

Section 5 – Hazardous Environment Planning

5.1 Overview

Section contents The topics covered in this section are:

	Topic	See Page
5.1	Overview.....	83
5.2	Hazardous Area Classifications	84
5.3	Mounting and Operating the HPM in a Division 2 Location	86
5.4	Field Wiring in Hazardous Locations.....	100

Introduction

Certain processes handle ignitable or explosive materials. Local electrical codes require that electrical devices that are located in, or connected to, such process areas have some type of control to prevent accidental ignition of the process material. Terminology used to discuss these installations is defined in this section, followed by specific requirements for the High-Performance Process Manager (HPM). For information about intrinsic safety applications, see your Honeywell Sales Engineer.

5.2 Hazardous Area Classifications

National Electrical Code Hazardous materials are classified by a variety of terms. The terminology for the National Electrical Code (NEC) that is used in the United States is summarized in Table 5-1. The table is not complete. Check your own local electrical codes for additional information and definition.

Table 5-1 Hazardous Area Classifications

NEC	Environment
Class I	Explosive gases or vapors are present.
Class II	Combustible dusts are present.
Class III	Ignitable fibers or flyings are present.
Division 1	A location where a hazardous concentration of gases or vapors exists approximately 10-100% of the time (subject to interpretation as above).
Division 1	A location where a hazardous concentration of gases or vapors exists approximately 1-10% of the time (subject to interpretation as above).
Division 2	A location where a hazardous concentration of gases or vapors exists approximately 0.1-1% of the time (subject to interpretation as above).
Nonhazardous	Hazardous vapors exist less than .1% of the time.
Group A	A hazardous atmosphere containing acetylene or other similar gases or vapors.
Group B	A hazardous atmosphere containing hydrogen or other similar gases or vapors.
Group C	A hazardous atmosphere containing ethylene or other similar gases or vapors.
Group D	A hazardous atmosphere containing pentane or other similar gases or vapors.
Group E	A hazardous atmosphere containing metal dust, such as aluminum.
Group F	A hazardous atmosphere containing carbon black, coal, or coke dust.

Continued on next page

5.2 Hazardous Area Classifications, Continued

Interpretation of Division 2 rules

Electrical equipment can be mounted in an NEC Division 2 location as long as it does not create a fire hazard during normal operation or routine maintenance. In other words, the equipment does not produce electrical sparks or have hot surface temperatures that are sufficient to ignite the hazardous vapors that may be present.

The equipment is allowed to produce sparks or hot surfaces if it malfunctions because there is a low probability that there will be hazardous vapors present at the same time as the malfunction.

The equipment is allowed to produce sparks or hot surfaces during repair or restorative maintenance because the personnel performing the maintenance are expected to be aware of the danger and to detect the presence of hazardous vapors before starting the work.

5.3 Mounting and Operating the HPM in a Division 2 Location

Factory Mutual approval Many of the devices in a High-Performance Process Manager subsystem have been examined and certified by Factory Mutual (FM) as safe for mounting in Class 1, Division 2 locations. Certain other devices such as a Field Termination Assembly (FTA) that contains unsealed relay contacts is not approved for these applications. Table 5-2 is a list of the approved devices. When an HPM cabinet is intended to be mounted in a Division 2 location, it must contain only the approved devices. A label that displays the FM logo is attached to the cabinet.

HPM placement considerations The considerations for High-Performance Process Manager placement are

- Use only those High-Performance Process Manager assemblies that have been certified for safe usage in Division 2 locations, or
- Locate the High-Performance Process Manager in a nonhazardous area, or
- Purge the High-Performance Process Manager enclosure or the High-Performance Process Manager area of gasses or vapors.

HPM placement publications In the USA, the Division 2 or nonhazardous area for placing High-Performance Process Manager enclosures can be selected by using publications such as the National Fire Protection Agency (NFPA) publication #497, *Classification of Class I Hazardous Locations for Electrical Installations in Chemical Plants*. Should no Division 2 or nonhazardous area exist, purged/pressurized enclosures or buildings are needed. Suitable purge techniques are described in local electrical code documents such as the NFPA #496, *Purged and Pressurized Enclosures for Electrical Equipment*.

Continued on next page

5.3 Mounting and Operating the HPM in a Division 2 Location,

Continued

Approved Division 2 area equipment

Table 5-2 lists the High-Performance Process Manager equipment that is approved for operation in Division 2 areas.

Table 5-2 HPM Equipment Approved for Use in a Division 2 Area

Model Number	Description
IOPs	
MU-PAIH03	High Level Analog Input (HLAI)
MU-PAIL02	Low level Analog Input (LLAI)
MU-PAOX03	Analog Output (AO)
MU-PAOY22	Analog Output (AO)
MU-PDIS12	Digital Input Sequence of Events (DI)
MU-PDIX02	Digital Input (DI)
MU-PDIY22	Digital Input (DI)
MU-PDOX02	Digital Output (DO)
MU-PDOY22	Digital Output (DO)
MU-PLAM02	Low Level Multiplexer (LLMux)
MU-PRHM01	Remote Hardened Low Level Multiplexer (RHMUX)
MU-PPIX02	Pulse Input (PI)
MU-PSDX02	Serial Device Interface (SDI)
MU-PSIM11	Serial Interface (SI)
MU-PSTX03	Smart Transmitter Interface (STIM)

Continued on next page

5.3 Mounting and Operating the HPM in a Division 2 Location,

Continued

Approved Division 2
area equipment,
continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas,
Continued

Model Number	Description
Standard FTA Components	
MU-TAIH02	High Level Analog Input/STI with compression terminals
MU-TAIH03	High Level Analog Input/STI with compression terminals
MU-TAIH12	High Level Analog Input/STI with compression terminals
MU-TAIH13	High Level Analog Input/STI with compression terminals
MU-TAIH22	High Level Analog Input/STI with compression terminals
MU-TAIH23	High Level Analog Input with compression terminals
MU-TAIH52	High Level Analog Input/STI with screw terminals
MU-TAIH53	High Level Analog Input/STI with screw terminals
MU-TAIH62	High Level Analog Input/STI with screw terminals
MU-TAIL02	Low Level Analog Input with compression terminals
MU-TAIL03	Low Level Analog Input with compression terminals
MU-TAMR02	LLMux Analog Input RTD with compression terminals
MU-TAMR03	LLMux Analog Input RTD with compression terminals
MU-TAMT02	LLMux Analog Input TC with compression terminals
MU-TAMT03	LLMux Analog Input TC with compression terminals
MU-TAMT12	LLMux Analog Input TC with remote CJR, compress terminals
MU-TAMT13	LLMux Analog Input TC with remote CJR, compress terminals
MU-TAOX02	Analog Output with compression terminals
MU-TAOX12	Analog Output with compression terminals
MU-TAOX52	Analog Output with screw terminals
MU-TAOY22	Analog Output with compress terminals, with Standby Manual
MU-TAOY23	Analog Output with comp terminals, without Standby Manual
MU-TAOY52	Analog Output with screw terminals, with Standby Manual
MU-TAOY53	Analog Output with screw terminals, without Standby Manual

Continued on next page

5.3 Mounting and Operating the HPM in a Division 2 Location,

Continued

Approved Division 2
area equipment,
continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas,
Continued

Model Number	Description
Standard FTA Components, continued	
MU-TDIA12	120 Vac Digital Input with compression terminals
MU-TDIA22	240 Vac Digital Input with compression terminals
MU-TDIA52	120 Vac Digital Input with fixed screw terminals
MU-TDIA62	240 Vac Digital Input with fixed screw terminals
MU-TDID12	24 Vdc Digital Input with compression terminals
MU-TDID52	24 Vdc Digital Input with fixed-screw terminals
MU-TDID72	24 Vdc Digital Input with removable-screw terminals
MU-TDIY22	24 Vdc Digital Input with compression terminals
MU-TDIY62	24 Vdc Digital Input with screw terminals
MU-TDOA12	120/240 Vac Solid-State Digital Output with Comp terminals
MU-TDOA13	120/240 Vac Solid-State Digital Output with Comp terminals
MU-TDOA52	120/240 Vac Solid-State Digital Output with Screw terminals
MU-TDOA53	120/240 Vac Solid-State Digital Output with Screw terminals
MU-TDOD12	3-30 Vdc Digital Output with compression terminals
MU-TDOD13	3-30 Vdc Digital Output with compression terminals
MU-TDOD14	3-30 Vdc Digital Output with compression terminals
MU-TDOD22	31-200 Vdc Digital Output with compression terminals
MU-TDOD23	5-200 Vdc Digital Output with compression terminals
MU-TDOD52	3-30 Vdc Digital Output with screw terminals
MU-TDOD53	3-30 Vdc Digital Output with screw terminals
MU-TDOD54	3-30 Vdc Digital Output with screw terminals
MU-TDOD62	31-200 Vdc Digital Output with fixed-screw terminals
MU-TDOD63	5-200 Vdc Digital Output with screw terminals

Continued on next page

5.3 Mounting and Operating the HPM in a Division 2 Location, Continued

Approved Division 2
area equipment,
continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas,
Continued

Model Number	Description
Standard FTA Components, continued	
MU-TDON12	24 Vdc Nonisolated Digital Output with compress terminals
MU-TDON52	24 Vdc Nonisolated Digital Output with screw terminals
MU-TDOY22	24 Vdc Isolated Digital Output with compression terminals
MU-TDOY62	24 Vdc Isolated Digital Output with screw terminals
MU-TDPR02	Digital Input Power Distribution Assembly
MU-TLPA02	Power Adapter (LLMux, SDI, SI)
MU-TPIX12	Pulse Input with compression terminals
MU-TPIX52	Pulse Input with screw terminals
MU-TSDM02	Serial Device Interface—Manual/Auto Station
MU-TSDT02	Serial Device Interface—Toledo Weigh Cell
MU-TSIM12	Serial Interface—Modbus EIA-232
MU-TSTX03	Smart Transmitter Interface with compression term
MU-TSTX13	Smart Transmitter Interface with compression term
MU-TSTX53	Smart Transmitter Interface with screw terminals

Continued on next page

5.3 Mounting and Operating the HPM in a Division 2 Location,

Continued

Approved Division 2
area equipment,
continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas,
Continued

Model Number	Description
Galvanically Isolated FTA Components	
MC-GRMT01	RHMUX Analog Input TC with screw terminals
MU-GRPA01	RHMUX GI/IS Power Adapter with compression terminals
MU-TRPA01	RHMUX GI/NI Power Adapter with compression terminals
MU-GAIH12	High Level Analog Input with compression terminals
MU-GAIH13	HLAI/STI with compression terminals
MU-GAIH14	HLAI/STI with compression terminals
MU-GAIH22	High Level Analog Input with compression terminals
MU-GAIH82	High Level Analog Input with crimp terminals
MU-GAIH83	HLAI/STI with crimp terminals
MU-GAIH84	HLAI/STI with crimp terminals
MU-GAIH92	High Level Analog Input with crimp terminals
MU-GAOX02	Analog Output with compression terminals
MU-GAOX12	Analog Output with compression terminals
MU-GAOX72	Analog Output with crimp term
MU-GAOX82	Analog Output with crimp terminals
MU-GDID12	Digital Input with compression terminals
MU-GDID13	Digital Input with compression terminals
MU-GDID82	Digital Input with crimp terminals
MU-GDID83	Digital Input with crimp terminals
MU-GDOD12	24 Vdc Digital Output with compression terminals
MU-GDOD82	24 Vdc Digital Output with crimp terminals
MU-GDOL12	24 Vdc Digital Output with compression terminals
MU-GDOL82	24 Vdc Digital Output with crimp terminals

Continued on next page

5.3 Mounting and Operating the HPM in a Division 2 Location, Continued

Approved Division 2
area equipment,
continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas,
Continued

Model Number	Description
Galvanically Isolated FTA Components, continued	
MU-GLFD02	Combiner Panel
MU-GMAR52	Marshalling Panel
MU-GPRD02	Power Distribution Assembly
I/O Link Extenders	
MU-IOLM02	Standard I/O Link Extender—Local Card File
MU-IOLX02	Standard I/O Link Extender—Remote Card File
MU-ILDX03	Long Distance I/O Link Extender
HPMM Card Sets	
MU-HPMS01	Nonredundant HPMM Card Set
MU-HPMR01	Redundant HPMM Card Sets
Card File Assemblies	
MU-HPFH01	Left 7-Slot Card File Assembly
MU-HPFH03	Left 7-Slot HPMM Card File Assembly
MU-HPFH11	Right 7-Slot Card File Assembly
MU-HPFH13	Right 7-Slot HPMM Card File Assembly
MU-HPFX02	15-Slot Card File Assembly
MU-HPFX03	15-Slot HPMM Card File Assembly
MU-HPFI03	Left 7-Slot IOP Card File Assembly
MU-HPFI13	Right 7-Slot IOP Card File Assembly
MU-HPFI23	15-Slot IOP Card File Assembly

Continued on next page

5.3 Mounting and Operating the HPM in a Division 2 Location,

Continued

Approved Division 2
area equipment,
continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas,
Continued

Model Number	Description
Cables	
MU-KTPC00	FTA to IOP, DIN to DIN connector
MU-KTPC05	FTA to IOP, DIN to DIN connector—5 meters
MU-KTPC10	FTA to IOP, DIN to DIN connector—10 meters
MU-KTPC15	FTA to IOP, DIN to DIN connector—15 meters
MU-KTPC20	FTA to IOP, DIN to DIN connector—20 meters
MU-KTPC25	FTA to IOP, DIN to DIN connector—25 meters
MU-KTPC30	FTA to IOP, DIN to DIN connector—30 meters
MU-KTPC35	FTA to IOP, DIN to DIN connector—35 meters
MU-KTPC40	FTA to IOP, DIN to DIN connector—40 meters
MU-KTPC45	FTA to IOP, DIN to DIN connector—45 meters
MU-KTPC50	FTA to IOP, DIN to DIN connector—50 meters
MU-KFTA00	FTA to IOP, phone to phone connector
MU-KFTA05	FTA to IOP, phone to phone connector—5 meters
MU-KFTA10	FTA to IOP, phone to phone connector—10 meters
MU-KFTA15	FTA to IOP, phone to phone connector—15 meters
MU-KFTA20	FTA to IOP, phone to phone connector—20 meters
MU-KFTA25	FTA to IOP, phone to phone connector—25 meters
MU-KFTA30	FTA to IOP, phone to phone connector—30 meters
MU-KFTA35	FTA to IOP, phone to phone connector—35 meters
MU-KFTA40	FTA to IOP, phone to phone connector—40 meters
MU-KFTA45	FTA to IOP, phone to phone connector—45 meters
MU-KFTA50	FTA to IOP, phone to phone connector—50 meters

Continued on next page

5.3 Mounting and Operating the HPM in a Division 2 Location, Continued

Approved Division 2
area equipment,
continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas,
Continued

Model Number	Description
Cables, continued	
MU-KFTS00	FTA to IOP, phone to phone connector
MU-KFTS05	FTA to IOP, phone to phone connector—5 meters
MU-KFTS10	FTA to IOP, phone to phone connector—10 meters
MU-KFTS15	FTA to IOP, phone to phone connector—15 meters
MU-KFTS20	FTA to IOP, phone to phone connector—20 meters
MU-KFTS25	FTA to IOP, phone to phone connector—25 meters
MU-KFTS30	FTA to IOP, phone to phone connector—30 meters
MU-KFTS35	FTA to IOP, phone to phone connector—35 meters
MU-KFTS40	FTA to IOP, phone to phone connector—40 meters
MU-KFTS45	FTA to IOP, phone to phone connector—45 meters
MU-KFTS50	FTA to IOP, phone to phone connector—50 meters
MU-KSPR00	Remote Power Distribution
MU-KSPR05	Remote Power Distribution—5 meters
MU-KSPR10	Remote Power Distribution—10 meters
MU-KSPR15	Remote Power Distribution—15 meters
MU-KSPR20	Remote Power Distribution—20 meters
MU-KSPR25	Remote Power Distribution—25 meters
MU-KSPR30	Remote Power Distribution—30 meters
MU-KSPR35	Remote Power Distribution—35 meters
MU-KSPR40	Remote Power Distribution—40 meters
MU-KSPR45	Remote Power Distribution—45 meters
MU-KSPR50	Remote Power Distribution—50 meters

Continued on next page

5.3 Mounting and Operating the HPM in a Division 2 Location, Continued

Approved Division 2
area equipment,
continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas,
Continued

Model Number	Description
Cables, continued	
MU-KFTD00	FTA to IOP, DIN to phone connector
MU-KFTD05	FTA to IOP, DIN to phone connector—5 meters
MU-KFTD10	FTA to IOP, DIN to phone connector—10 meters
MU-KFTD15	FTA to IOP, DIN to phone connector—15 meters
MU-KFTD20	FTA to IOP, DIN to phone connector—20 meters
MU-KFTD25	FTA to IOP, DIN to phone connector—25 meters
MU-KFTD30	FTA to IOP, DIN to phone connector—30 meters
MU-KFTD35	FTA to IOP, DIN to phone connector—35 meters
MU-KFTD40	FTA to IOP, DIN to phone connector—40 meters
MU-KFTD45	FTA to IOP, DIN to phone connector—45 meters
MU-KFTD50	FTA to IOP, DIN to phone connector—50 meters
MU-KDPR00	Power Distribution
MU-KDPR05	Power Distribution—5 meters
MU-KDPR10	Power Distribution—10 meters
MU-KDPR15	Power Distribution—15 meters
MU-KDPR20	Power Distribution—20 meters
MU-KDPR25	Power Distribution—25 meters
MU-KDPR30	Power Distribution—30 meters
MU-KDPR35	Power Distribution—35 meters
MU-KDPR40	Power Distribution—40 meters
MU-KDPR45	Power Distribution—45 meters
MU-KDPR50	Power Distribution—50 meters

Continued on next page

5.3 Mounting and Operating the HPM in a Division 2 Location, Continued

Approved Division 2
area equipment,
continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas,
Continued

Model Number	Description
Cables, continued	
MU-KLAM00	LLMux FTA to Power Adapter (internal to cabinet)
MU-KLX076	SDI, SI, LLMux, RHMUX FTA to Power Adapter – 76 meters (external to cabinet)
MU-KLX152	SDI, SI, LLMux, RHMUX FTA to Power Adapter – 152 meters (external to cabinet)
MU-KLX305	SDI, SI, LLMux, RHMUX FTA to Power Adapter – 305 meters (external to cabinet)
MU-KLO305	RHMUX FTA to Power Adapter – 305 meters (external to cabinet)
MU-KSX030	SDI/SI FTA to EIA-422/485—30 meters
MU-KSX152	SDI/SI FTA to EIA-422/485—152 meters
MU-KSX305	SDI/SI FTA to EIA-422/485—305 meters
MU-KGPR00	Galvanic Isolation Power Distribution Cable
MU-KGPR05	Galvanic Isolation Power Distribution Cable—5 meters
MU-KGPR10	Galvanic Isolation Power Distribution Cable—10 meters
MU-KBFT01	FTA I/O Bridge—0.5 meter
MU-KBFT02	FTA I/O Bridge—2 meters

Continued on next page

5.3 Mounting and Operating the HPM in a Division 2 Location, Continued

Approved Division 2
area equipment,
continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas,
Continued

Model Number	Description
UCN Cables	
MU-NKT002	UCN Trunk Cable—2.5 meters
MU-NKT005	UCN Trunk Cable—5 meters
MU-NKT010	UCN Trunk Cable—10 meters
MU-NKT020	UCN Trunk Cable—20 meters
MU-NKT030	UCN Trunk Cable—30 meters
MU-NKT050	UCN Trunk Cable—50 meters
MU-NKT100	UCN Trunk Cable—100 meters
MU-NKT200	UCN Trunk Cable—200 meters
MU-NKT400	UCN Trunk Cable—400 meters
MU-NKT600	UCN Trunk Cable—600 meters
MU-NKD000	UCN Drop Cable Set (pair)
MU-NKD002	UCN Drop Cable Set—2 meters (pair)
MU-NKD005	UCN Drop Cable Set—5 meters (pair)
MU-NKD010	UCN Drop Cable Set—10 meters (pair)
MU-NKD020	UCN Drop Cable Set—20 meters (pair)
MU-NKD030	UCN Drop Cable Set—30 meters (pair)
MU-NKD040	UCN Drop Cable Set—40 meters (pair)
MU-NKD050	UCN Drop Cable Set—50 meters (pair)
MU-NTAP02	UCN 2-Drop Tap Assembly Kit (pair)
MU-NTAP04	UCN 4-Drop Tap Assembly Kit (pair)
MU-NTAP08	UCN 8-Drop Tap Assembly Kit (pair)
MU-NKTK01	UCN Drop Connector Kit/RG-11
MU-NKDK01	UCN Drop Connector Kit/RG-6
MU-NCSK01	UCN Trunk Splice Kit

Continued on next page

5.3 Mounting and Operating the HPM in a Division 2 Location,

Continued

Approved Division 2
area equipment.
continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas,
Continued

Model Number	Description
Power Systems	
MU-PSSX03	Power System, single Power Supply Module (PSM)
MU-PSRX03	Power System, redundant Power Supply Modules
MU-PSRB03	Power System, redundant PSMs with Battery Pack
MU-PSSX04	Power System, single Power Supply Module
MU-PSRX04	Power System, redundant Power Supply Modules
MU-PSRB04	Power System, redundant PSMs with Battery Pack
MU-PAS121	AC Only Power System, single PSM, 120 Vac 16 A
MU-PAR121	AC Only Power System, redund PSMs, 120 Vac 16 A
MU-PAS221	AC Only Power System, single PSM, 220 Vac 16 A
MU-PAR221	AC Only Power System, redund PSMs, 220 Vac 16 A
MU-PAS111	AC Only Power System, single PSM, 120 Vac 8 A
MU-PAR111	AC Only Power System, redundant PSMs, 120 Vac 8 A
MU-PAS211	AC Only Power System, single PSM, 220 Vac 8 A
MU-PAR211	AC Only Power System, redundant PSMs, 220 Vac 8 A
Standby Manual Devices	
MU-SMAC02	Analog Output Standby Manual Device with case and cable
MU-SMDC02	Digital Output Standby Manual Device with case
MU-SMDX02	Digital Output Standby Manual Device with cable
Miscellaneous	
MU-MASX02	Manual/Auto Station model PC6001U2M040A0

Continued on next page

5.3 Mounting and Operating the HPM in a Division 2 Location, Continued

Approved Division 2
area equipment,
continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas,
Continued

Model Number	Description
Cabinet Hardware	
MU-CBDX01	Dual Access Cabinet, Rittal
MU-CBSX01	Single Access Cabinet, Rittal
MU-TMCN01	Narrow FTA Mounting Channel, Rittal
MU-TMCN02	Narrow FTA Mounting Channel with ground bar, Rittal
MU-TMCW01	Wide FTA Mounting Channel, Rittal
MU-TMCW02	Wide FTA Mounting Channel with ground bar, Rittal
MU-CBDM01	Dual Access Cabinet, NEMA 1
MU-CBSM01	Single Access Cabinet, NEMA 1
MU-TMCN11	Narrow FTA Mounting Channel, NEMA 1
MU-TMCN12	Narrow FTA Mounting Channel with ground bar, NEMA 1
MU-TMCW11	Wide FTA Mounting Channel, NEMA 1
MU-TMCW12	Wide FTA Mounting Channel with ground bar, NEMA 1
MU-TSGB01	FTA Shield Grounding Bar
Cabinet Fan Assemblies	
MU-FAN501	Cabinet Fan Assembly, 240 Vac
MU-FAN601	Cabinet Fan Assembly, 120 Vac
MU-FAN511	Cabinet Fan Assembly with alarm, 240 Vac
MU-FAN611	Cabinet Fan Assembly with alarm, 120 Vac

5.4 Field Wiring in Hazardous Locations

Nonincendive FTAs (current limiting)

Some of the Field Termination Assemblies (FTAs) that are used in the High-Performance Process Manager subsystem have resistors in the output circuits to limit the current available to the field terminals. These output circuits have been examined and certified by Factory Mutual as being Nonincendive.

This means that if the field wires are accidentally opened, shorted, or grounded and the HPM is operating normally, the wiring will not release enough energy to cause ignition in the specified flammable atmosphere.

Table 5-3 is a list of the analog input, analog output, and digital input FTAs that have Nonincendive outputs.

Also, when digital output circuits of a digital output FTA are current and voltage limited to suitable levels by the user, the digital output FTA can also be considered Nonincendive.

Cable and load parameters (entity parameters)

To ensure that the field circuits are incapable of igniting a specified flammable vapor, the size of the cable and load parameters must be known and controlled. Table 5-3 provides the maximum permissible values of the parameters for each of FTAs that are listed in the table.

Electrical code approval

In general, field wiring in Division 2 hazardous locations must be done according to local codes; however, in some jurisdictions, Nonincendive wires need not conform to the normal Division 2 wiring rules, but can use wiring methods that are suitable for ordinary locations.

See ANSI/ISA S12.12, the section “Electrical Equipment For Use In Class I, Division 2 Hazardous [Classified] Locations.”

Current limiting resistor value

The value of the resistors on the listed FTAs were selected to assure worst case short circuit currents in a hazardous area of less than 150 milliamps for normal operating equipment. According to NFPA publication #493, *Intrinsically Safe Apparatus for Use in Division 1 Hazardous Locations*, 150 milliamps from a 24 Vdc source is below the ignition threshold in a resistive circuit for gases in Groups A through D environments.

Continued on next page

5.4 Field Wiring in Hazardous Locations, Continued

Nonincendive FTAs

Wiring to the FTAs that are listed in Table 5-3 has been approved as Nonincendive wiring by Factory Mutual Research, Inc. When the wiring is opened, shorted, or grounded and the High-Performance Process Manager is in its normal operating state, the wiring cannot release enough energy to cause the ignition of a flammable atmosphere.

Table 5-3 Nonincendive FTA Types

FTA Type	FTA Models
Low Level Analog Input	MU/MC-TAIL01 MU/MC-TAIL02 MU/MC-TAIL03
High Level Analog Input	MU/MC-TAIH01 MU/MC-TAIH02 MU/MC-TAIH03 MU/MC-TAIH12 MU/MC-TAIH13 MU/MC-TAIH52 MU/MC-TAIH53
Smart Transmitter Interface Input	MU/MC-TSTX03 MU/MC-TSTX13 MU/MC-TSTX53
Pulse Input	MU/MC-TPIX12 MU/MC-TPIX52
4-20 mA Analog Output	MU/MC-TAOX01 MU/MC-TAOX02 MU/MC-TAOX12 MU/MC-TAOX52 MU/MC-TAOY22 MU/MC-TAOY23 MU/MC-TAOY52 MU/MC-TAOY53
24 Vdc Digital Input	MU/MC-DID11 MU/MC-DID12 MU/MC-DID52 MU/MC-DID72 MU/MC-DIY22 MU/MC-DIY62

Continued on next page

5.4 Field Wiring in Hazardous Locations, Continued

Cable size and load parameters

To ensure that the circuits are incapable of igniting a specific flammable atmosphere, the size of cable and load parameters must be controlled. The maximum values are given in Table 5-4.

Table 5-4 FTA Cable and Load Parameters

Parameter	Maximum Allowable Values					
	TPIX12 TPIX52	TAIL01 TAIL02 TAIL03	TAIH01 TAIH02 TAIH03 TAIH12 TAIH13 TAIH52 TAIH53 TSTX03 TSTX13 TSTX53	TAIH22 TAIH23 TAIH62	TAOX01 TAOX02 TAOX12 TAOX52 TAOY22 TAOY23 TAOY52 TAOY53	TDID12 TDID52 TDID72
VOC*—Maximum Open Circuit Voltage	26 Vdc	9 Vdc	26 Vdc	26 Vdc	26 Vdc	30 Vdc
ISC*—Maximum Short Circuit Current	63 mA	0.3 mA	186 mA	40 mA	22 mA	152 mA
C _a —Maximum Allowable Connected Cable Capacitance	0.4 μF	15 μF	0.4 μF	0.4 μF	0.4 μF	0.25 μF
L _a —Maximum Allowable Cable Inductance	17 mH	1 H	2.3 mH	35 mH	130 mH	3 mH
C _n —Maximum Allowable Connected Capacitance (Cable + Load)	0.4 μF	15 μF	0.4 μF	0.4 μF	0.4 μF	0.25 μF
L _n —Maximum Allowable Connected Inductance (Cable + Load)	17 mH	1 H	150 mH	150 mH	130 mH	400 mH

* Controlled by the High-Performance Process Manager design.

ATTENTION

ATTENTION—The data in Table 5-4 is controlled by the Honeywell drawing 51109499 and cannot be changed without the approval of Factory Mutual Research, Inc.

Section 6 – Corrosion Protection Planning

6.1 Overview

Section contents The topics covered in this section are:

	Topic	See Page
6.1	Overview.....	103
6.2	Model Numbers.....	106

Introduction

Corrosion is one of the leading causes of electronic printed circuit assembly board failure in harsh environments. Conformal coating of the assembly’s printed circuits and components provides a solution for the problem. Conformally coated assemblies are completely covered with a thin layer of a special plastic material that is resistant to the corrosive effects of humidity and most chemical gases.

ATTENTION

Table 6-1 recommends the minimum equipment requirement that is based on environmental classification tests at the site where the equipment is installed.

Table 6-1 Environment Minimum Equipment Requirement

Environment Classification	Minimum Equipment Requirement
Mild (G1)	Non-conformally coated
Moderate (G2)	Conformally coated
Harsh (G3)	Conformally coated
Severe (Gx)	Conformally coated and installed in an environmentally hardened enclosure

G3 rating

All coated assemblies will withstand the effects of a G3 (harsh) rated environment. Uncoated boards are rated for mild (G1) environments. A harsh environment is defined by ANSI/ISA-S71.04-1985, “Environmental Conditions for Process Measurement and Control Systems: Airborne Contaminates.”

Continued on next page

6.1 Overview, Continued

Environmental harshness levels

Table 6-2 defines environmental harshness levels for airborne contaminants.

Table 6-2 Harsh Environment Definitions from ANSI/ISA-S71.04-1985

Severity Level		G1 (Mild)	G2 (Moderate)	G3 (Harsh)	Gx (Severe)
Copper Reactivity Level (Angstroms/Month)		<300	<1000	<2000	≥2000
Contaminant Gas		Concentration (Parts/Billion)			
Group A	H₂S	<3	<10	<50	≥50
	SO₂, SO₃	<10	<100	<300	≥300
	Cl₂	<1	<2	<10	≥10
	NO_x	<50	<125	<1250	≥1250
Group B	HF	<1	<2	<10	≥10
	NH₃	<500	<10,000	<25,000	≥25,000
	O₃	<2	<25	<100	≥100

Gas concentrations

Gas concentrations are for reference purposes only and are believed to approximate the reactivity levels, assuming relative humidity is less than 50%. For each 10% increase in relative humidity above 50%, or change in relative humidity by greater than 6%/hour, the severity level can be expected to increase by one level.

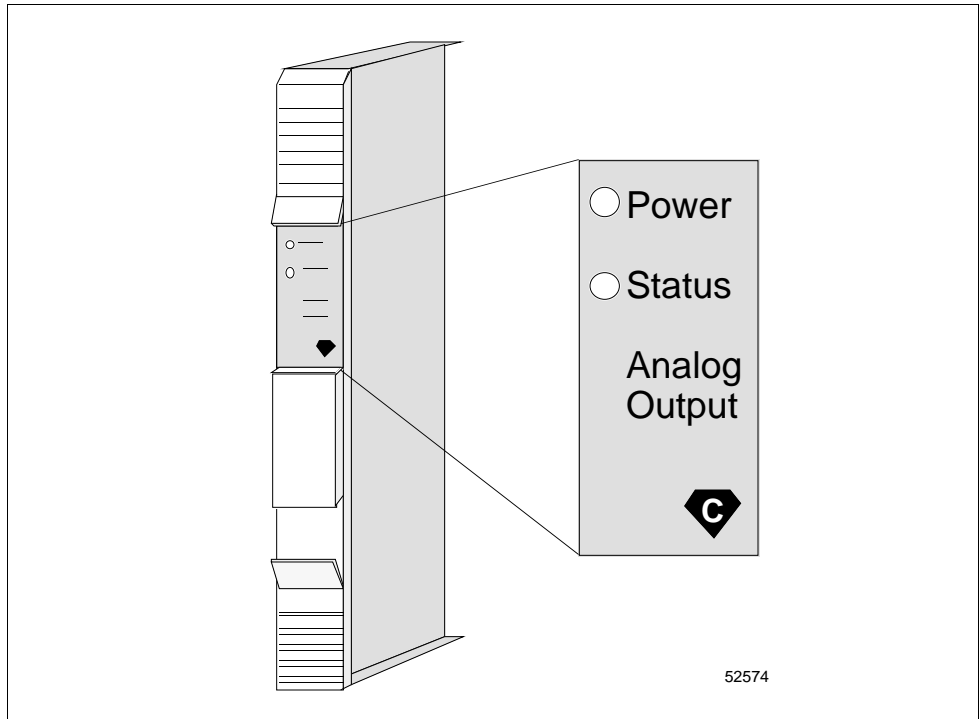
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6.1 Overview, Continued

Conformal coating symbol

Conformally coated assemblies can be easily identified by a distinctive symbol located on the assembly. The symbol consists of a “C” that is surrounded by a solid diamond. The diamond universally symbolizes hardness. The symbol is intended to represent the hardened protection against harsh environments that conformal coating provides. Figure 6-1 illustrates the symbol on the faceplate of an Analog Output IOP.

Figure 6-1 Conformal Coating Symbol



Harsh Environment Enclosure

For those users who want to locate their IOPs closer to the process and outside the control room in a severe environment, another level of protection is required. Honeywell offers the availability of a harsh environment IOP enclosure that is capable of withstanding a Gx rated atmosphere. The product includes a sealed NEMA 4x stainless steel enclosure, a special 7-Slot card file with fans for air circulation to house conformally coated IOP and I/O Link Extender cards, and a 24 Vdc Power System that uses components found in the HPM AC Only Power System. There is no active external cooling required for external ambient temperatures of up to 60°C. The IOPs interface with the HPMM(s) in the control room by fiber optic I/O Link Extender. Standard IOP to FTA cables that are enclosed in sealed conduit provide the IOP to associated FTA interface. The FTAs are mounted in sealed NEMA 4x stainless steel enclosures that are provided by the user.

6.2 Model Numbers

Model numbers

Model numbers for conformally coated assemblies and upgrade kits are identified by a “MC” prefix, instead of the normal “MU” prefix for a noncoated assembly. An example would be a conformally coated Low Level Analog Input IOP. Its model number is MC-PAIL02. The model number of the noncoated version of the IOP is MU-PAIL02.

ATTENTION

ATTENTION—The High Level Analog Input and Analog Output IOPs are available only as conformally coated assemblies. There are no noncoated versions available. The model numbers are MC-PAIH03 and MC-PAOX03, respectively.

Assembly numbers

Typically, the part number’s tab for a conformally coated assembly has the format “x5x” (non-CE Compliant) or “x7x” (CE Compliant), where “x” can be any number, 1 through 9. This provides a standard method of identifying conformally coated assemblies.

Continued on next page

6.2 Model Numbers, Continued

Conformally coated model list

Table 6-3 is a list of conformally coated High-Performance Process Manager assemblies.

Table 6-3 Conformally Coated Assembly Model Numbers

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
IOPs			
MC-PAIH03	N/A	51304754-150	High Level Analog Input (HLAI)
MC-PAIL02	N/A	51304481-150	Low level Analog Input (LLAI)
MC-PAOX03	51304672-150	51309152-175	Analog Output (AO)
MC-PAOY22	N/A	80363969-150	Analog Output (AO)
MC-PDIS12	N/A	51402625-175	Digital Input Sequence of Events (DI)
MC-PDIX02	N/A	51304485-150	Digital Input (DI)
MC-PDIY22	N/A	80363972-150	Digital Input (DI)
MC-PDOX02	N/A	51304487-150	Digital Output (DO)
MC-PDOY22	N/A	80363975-150	Digital Output (DO)
MC-PLAM02	N/A	51304362-150	Low Level Multiplexer (LLMux)
MC-PRHM01	N/A	51404109-175	Remote Hardened Low Level Multiplexer (RHMUX)
MC-PPIX02	N/A	51304386-150	Pulse Input (PI)
MC-PSDX02	N/A	51304362-250	Serial Device Interface (SDI)
MC-PSIM11	N/A	51304362-350	Serial Interface (SI)
MC-PSTX02	51304516-150	N/A	Smart Transmitter Interface (STI)
MC-PSTX03	N/A	51304516-250	Smart Transmitter Interface Multivariable (STIM)
Standard FTAs			
MC-TAIH02	51304453-150	N/A	High Level Analog Input/STI with compression term
MC-TAIH03	N/A	51309136-175	High Level Analog Input with compression terminals
MC-TAIH12	51304337-150	N/A	High Level Analog Input/STI with compression term
MC-TAIH13	N/A	51309138-175	High Level Analog Input with compression terminals
MC-TAIH22	80366195-150	N/A	High Level Analog Input/STI with compression term
MC-TAIH23	N/A	80366195-175	High Level Analog Input with compression terminals
MC-TAIH52	51304337-250	N/A	High Level Analog Input/STI with screw terminals

Continued on next page

6.2 Model Numbers, Continued

Conformally coated model list, continued

Table 6-3 Conformally Coated Assembly Model Numbers, Continued

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
Standard FTAs, continued			
MC-TAIH53	N/A	51309138-275	High Level Analog Input with screw terminals
MC-TAIH62	80366192-150	N/A	High Level Analog Input/STI with screw terminals
MC-TSTX03	N/A	51309140-175	Smart Transmitter Interface with Compression Term
MC-TSTX13	N/A	51309142-175	Smart Transmitter Interface with Compression Term
MC-TSTX53	N/A	51309142-275	Smart Transmitter Interface with Screw Terminals
MC-TAIL02	51304437-150	N/A	Low Level Analog Input with compression terminals
MC-TAIL03	N/A	51309202-175	Low Level Analog Input with compression terminals
MC-TAMR02	51304477-150	N/A	LLMux Analog Input RTD with compression terminals
MC-TAMR03	N/A	51309218-175	LLMux Analog Input RTD with compression terminals
MC-TAMT02	51401491-150	N/A	LLMux Analog Input TC with compression terminals
MC-TAMT03	N/A	51301491-175	LLMux Analog Input TC with compression terminals
MC-TAMT12	51401573-150	N/A	LLMux Analog Input TC with remote CJR, comp term
MC-TAMT13	N/A	51301573-175	LLMux Analog Input TC with remote CJR, comp term
MC-TAOX02	51304476-150	51304476-175	Analog Output with compression terminals
MC-TAOX12	51304335-150	51304335-175	Analog Output with compression terminals
MC-TAOX52	51304335-250	51304335-275	Analog Output with screw terminals
MC-TAOY22	80366177-150	80366177-175	Analog Output with compression terminals
MC-TAOY23	80366177-250	80366177-275	Analog Output with compression terminals
MC-TAOY52	80364007-150	80364007-175	Analog Output with screw terminals
MC-TAOY53	80364007-250	80364007-275	Analog Output with screw terminals
MC-TDIA12	51304439-150	51304439-175	120 Vac Digital Input with compression terminals
MC-TDIA52	51304439-250	51304439-275	120 Vac Digital Input with fixed-screw terminals
MC-TDIA72	51303930-150	N/A	120 Vac Digital Input with removable-screw terminals
MC-TDIA22	51304431-150	51304431-175	240 Vac Digital Input with compression terminals

Continued on next page

6.2 Model Numbers, Continued

Conformally coated
model list, continued

Table 6-3 Conformally Coated Assembly Model Numbers, Continued

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
Standard FTAs, continued			
MC-TDIA62	51304431-250	51304431-275	240 Vac Digital Input with fixed-screw terminals
MC-TDID12	51304441-150	51304441-175	24 Vdc Digital Input with compression terminals
MC-TDID52	51304441-250	51304441-275	24 Vdc Digital Input with fixed-screw terminals
MC-TDID72	51303928-150	N/A	24 Vdc Digital Input with removable-screw terminals
MC-TDIY22	80366180-150	80366180-175	24 Vdc Digital Input with compression terminals
MC-TDIY62	80366180-250	80366180-275	24 Vdc Digital Input with fixed-screw terminals
MC-TDOA13	51304648-150	51304648-175	120/240 Vac Solid-State Digital Output w/comp term
MC-TDOA53	51304648-250	51304648-275	120/240 Vac Solid-State Digital Output w/screw term
MC-TDOD13	51304650-150	N/A	3-30 Vdc Digital Output with compression terminals
MC-TDOD14	N/A	51309153-175	3-30 Vdc Digital Output with compression terminals
MC-TDOD22	51304428-150	N/A	31-200 Vdc Digital Output with compression terminals
MC-TDOD23	N/A	51309154-175	31-200 Vdc Digital Output with compression terminals
MC-TDOD53	51304650-250	N/A	3-30 Vdc Digital Output with screw terminals
MC-TDOD54	N/A	51309153-275	3-30 Vdc Digital Output with screw terminals
MC-TDOD62	51304428-250	N/A	31-200 Vdc Digital Output with screw terminals
MC-TDOD63	N/A	51309154-275	31-200 Vdc Digital Output with screw terminals
MC-TDON12	51304446-150	N/A	24 Vdc Nonisolated Digital Output with comp term
MC-TDON52	51304446-250	N/A	24 Vdc Nonisolated Digital Output with screw term
MC-TDOY22	80366183-150	80366183-175	24 Vdc Isolated Digital Output with compression term
MC-TDOY62	80364013-150	80364013-175	24 Vdc Isolated Digital Output with screw terminals
MC-TDOR12	51304443-150	51309148-175	120 Vac/125 Vdc Relay Digital Output with comp term
MC-TDOR52	51304443-250	51309148-275	120 Vac/125 Vdc Relay Digital Output with screw term
MC-TDOR22	51304427-150	51309150-175	240 Vac/125 Vdc Relay Digital Output with comp term
MC-TDOR62	51304427-250	51309150-275	240 Vac/125 Vdc Relay Digital Output with screw term

Continued on next page

6.2 Model Numbers, Continued

Conformally coated model list, continued

Table 6-3 Conformally Coated Assembly Model Numbers, Continued

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
Standard FTAs, continued			
MC-TDOY23	80366189-150	80366189-175	240 Vac/125 Vdc Relay Digital Output with comp term
MC-TDOY63	80366185-150	80366185-175	240 Vac/125 Vdc Relay Digital Output with screw term
MC-TDPR02	51304425-150	51304425-175	Digital Input Power Distribution Assembly
MC-TLPA02	51304467-150	51309204-175	Power Adapter
MC-TPIX12	51304084-150	51304084-175	Pulse Input with compression terminals
MC-TPIX52	51304084-250	51304084-275	Pulse Input with screw terminals
MC-TSDM02	51303932-252	N/A	Serial Device Interface—Manual/Auto Station
MC-TSDT02	51303932-251	N/A	Serial Device Interface—Toledo Weigh Cell
MC-TSDU02	51303932-253	N/A	Serial Device Interface—UDC 6000 Modbus
MC-TSIA12	51303932-453	51303932-478	Serial Interface—Allen-Bradley
MC-TSIM12	51303932-451	51303932-476	Serial Interface—Modbus EIA-232
Galvanically Isolated FTAs			
MC-GRMT01	N/A	51404106-175	RHMUX Analog Input with local CJR, screw term
MC-GRPA01	N/A	51304724-175	RHMUX GI/IS Power Adapter with compression term
MC-TRPA01	N/A	51304722-175	RHMUX GI/NI Power Adapter with compression term
MC-GAIH12	51304636-150	N/A	High Level Analog Input with compression terminals
MC-GAIH13	51304718-150	51304718-175	High Level Analog Input/STI with compression term
MC-GAIH14	51304730-150	51304730-175	High Level Analog Input/STI with compression term
MC-GAIH22	51304748-150	51304748-175	High Level Analog Input with compression terminals
MC-GAIH82	51304636-350	N/A	High Level Analog Input with crimp terminals
MC-GAIH83	51304718-350	51304718-375	High Level Analog Input/STI with crimp terminals
MC-GAIH84	51304730-350	51304730-375	High Level Analog Input/STI with crimp terminals
MC-GAIH92	51304748-350	51304748-375	High Level Analog Input with crimp terminals
MC-GAOX02	51304638-150	51304638-175	Nonredundant Analog Output with compression term

Continued on next page

6.2 Model Numbers, Continued

Conformally coated model list, continued

Table 6-3 Conformally Coated Assembly Model Numbers, Continued

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
Galvanically Isolated FTAs, continued			
MC-GAOX12	51304638-250	51304638-275	Redundant Analog Output with compression terminal
MC-GAOX72	51304638-350	51304638-375	Nonredundant Analog Output with crimp terminals
MC-GAOX82	51304638-750	51304638-775	Redundant Analog Output with crimp terminals
MC-GDID12	51304640-150	51304640-175	Digital Input with compression terminals
MC-GDID13	51304728-150	51304728-175	Digital Input with compression terminals
MC-GDID82	51304640-350	51304640-375	Digital Input with crimp terminals
MC-GDID83	51304728-350	51304728-375	Digital Input with crimp terminals
MC-GDOD12	51304642-150	51304642-175	24 Vdc Digital Output with compression terminals
MC-GDOD82	51304642-350	51304642-375	24 Vdc Digital Output with crimp terminals
MC-GDOL12	51304736-150	51304736-175	24 Vdc Digital Output with compression terminals
MC-GDOL82	51304736-350	51304736-375	24 Vdc Digital Output with crimp terminals
MC-GLFD02	51304732-150	51304732-175	Combiner Panel
MC-GMAR52	51304646-150	51309156-175	Marshalling Panel
MC-GPRD02	51304644-150	51304644-175	Power Distribution Assembly
I/O Link Extender			
MC-IOLM02			Standard I/O Link Extender—Local Card File
	N/A	51304419-150	Standard I/O Link Extender Card
	N/A	51201557-350	Standard I/O Link Extender Coupler
MC-IOLX02			Standard I/O Link Extender—Remote Card File
	N/A	51304419-150	Standard I/O Link Extender Card
	N/A	51201557-150	Standard I/O Link Extender Coupler
MC-ILD03			Long Distance I/O Link Extender
	N/A	51304532-150	Long Distance I/O Link Extender Card
	N/A	51309208-150	Long Distance I/O Link Extender Coupler

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6.2 Model Numbers, Continued

Conformally coated model list, continued

Table 6-3 Conformally Coated Assembly Model Numbers, Continued

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
Card Files			
MC-HPFH01	51404125-150	N/A	Left 7-Slot Card File Assembly
MC-HPFH03	N/A	51404191-175	Left 7-Slot HPMM Card File Assembly
MC-HPFH11	51404126-150	N/A	Right 7-Slot Card File Assembly
MC-HPFH13	N/A	51404192-175	Right 7-Slot HPMM Card File Assembly
MC-HPFX02	51404127-150	N/A	15-Slot Card File Assembly
MC-HPFX03	N/A	51404193-175	15-Slot HPMM Card File Assembly
MC-HPFI03	N/A	51404191-275	Left 7-Slot IOP Card File Assembly
MC-HPFI13	N/A	51404192-275	Right 7-Slot IOP Card File Assembly
MC-HPFI23	N/A	51404193-275	15-Slot IOP Card File Assembly
HPMM Card Sets			
MC-HPMS01			Nonredundant HPMM Card Set
	N/A	51301635-150	High-Performance Comm/Control Card
	N/A	51301642-150	High-Performance I/O Link Card
	N/A	51302573-150	HPM UCN Interface Module
MC-HPMR01			Redundant HPMM Card Sets
	N/A	51301635-150	High-Performance Comm/Control Card (2)
	N/A	51301642-150	High-Performance I/O Link Card (2)
	N/A	51302573-150	HPM UCN Interface Module (2)
	N/A	51201667-100	Redundancy Cable

Continued on next page

6.2 Model Numbers, Continued

Conformally coated model list, continued

Table 6-3 Conformally Coated Assembly Model Numbers, Continued

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
Power System			
MC-PSSX03	N/A	51401217-450	Power System, single Power Supply Module
MC-PSSX04	N/A	51404174-175	Power System, single Power Supply Module
MC-PSRX03	N/A	51401217-550	Power System, redundant Power Supply Modules
MC-PSRX04	N/A	51404174-275	Power System, redundant Power Supply Modules
MC-PSRB03	N/A	51401217-650	Power System, redundant PSMs with Battery Pack
MC-PSRB04	N/A	51404174-375	Power System, redundant PSMs with Battery Pack
MC-PAS121	51401140-150	N/A	AC Only Power System, single PSM, 115 Vac 16 A
MC-PAR121	51401140-250	N/A	AC Only Power System, redund PSMs, 115 Vac 16 A
MC-PAS221	51401140-350	N/A	AC Only Power System, single PSM, 230 Vac 16 A
MC-PAR221	51401140-450	N/A	AC Only Power System, redund PSMs, 230 Vac 16 A
MC-PAS111	51401140-550	N/A	AC Only Power System, single PSM, 115 Vac 8 A
MC-PAR111	51401140-650	N/A	AC Only Power System, redund PSMs, 115 Vac 8 A
MC-PAS211	51401140-750	N/A	AC Only Power System, single PSM, 230 Vac 8 A
MC-PAR211	51401140-850	N/A	AC Only Power System, redund PSMs, 230 Vac 8 A
Standby Manual Devices			
MC-SMAC02	N/A	51401277-250	Analog Output Standby Manual Device w/case, cable
MC-SMDC02	N/A	51304526-150	Digital Output Standby Manual Device w/case, cable
MC-SMDX02	N/A	51304527-150	Digital Output Standby Manual Device with cable
Cabinet Fan Assemblies			
MC-FAN511			Cabinet Fan Assembly with alarm, 240 Vac
	N/A	51303940-250	Cabinet Fan Assembly with alarm, 240 Vac
MC-FAN611			Cabinet Fan Assembly with alarm, 120 Vac
	N/A	51303940-150	Cabinet Fan Assembly with alarm, 120 Vac

Continued on next page

6.2 Model Numbers, Continued

Conformally coated model list, continued

Table 6-3 Conformally Coated Assembly Model Numbers, Continued

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
Miscellaneous			
MC-CBSS01			NEMA 4x Stainless Steel Enclosure (.6 m W x .5 m D x .6 m H) with Left 7-Slot card file
MC-CBSS02			NEMA 4x Stainless Steel Enclosure (.6 m W x .5 m D x .6 m H) with Right 7-Slot card file

Section 7 – CE Compliance

7.1 Overview

Section contents The topics covered in this section are:

	Topic	See Page
7.1	Overview.....	115
7.2	Card Files.....	116
7.3	HPMM Cards.....	117
7.4	IOPs.....	117
7.5	FTAs.....	120
7.6	I/O Link Extender.....	129
7.7	IOP to FTA Cables.....	130
7.8	Power Cables.....	131
7.9	I/O Link Interface Cables.....	136
7.10	UCN Trunk Cable Taps.....	137
7.11	Cabinets.....	139

Introduction To meet CE Compliance directives, card files, High-Performance Process Manager Module (HPMM) cards, Field Termination Assemblies (FTAs), Power Systems, and cables, namely IOP to FTA cables, power cables, and I/O Link Interface cables, are available and identified either by model number or by the assembly part number.

Hardware differences Where applicable, this section describes general differences between the CE Compliant hardware and non-CE Compliant hardware.

Also discussed are the hardware combinations and rules that must be considered for CE Compliance.

CE Compliant hardware identification Finally, where applicable, each subsection that is devoted to a particular type of hardware identifies the CE Compliant and the non-CE Compliant hardware.

Master Reference Ground The use of a Master Reference Ground (MRG), which is separate from Safety Ground, is not acceptable for a CE Compliant installation. References to Master Reference Ground must be ignored and a single Safety Ground must be substituted.

CE Compliant installation Only recommended CE Compliant hardware, cabling, and practices must be considered for a CE Compliant installation. Install only a single ground system.

7.2 Card Files

Introduction

All three card file types are available for CE Compliant applications. The CE Compliant models have three unique features. They are

- Filtered backpanel IOP connectors
- IOP connector ground panel(s)
- Rear backpanel shield

Unlike the non-CE Compliant 7-Slot and 15-Slot card files that are not dedicated HPMM or IOP card files, the CE-Compliant 7-Slot and 15-Slot card files are mechanically either HPMM or IOP card files. 7-Slot or 15-Slot IOP card files will not accept an HPMM card set.

Backpanel ground plane

The backpanel ground panel provides a ground plane for the body of the IOP connectors. The body of the connector in turn provides ground for the IOP to FTA cable shield when mated with the IOP connector.

Rear backpanel shield panel

Like the UCN connector shield enclosure, the backpanel shield panel provides EMI protection at the back of the backpanel.

IOP to FTA cables

Both the model MU-KFTAxx and MU-KFTSxx IOP to FTA cables can be used with both the CE Compliant and non-CE Compliant card files. However, only the CE Compliant card file models and the model MU-KFTSxx IOP to FTA cables together are acceptable as CE Compliant.

Model list

Table 7-1 lists the model numbers of the CE Compliant card files. All models are available without conformal coating (MU) and with conformal coating (MC). The PM/APM technology IOP Only card file is also included because it may exist when a PM or APM is upgraded to an HPM.

Table 7-1 Card Files

Card File Description	Non-Conformally Coated Model Number	Conformally Coated Model Number
Left 7-Slot HPMM	MU-HPFH03	MC-HPFH03
Right 7-Slot HPMM	MU-HPFH13	MC-HPFH13
15-Slot HPMM	MU-HPFX03	MC-HPFX03
Left 7-Slot IOP	MU-HPFI03	MC-HPFI03
Right 7-Slot IOP	MU-HPFI13	MC-HPFI13
15-Slot IOP	MU-HPFI23	MC-HPFI23
IOP Only (PM/APM)	MU-IOFX03	MC-IOFX03

Continued on next page

7.2 Card Files, Continued

Conversion kit A model MU-ZPFI03 upgrade kit will convert a 7-Slot or 15-Slot HPMM card file to an IOP card file.

7.3 HPMM Cards

Introduction The High-Performance Process Manager Module (HPMM) card set is CE Compliant.

Conformal coating The HPMM card set is available with and without conformal coating.

7.4 IOPs

Introduction Only the model MU-PAOX03 Analog Output IOP is available in a CE Compliant and non-CE Compliant version. All other IOP models are CE Compliant only.

Conformal coating All IOP cards are available with and without conformal coating.

Continued on next page

7.4 IOPs, Continued

Nonconformally coated IOPs Table 7-2 lists the model numbers of the CE Compliant and non-CE Compliant IOP cards that are not conformally coated. Model numbers and part numbers identify the assemblies.

Table 7-2 IOPs—Nonconformally Coated

IOP Type	Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
LLAI	MU-PAIL02	N/A	51304481-100
LLMux	MU-PLAM02	N/A	51304362-100
RHMUX	MU-PRHM01	N/A	51404109-125
HLAI	MU-PAIH03	N/A	51304754-100
STIM	MU-PSTX03	N/A	51304516-200
AO	MU-PAOX03	51304672-100	51309152-125
AO	MU-PAOY22	N/A	80363969-100
DI	MU-PDIX02	N/A	51304485-100
DI	MU-PDIY22	N/A	80363972-100
DISOE	MU-PDIS12	51402625-125	N/A
DO	MU-PDOX02	N/A	51304487-100
DO	MU-PDOY22	N/A	80363975-100
PI	MU-PPIX02	N/A	51304386-100
SDI	MU-PSDX02	N/A	51304362-200
SI	MU-PSIM11	N/A	51304362-300

Continued on next page

7.4 IOPs, Continued

Conformally coated IOPs

Table 7-3 lists the model numbers of the CE Compliant and non-CE Compliant IOP cards that are conformally coated. Model numbers and part numbers identify the assemblies.

Table 7-3 IOPs—Conformally Coated

IOP Type	Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
LLAI	MC-PAIL02	N/A	51304481-150
LLMux	MC-PLAM02	N/A	51304362-150
RHMUX	MC-PRHM01	N/A	51404109-175
HLAI	MC-PAIH03	N/A	51304754-150
STI	MC-PSTX02	N/A	51304516-150
STIM	MC-PSTX03	N/A	51304516-250
AO	MC-PAOX03	51304672-150	51309152-175
AO	MC-PAOY22	N/A	80363969-150
DI	MC-PDIX02	N/A	51304485-150
DI	MC-PDIY22	N/A	80363972-150
DISOE	MC-PDIS12	N/A	51402625-175
DO	MC-PDOX02	N/A	51304487-150
DO	MC-PDOY22	N/A	80363975-150
PI	MC-PPIX02	N/A	51304386-150
SDI	MC-PSDX02	N/A	51304362-250
SI	MC-PSIM11	N/A	51304362-350

7.5 FTAs

Introduction

Many types of FTAs are available that are CE Compliant. Some are identified by a model number that is different than the model number for the non-CE Compliant FTA. Other CE Compliant FTA types have the same model number as the non-CE Compliant FTA, but are generally identified by the tab number of the part number that ends in “25.”

The CE Compliant FTAs feature filtered connectors to interface the CE Compliant model MU-KFTSxx IOP to FTA cable(s).

Conformal coating

All FTAs are available with and without conformal coating.

Nonconformally coated FTAs

Table 7-4 is a list of CE Compliant and non-CE Compliant FTAs that are not conformally coated. Model numbers and part numbers identify the assemblies.

Table 7-4 Field Termination Assemblies—Nonconformally Coated

FTA Type	Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
LLAI	MU-TAIL02	51304437-100	N/A
LLAI	MU-TAIL03	N/A	51309202-125
LLMux RTD	MU-TAMR02	51304477-100	N/A
LLMux RTD	MU-TAMR03	N/A	51309218-125
LLMux TC	MU-TAMT02	51401491-100	N/A
LLMux TC	MU-TAMT03	N/A	51309223-125
LLMux TC Remote	MU-TAMT12	51401573-100	N/A
LLMux TC Remote	MU-TAMT13	N/A	51309213-125
RHMUX GI/IS Power Adapter	MU-GRPA01	N/A	51304724-125
RHMUX GI/NI Power Adapter	MU-TRPA01	N/A	51304722-125
HLAI/STI	MU-TAIH02	51304453-100	N/A
HLAI/STI	MU-TAIH12	51304337-100	N/A
HLAI/STI	MU-TAIH22	80366195-100	N/A
HLAI/STI	MU-TAIH52	51304337-200	N/A
HLAI/STI	MU-TAIH62	80366192-100	N/A
HLAI	MU-TAIH03	N/A	51309136-125
HLAI	MU-TAIH13	N/A	51309138-125

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7.5 FTAs, Continued

Nonconformally coated FTAs, continued

Table 7-4 Field Termination Assemblies—Nonconformally Coated, Continued

FTA Type	Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
HLAI	MU-TAIH23	N/A	80369165-125
HLAI	MU-TAIH53	N/A	51309138-225
STI	MU-TSTX03	N/A	51309136-125
STI	MU-TSTX13	N/A	51309138-125
STI	MU-TSTX53	N/A	51309138-225
AO	MU-TAOX02	51304476-100	51304476-125
AO	MU-TAOX12	51304335-100	51304335-125
AO	MU-TAOX52	51304335-200	51304335-225
AO	MU-TAOY22	80366177-100	80366481-125
AO	MU-TAOY23	80366177-200	N/A
AO	MU-TAOY52	80364007-100	80366484-125
AO	MU-TAOY53	80364007-200	N/A
24 Vdc DI	MU-TDID12	51304441-100	51304441-125
24 Vdc DI	MU-TDID52	51304441-200	51304441-225
24 Vdc DI	MU-TDID72	51303928-100	N/A
24 Vdc DI	MU-TDIY22	80366180-100	80366180-125
24 Vdc DI	MU-TDIY62	80364010-100	80364010-125
120 Vac DI	MU-TDIA12	51304439-100	51304439-125
120 Vac DI	MU-TDIA52	51304439-200	51304439-225
120 Vac DI	MU-TDIA72	51303930-100	N/A
240 Vac DI	MU-TDIA22	51304431-100	51304431-125
240 Vac DI	MU-TDIA62	51304431-200	51304431-225
24 Vdc Nonisolated DO	MU-TDON12	51304446-100	N/A
24 Vdc Nonisolated DO	MU-TDON52	51304446-200	N/A
24 Vdc Isolated DO	MU-TDOY22	80366183-100	80366183-125

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