



**Series 100, 200, and 300
RTD & Thermocouple
ATEX and IECEx
Certified EX Assemblies**

**Instruction Manual
BPM101**

**Protection Scheme – Explosion Proof
Approved as:
Flame Proof by Enclosure “d”
&
Dust-Ignition by Enclosure “t”**

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This is a certified / controlled document.
Changes must be approved by the appropriate Approval Body

RTD and Thermocouple Assemblies

1. Scope:

This document provides information for proper use and installation of Burns Engineering Series 100, 200, and 300 temperature measurement assemblies for applications in hazardous environments according to the directives for ATEX, IECEx, and the Flame Proof requirements in the US and Canada.

Other pertinent documents related to the use, installation, approved item number structure and operation are:

- Burns Drawing #18938: (<http://www.burnsengineering.com/local/uploads/content/files/18938.pdf>)
- Burns RTD Manual: (http://www.burnsengineering.com/local/uploads/files/RTD_Installation_Manual.pdf)
- Burns Thermocouple Manual: (http://www.burnsengineering.com/local/uploads/files/Thermocouple_Installation_Manual.pdf)

2. Support:

If any questions regarding these products, their use or the approvals associated with their proper use, please contact Burns Engineering's Application Engineering team at:

Burns Engineering, Inc.
10201 Bren Road East
Minnetonka Minnesota
55343

Email: info@burnsengineering.com
Phone: 800-328-3871

TRADEMARKS:

Burns Engineering is a registered trademark of Burns Engineering, Inc.
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RTD and Thermocouple Assemblies

3. Labeling

Burns Engineering temperature assemblies tagged with the following information have been certified in compliance with the required standards for the region of use and Component-Type Examination Certificate:

NOTE: The ambient temperature and maximum surface temperature for the assembly with connection head/ enclosure is based on the connection head incorporated into the assembly. See Table 2, in paragraph 7.4 Specific Conditions of Use, for the Ambient Temperature Range and the Maximum Surface Temperature for connection head selection.

The following information is provided as part of the labeling of the assembly:

- Name and location of the manufacturer:
 - o Burns Engineering, 10201 Bren Road East Minnetonka MN 55343
- ATEX
 - o Approval description:
 - II 2 G Ex db IIC 80°C...140°C Gb
 - II 2 D Ex tb IIIC T80°C...T140°C Db
 - o Ingress Protection IP66
 - o ATEX Certificate Number: FM15ATEX0054X
- IECEx:
 - o Approval description:
 - Ex db IIC 80°C...140°C Gb
 - Ex tb IIIC T80°C...T140°C Db
 - o Ingress Protection IP66
 - o IECEx Certificate Number: IECEx FMG 15.0031X
- For use in Canada:
 - o Approval description:
 - Class I, Zone 1 Ex db IIC 80°C...140°C Gb
 - Zone 21, Ex tb IIIC T80°C...T140°C Db
 - o Ingress Protection IP66
 - o Canadian Certificate Number: FM16CA0009X
- For use in United States:
 - o Approval description: Class & Division,
 - Explosion Proof Class I, Div. 1, Groups A, B, C, D
 - Dust-Ignition Proof Class II / III, Div. 1, Groups E, F, G
 - Ambient Temperature Range: -40°C to +60°C, T6
 - TYPE 4 or 4X
 - US Certificate Number: FM16US0097X
 - o Approval description: Flameproof
 - Class I, Zone 1 AEx db IIC 80°C...140°C Gb
 - Zone 21, AEx tb IIIC T80°C...T140°C Db
 - Ingress Protection IP66
 - US Certificate Number: FM16US0097X
- The Model Series, Serial Number* or Date of Manufacture
 - *The serial number is applied to the sensor, internal to the full assembly.
- Per the approval level and relevant specifics
- Ingress protection rating: IP 66
- The following warning :

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WARNING:

DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT

DO NOT OPEN WHEN ENERGIZED

POTENTIAL ELECTROSTATIC CHARGING HAZARD – CLEANING OF THE ENCLOSURE SURFACES SHOULD BE DONE WITH A DAMP CLOTH

AVERTISSEMENTS:

NE PAS OUVRIR SI UNE ATMOSPHERE EXPLOSIVE EST PRÉSENT

NE PAS OUVRIR SOUS TENSION POTENTIEL RISQUE

D'ÉLECTROSTATIQUE CHARGEMENT – SI NÉCESSAIRE, NETTOYEZ DES SURFACES D'ENCLOSURE AVEC UN CHIFFON HUMIDE

4. Installation Requirements

The assembly must be installed in accordance with the latest issue of the relevant sections of the IEC/EN 60079 standards for installation and maintenance of electrical apparatus for use in Explosive Atmospheres.

The IEC and/or EN Standards specifically relevant:

60079-14: Explosive atmospheres -Part 14: Electrical installations design, selection & erection

60079-10: Explosive atmospheres -Part 10-1: Classification of areas - Explosive gas atmospheres

For installation in the United States: Comply with Electrical Code: ANSI/NFPA-70 NEC®

For installation in Canada: Comply with Canadian Electrical Code: CSA C22.1

The installation must also be in accordance with and local codes that may apply and should only be carried out by a qualified technician / engineer who has the necessary training.

Consult Burns Engineering if the enclosure needs to be extended from the process to maintain the surface temperature limits shown in Table 2. (reference paragraph 6.6)

Contact Burns if a certified conduit sealing device is required in accordance with the Ex rating for the assembly and the installed environment.

5. Type Approval Standards

The Burns Engineering Ex approved temperature assemblies have an EC Type examination certificate or other relevant certificate, issued by FM Approvals and have been approved to the following standards:

ATEX	IECEx	Canada	United States
EN 60079-0: 2012+A11	IEC 60079-0: 2011	CSA-C22.2 No. 0.4: R2013	FM Class 3600: 2011
EN 60079-1: 2014	IEC 60079-1: 2014-06	CSA-C22.2 No. 0.5: R2012	FM Class 3615: 2006
EN 60079-31: 2013	IEC 60079-31: 2013	CAN/CSA 60079-0: 2015	FM Class 3810: 2005
EN 60529: 1991 +A1: 2000 +A2: 2013	IEC 60529: 2013, Ed 2.2	CAN/CSA 60079-1: 2011	FM Class 3616: 2011
		CAN/CSA 60079-31: 2015	ANSI/ISA 60079-0: 2013
		CSA-C22.2 No. 60529: 2010	ANSI/ISA 60079-1: 2015
			ANSI/ISA 60079-31: 2015
			ANSI/NEMA-250: 2003
			ANSI/IEC 60529: 2004

6. Zone, Gas Group, Category and Temperature Class

The Burns Engineering Series 100, 200, and 300 ATEX and IECEx temperature assemblies have been certified for installation in locations with the following conditions.

6.1. Area Classification

Zone 1	Area in which an explosive gas atmosphere is likely to occur in normal operation occasionally
Zone 2	Area in which an explosive gas atmosphere is not likely to occur in normal operation and if it does occur, is likely to do so only infrequently and will exist for a short period only
Zone 21	Place in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur in normal operation occasionally
Zone 22	Place in which an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation but, if it does, will persist for a short period only

6.2. Gas Grouping

Group IIA	Propane
Group IIB	Ethylene
Group IIC	Hydrogen and Acetylene

6.3. Equipment Category

2 G, 2 D: Suitable for use in Zone 1, 2, 21, 22, Gases and Dust explosive environments.

6.4. Temperature Classification

[Reserved]

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6.5. Ambient Temperature Range

The ambient temperature class and maximum surface temperature for the assembly with connection head/ enclosure is based on the rating code and connection head incorporated into the assembly. See paragraph 7.4 Specific Conditions of Use, and Table 2 for the Ambient Temperature Range and the Maximum Surface Temperature for connection head selection.

6.6. Process Temperature Range, (measurement range)

Process temperature may range from -200°C to +1180°C, based on specific model and type. See the Product Catalog for the process temperature range for each specific device. Temperature class for probe portion of equipment may be equal to connected process temperature and service temperature limits of the probe used in the installation.

7. Safe Use of ATEX/IECEx Approved Equipment

7.1 Notes on Safe Use of Equipment

Approved usage of the assemblies is restricted to operating temperature range, ambient temperature range, and pressure range as defined in this product manual, specific Model Mounting & Outline Drawing, or as specified on the related Approval Certificate.

Product configurations approved for use in Ex environments per this document and the related directives are specifically detailed in the Burns Configuration Control drawing number 18938. A link to this drawing is available in Exhibit B, and on the Burns Engineering Web Site (www.BurnsEngineering.com).

7.2 Mounting, Commissioning, and Operation

The device has been designed to operate safely in accordance with the current technical and safety regulations of the EU, USA, Canada or other region under IECEx. If installed incorrectly or used for applications for which it is not intended, it is possible that application related concerns may arise. For this reason, the instrument must be selected, installed, connected, operated, and maintained according to the instructions in this and the specific product operating manual.

Product selection / configuration must consider the maximum process operating temperature to ensure the maximum enclosure surface temperature is not exceeded. (See paragraph 7.4-4 and Table 2) Contact Burns Application Engineering for guidance and appropriate approaches.

Persons handling/installing or commissioning this equipment must be authorized and suitably qualified. The manual must be read, understood, and the instructions must be followed. Modifications and repairs to the device are only permissible upon consultation with Burns Engineering Application Engineering staff.

7.3 Explosive Hazardous Area

If the device is to be installed in an explosive hazardous area, then the specifications in the certificate as well as all national and local regulations must be observed.

The instrument will be delivered with the certified ATEX/IECEx marking: (and/or equivalent based on region and specific rating code)

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II 2 G Ex db IIC 80°C...140°C Gb,

II 2 D Ex tb IIIC T80°C...T140°C Db,

Ta: (The ambient temperature class and maximum surface temperature for the assembly with connection head/ enclosure is based on the connection head incorporated into the assembly. See paragraph 7.4-4 and Table 2 for the Ambient Temperature Range and the Maximum Surface Temperature for the connection heads listed in this manual.)

The certificate type applicable to the specific assembly can be identified from the Ex code in the model number structure indicated on the TAG attached to the assembly. The Ex Code is immediately following the standard product definition characters and separated by the first "/" in the model string.

(ex: 200L10A5A3C070ST406/ATEX)

These codes and models are described in the Certificate of Compliance and Burns drawing # 18938.

Applicable Codes:

Rating Code in Model Number	Use Region	Explosion Proof rating
No Code	Any	NOT FOR USE in Hazardous Environments
/AFM:	United States	Class I, Division 1, Groups A, B, C, D Class II / III, Div. 1, Groups E, F and G Ambient Temperature Range: -40°C to +60°C TYPE 4 OR 4X
/ATEX:	European Union & UK	II 2 G Ex db IIC 80°C...140°C Gb II 2 D Ex tb IIIC T80°C...T140°C Db Ta** IP66
/IEC:	Wherever IECEx is accepted	II 2 G Ex db IIC 80°C...140°C Gb II 2 D Ex tb IIIC T80°C...T140°C Db Ta** IP66
/AFP:	United States	Flameproof and Dust-Ignition Protected by Enclosure Class I, Zone 1 AEx db IIC 80°C...140°C Gb Zone 21, AEx tb IIIC T80°C...T140°C Db Ta** IP66
/FMC:	Canada	Flameproof and Dust-Ignition Protected by Enclosure Class I, Zone 1, Ex db IIC 80°C...140°C Gb Zone 21, Ex tb IIIC T80°C...T140°C Db Ta** IP66
/EX:	US, Canada, EU/UK, International	Flameproof and Dust-Ignition Protected by Enclosure ATEX, IECEx; and for use in Canada and United States Includes codes: /ATEX, /IEC, /FMC, and /AFP, Ta** IP66
/EX1:	Based on Code Included as shown above	Combined ratings: AFP, FMC.
/EX2:		Combined ratings: AFM, FMC
/EX3:		Combined ratings: AFM, ATEX
/EX4:		Combined ratings: AFM, ATEX, IEC
/EX5:		Combined ratings: ATEX, IEC
/EX6:		Combined ratings: ATEX, IEC, AFP, FMC, AFM

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** The ambient temperature class and maximum surface temperature for the assembly with connection head/ enclosure is based on the rating code and the connection head incorporated into the assembly. See paragraph 7.4-4 and Table 2 for the Ambient Temperature Range and the Maximum Surface Temperature for the connection heads listed in this manual. For rating code "AFM", the ambient temperature range is -40°C to +60°C. Combined rating code options that include code "AFM", the ambient temperature range is -40°C to +60°C.

This installation supplement only applies to assemblies incorporating the codes: /ATEX, /IEC, /AFP, /FMC, /AFM and /EX, or various combinations of these codes as defined in the table above. For additional information regarding the application of these codes and the assembly requirements of the combined codes, which may include the AFM code (Class & Division), are defined in Burns Drawing 18938.

Enclosure Information

The unit is supplied without a cable gland for the signal / power entry ports. It is the user's / installer's responsibility to select a suitable cable gland or conduit connection components that meet or exceed the required Ex approval and that are suitable for the signal / power cable used. Table 1 indicates the connection sizes for the various connection heads associated with the Series 100, 200, 300 assemblies. All female threads that are identified as a Flame Path are Deep Tapped threads according to the NPT requirements of ANSI B1.20.1, plus 0.0 to +2.0 turns deeper. Refer to the literature available for the head included in the assembly for additional details required for safe installation and use.

When "N" is entered as the Code for the Enclosure, the assembly is shipped from Burns without an enclosure. This equipment is to be connected to:

- A suitably certified Ex d IIC / Ex tb IIIC enclosure/connection head
 - Approval Codes: ATEX, IEC, FMC
- A suitably certified AEx d IIC / AEx tb IIIC enclosure/connection head
 - Approval Code: AFP
- A suitably certified Explosionproof / Dust Ignitionproof enclosure/connection head.
 - Approval Code: AFM
- For Combined ratings, EX, EX1 through EX6, the enclosure/connection head must be suitably certified to all applicable ratings included in the combined option. See the Applicable Codes table above.

Table 1

Enclosure Port sizes			
Enclosure Model Code	Manufacturer	Instrument Port	Conduit / Power / Signal Port
3A/3E 5A/5E	Burns Engineering	1/2" NPT	3/4" NPT 1 place
14S	Yung Chan Metal Industry Co. LTD	1/2" NPT	3/4" NPT 1 place
19A/22A	Limatherm	1/2" NPT	1/2" NPT 2 places
25A	Killark Div. of Hubbell Inc.	3/4" NPT	3/4" NPT 1 Place
75A	PR Electronics	1/2" NPT	1/2" NPT 2 places

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WARNING: ANY UNUSED WIRING ENTRIES THAT MAY EXIST ARE TO BE CLOSED USING SUITABLY CERTIFIED PLUGS TO MAINTAIN THE ENCLOSURE TYPE OF PROTECTION

NOTE: Please insure that the connection to the wiring port is wrench tight. At least 5 full turns of thread engagement is required.

7.4 Specific Conditions of Use

1. Consult the manufacturer if dimensional information on the flameproof joints is necessary.
2. Consult the manufacturer's instructions for the specific information regarding wiring entry number, sizes, position and thread type.
3. Potential Electrostatic Charge Hazard – Cleaning of the enclosure surface should be done with a damp cloth.
4. The ambient temperature class and maximum surface temperature for the assembly with connection head/ enclosure is based on the connection head incorporated into the assembly. See **Table 2** for temperature ratings for connection head selection.
5. Equipment with Connection Head option "N" is to be connected to a suitably certified Ex d IIC / Ex tb IIIC connection head.
6. Temperature class for probe portion of equipment may be equal to connected process temperature and service temperature limits of the probe used in the installation.

Table 2

Connection Head #	Enclosure Description	"Ta" Range	Max. Surface Temp of Enclosure (Gas Atmosphere)	Max. Surface Temp of Enclosure (Zone 21 Dust Atmosphere)
3A	Aluminum enclosure with Waterproofing Kit	-40°C to 100°C	105°C	T105°C
3E	Aluminum enclosure with Waterproofing Kit	-40°C to 100°C	105°C	T105°C
5A	Aluminum enclosure	-40°C to 100°C	105°C	T105°C
5E	Aluminum enclosure	-40°C to 100°C	105°C	T105°C
14S	Stainless Steel enclosure	-40°C to 80°C	100°C	T100°C
19A	Aluminum enclosure with LED indicator	-20°C to 75°C	80°C	T80°C
22A	Aluminum enclosure with LCD indicator	-20°C to 75°C	80°C	T80°C
25A	Aluminum enclosure	-20°C to 70°C	140°C	T140°C
75A	Aluminum enclosure with T75 Transmitter and indicator	-40°C to 85°C	100°C	T100°C

Enclosure Materials:

Table 3

Enclosure Model Code	Material	Coating
3A / 5A	Aluminum	None
3E / 5E	Aluminum	Epoxy Paint
14S	Stainless Steel	None
19A/22A	Aluminum	Chemically resistant paint
25A	Aluminum	Paint
75A	Aluminum	Epoxy Paint

Note: 3A & 3E ships with an internal water-proofing kit installed by the Owner/User.

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7.5 Enclosure Safety:**Locking the Connection Head Cover**

The safe use is ensured as long as the cover is correctly threaded and locked to the base. See Table 4 below for cover locking information.

To lock the cover, back out the set screw, then firmly tighten down/secure the cover to compress the O-ring, until the cover comes in contact with the base. Turn down the set screw until it engages with the base to lock the cover in place.

To un-lock the cover allowing for removal, turn the locking set screw backing it out to disengage with the base. The cover will be free to be removed.

Earth Grounding

The Burns Engineering assemblies must be connected to a good quality earth ground. The enclosure is provided with internal and external grounding terminals. See Table 4 for details associated with the grounding features. See Table 5 for Grounding wires sizes.

Table 4: Cover Locking and Grounding Details

Enclosure Model Code	Mfg'er	Cover Locking Details			Internal Ground			External Ground		
		Location	Hardware	Tool	Location	Hardware	Tool	Location	Hardware	Tool
3A/3E 5A/5E	Burns Engineering	Protruding from the perimeter of the cover	Steel, M3 x 0.5 mm threaded set screw, 6 mm long	1.5 mm Hex wrench	Inside on the bottom of enclosure base near the instrument connection	Binder head slotted screw. Zinc/green plated steel. 6-32 UNC-2A, 1/4" long	Flat-blade screw driver for slotted screw	On the side of the conduit connection port.	Binder head slotted screw. Zinc/green plated steel. 6-32 UNC-2A, 1/4" long	Flat-blade screw driver for slotted screw
14S	Yung Chan Metal Industry Co. LTD	Protruding from the perimeter of the cover	Stainless Steel Hex. Socket Grub Screw M3 x 8mm	1.5 mm hex Hex wrench	Upper area of base along the Inside diameter.	Stainless Steel bolt and Locking washer. M3 x 5L	Screw Driver	On the side of the conduit connection port.	Stainless Steel bolt and Locking washer. M4 x 5L	Screw Driver
19A/22A	Limatherm	Protruding from the perimeter of the cover	Stainless steel Set Screw, M3 x 6, Hex Socket.	2.0 mm Hex wrench	Inside the Base between the conduit ports.	Binder head screw, Stainless steel M4 x 9mm with bracket.	Flat-blade screw driver for slotted screw	On the side of the base above one of the conduit connections.	Binder head screw, Stainless steel M5 x 12mm, with bracket.	Flat-blade screw driver for slotted screw
25A	Killark Div. of Hubbel Inc.	Protruding from the perimeter of the cover	Socket head cap screw, Stainless steel. #6-32 UNC, 0.375" long.	Socket tool appropriate for Set Screw.	Inside the Base between the conduit ports.	Binder head screw. Green 300 series SST. #8-32 x .375 with washer.	Flat-blade screw driver for slotted screw	On one of the Mounting tabs on the circumference of the base.	Binder head screw. Green 300 series SST. #8-32 x .375 with terminal ring.	Flat-blade screw driver for slotted screw
75A	PR Electronics /Limatherm	Protruding from the perimeter of the cover	Stainless steel Set Screw, M3 x 6, Hex Socket.	2.0 mm Hex wrench	Inside the Base between the conduit ports.	Binder head screw, Stainless steel M4 x 9mm with bracket.	Flat-blade screw driver for slotted screw	On the side of the base above one of the conduit connections.	Binder head screw, Stainless steel M5 x 12mm, with bracket.	Flat-blade screw driver for slotted screw

Table 5: Earth Grounding Wire sizes:

Wire Size			
Enclosure Model Code	Manufacturer	Internal Ground	External Ground
3A/3E 5A/5E	Burns Engineering	11 AWG or 4.17mm ²	11 AWG or 4.17mm ²
19A/22A	Limatherm	Standard wire: 1.5mm ² Solid Wire: 2.5mm ²	Standard wire: 4.0mm ² Solid Wire: 6.0mm ²
14S	Yung Chan Metal Industry Co. LTD	#10 AWG or 6.6mm ²	#10 AWG or 6.6mm ²
25A	Killark Div. of Hubbell Inc.	#10 AWG or 6.6mm ²	#10 AWG or 6.6mm ²
75A	PR Electronics	Standard wire: 1.5mm ² Solid Wire: 2.5mm ²	Standard wire: 4.0mm ² Solid Wire: 6.0mm ²

Wiring Material must be appropriate for the environment where located

Safety Warnings:

The following warnings should be observed:

WARNING: DO NOT OPEN IN HAZARDOUS AREA

WARNING: DO NOT OPEN WHEN ENERGIZED

WARNING: POTENTIAL ELECTROSTATIC CHARGING HAZARD—SEE NOTES

To minimize an electrostatic charging hazard on the exterior of the enclosure, the enclosure should be connected to earth ground. See section 8 below for more details.

Cleaning of the enclosure surfaces should be done with a damp cloth.

8 Maintenance

8.1 External Maintenance

The temperature assemblies can be externally maintained with a clean dry cloth.

8.2 Sensor Maintenance

For assemblies that incorporate a Thermowell (Indirect Immersion) cleaning of the sensor is typically not necessary.

For assemblies that are directly inserted into the process, cleaning is at the users discretion based on the risk of buildup on the sensor sheath.

If cleaning is deemed necessary, the sensor may be removed from the process and cleaned with an appropriate solvent. Dry the sensor completely before you insert it back it the process. It is not recommended to use Ultrasonic Bath cleaning.

It is recommended that the user perform periodic calibration / verification. For more information regarding periodic performance checks view this Technical Paper: RTD Calibration and Verification

[Link: http://www.burnsengineering.com/local/uploads/files/RTD_Calibration_Verification.pdf]

8.3 Internal Maintenance (enclosure)

Please make sure that the internals of the unit always stay dry and clean. There are no user maintainable components inside the enclosure.

9 Warning

All spring loaded style assemblies (except those with Approval code "AFM" specifically in the model number string) incorporate a Flameproof extension that is threaded directly into the enclosure ("C", "E", & "K" Styles) or to the threaded spring loaded sensor fitting ("L" Style) that is threaded to the enclosure. No other hardware components can be between the Flameproof extension and the enclosure/spring loaded fitting.

No customer modifications are available and are strictly forbidden. Any modification or adjustment to the assembly must be approved by the Burns Application Engineer, Quality Manager and /or the Approval Body. See the assembly illustration within Burns Drawing 18938 for required component position.

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Exhibit A: Product Approval Certificates (FM Approvals)

These files can be accessed on the Burns Website:

<http://www.burnsengineering.com/certifications-declarations>

[ATEX Certificate](#)

[IECEx Certificate](#)

[Flameproof, Canada Certificate](#)

[Explosionproof \(Class/Div\) & Flameproof, USA Certificate](#)

[ISO-9001 Registration Certificate](#)

[QAN; Quality Assurance Notification \(ATEX\)](#)

[QAR; Quality Assessment Report \(IECEx\)](#)

Exhibit B: Other Documents / Certifications

All files can be accessed on the Burns Website

Ex/Xp Product Configuration Control / Definition Drawing 18938

Available here: <http://www.burnsengineering.com/>, Under Industrial Sensors

Component Certificates for Connection Heads; By Head Number

Available here: <http://www.burnsengineering.com/Component-Certificates>

General User Manual for RTDs; Series 200 & 300

Available here: http://www.burnsengineering.com/local/uploads/files/RTD_Installation_Manual.pdf

General User Manual for Thermocouples; Series 100

Available here: http://www.burnsengineering.com/local/uploads/files/Thermocouple_Installation_Manual.pdf