector except that the reference ther-

mistor is replaced by a fixed resistor. The detector, therefore, responds more slowly to Rate-of-Rise of temperature. The bridge components are chosen instead to cause the comparator to change state when the sensing thermistor reaches a predetermined temperature irrespective of the rate of change.

The static temperature A1S is 54 °C to 65 °C.

Wiring

Loop cabling is connected to base terminals as follows:

- L -VE
- L1 +VE IN
- L2 +VE OUT
- R Remote LED Drive

Mechanical construction

The major components of the detector are:

- Body Assembly
- Printed Circuit
- Thermistors
- Light Pipe
- Inner Cover
- Outer Cover

Assembly

The body assembly consists of a plastic moulding which has four embedded detector contacts aligning with contacts in the 5BEx base. The moulding incorporates securing features to retain the detector in the base. The PCB is soldered to the body contacts, then the underside of the PCB is epoxy encapsulated. The light pipe is slotted into the inner cover which is then clipped to the body. Finally, the outer cover is clipped to the body.

Final assembly

The sensor housing is fitted to the body assembly. Finally, the outer cover is snapped into position on the body to provide mechanical protection to the otherwise exposed sensing thermistor.

Technical specifications

The detectors in the MD600Ex range differ mainly in their response characteristics. Unless otherwise specified, the information given below applies to all types.

Mechanical

Parameter	Value
Dimensions	See Fig. 2.
Materials: ■ Body and Cover	FR3010 'BAYBLEND' fire resistant.
Weight: ■ Detector ■ Detector + Base	0.116 kg 0.180 kg

Table 1: Mechanical Specifications

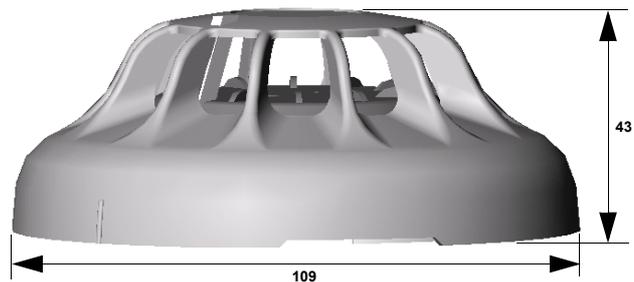


Fig. 2: MD600Ex Series - Overall Dimensions

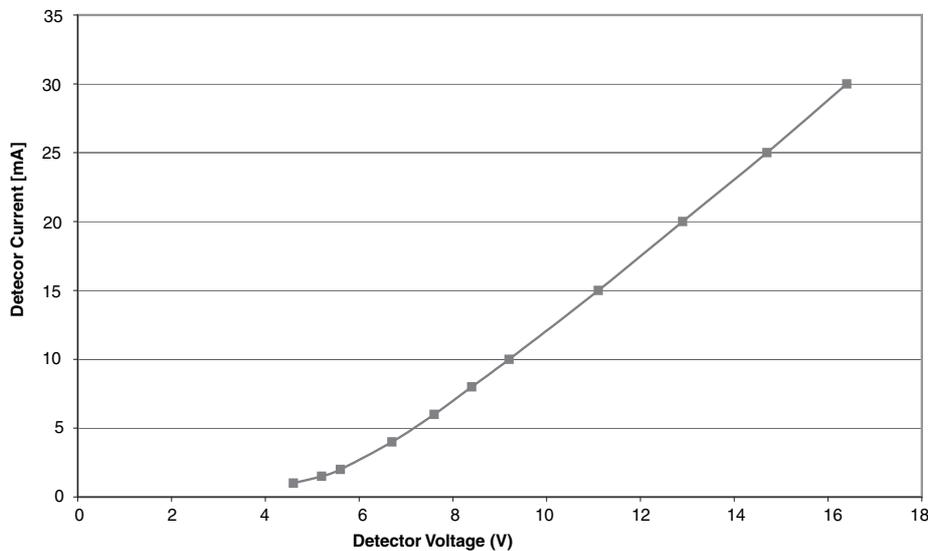


Fig. 3: Alarm Load

Environmental

Parameter	Value
Storage Temperature	-25 °C to +80 °C
Operating Temperature Long-Term	-20 °C to +70 °C (see note below)

Table 2: Environmental Specifications

Parameter	Value
Operating Temperature Short-Term (<3 min.)	-40 °C to +120 °C (see note below)
Relative Humidity	95% non-condensing

Table 2: Environmental Specifications



Notes

- The operating temperatures quoted exceed the ATEX Certification limits
- The maximum temperatures quoted are those at which the detector may sustain permanent damage. Maximum ambient temperatures at which detectors may be used, without high false alarm rates, are dependent upon detector type.

Electromagnetic compatibility

The detector complies with the following:

- Product family standard EN50130-4 in respect of:
 - Conducted Disturbances
 - Radiated Immunity
 - Electrostatic Discharge
 - Fast Transients
 - Slow High Energy
- EN61000-6-3: for Emissions

Electrical characteristics

Table 3 shows the electrical characteristics. These are taken at 25 °C with an operating voltage of 20 V unless otherwise specified. The alarm load presented to the controller by the detector is shown in Fig. 3.

Characteristic	Min.	Typ.	Max.	Unit
Operating Voltage (dc)	16		28	V
Quiescent Current	40		45	µA
Quiescent Current (CS)	50		55	µA
Switch-on Surge	-	-	200	µA
Stabilisation Time	-	-	1	sec
Alarm Current	See Fig. 3			mA
Holding Current			1	mA
Holding Voltage			5	V
Reset Time	1/2	1	2	sec
Remote LED Drive	via a 3.4k resistor			

Table 3: Electrical Characteristics



Intrinsic Safety Rating

Parameter	Value
Maximum Voltage for safety (U _i)	28 V
Maximum Current for Safety (I _i)	93 mA
Maximum Power Input (P _i)	650 mW
Equivalent Inductance (L _i)	0
Equivalent Capacitance (C _i)	0

Table 4: Safety Rating

Performance characteristics

General

The performance of Heat Detectors is normally specified in two ways. These are:

- The MD601Ex meets the requirements for the EN54-5 classification for A1R.
- The MD611Ex meets the EN54-5 classification A1S.

CPD Information

 0832
Tyco Fire & Security GmbH, Victor von Bruns-Strasse 21, 8212 Neuhausen am Rheinfall, Switzerland 16 DoP-2015-4043
<p>EN54-5:2000 +A1:2002 Conventional Intrinsically Safe Class A1R rate of rise point type heat detector for use in fire detection and alarm systems in buildings.</p> <p>MD601Ex Application & Design: 01B-04-D11 Installation Instructions: 01B-04-I3 Service Instructions: 01B-04-S2</p>
<p>Essential Characteristics EN54-5 Nominal activation conditions/Sensitivity, Response delay (response time) and Performance under fire conditions: Pass Operational reliability: Pass Tolerance to supply voltage: Pass Durability of operational reliability and response delay; temperature resistance: Pass Durability of operational reliability; vibration resistance: Pass Durability of operational reliability; humidity resistance: Pass Durability of operational reliability; corrosion resistance: Pass Durability of operational reliability; electrical stability: Pass</p>

 0832
Tyco Fire & Security GmbH, Victor von Bruns-Strasse 21, 8212 Neuhausen am Rheinfall, Switzerland 16 DoP-2015-4041
<p>EN54-5:2000 +A1:2002</p> <p>Conventional Intrinsically Safe Class A1S fixed temperature point type heat detector for use in fire detection and alarm systems in buildings.</p> <p>MD611Ex Application & Design: 01B-04-D11 Installation Instructions: 01B-04-I3 Service Instructions: 01B-04-S2</p>
<p>Essential Characteristics</p> <p>EN54-5</p> <p>Nominal activation conditions/Sensitivity, Response delay (response time) and Performance under fire conditions: Pass</p> <p>Operational reliability: Pass</p> <p>Tolerance to supply voltage: Pass</p> <p>Durability of operational reliability and response delay; temperature resistance: Pass</p> <p>Durability of operational reliability; vibration resistance: Pass</p> <p>Durability of operational reliability; humidity resistance: Pass</p> <p>Durability of operational reliability; corrosion resistance: Pass</p> <p>Durability of operational reliability; electrical stability: Pass</p>

Detector identification

The detector is identified by the logo label as shown in Fig. 4.

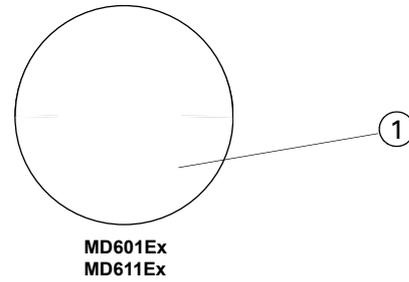


Fig. 4: Detector Identification
 1 – White

Ordering information

Item	Order Code
Heat Detector Type MD601Ex (A1R)	516.052.051.Y
Heat Detector Type MD611Ex (A1S)	516.052.041.Y
5BEx 5" Universal Base	517.050.023

Table 5: Order Codes