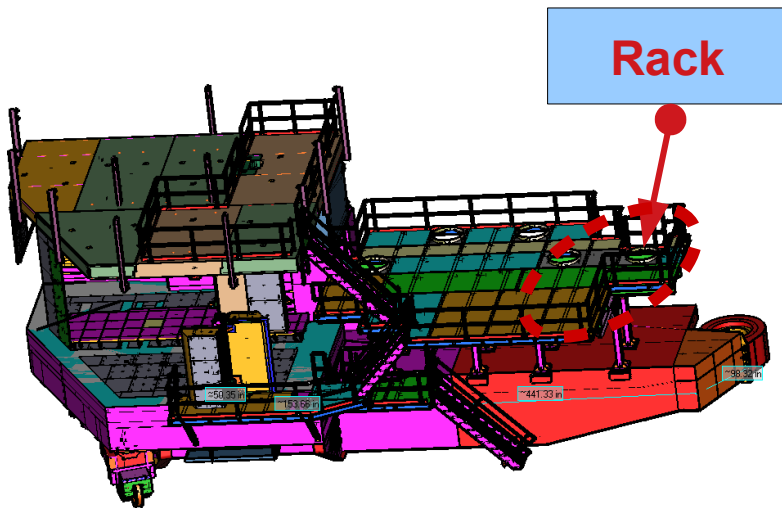


Signal/HV Cable Runs

- Plan is for a single 84" tall, 19" standard width rack to be placed near the pivot
 - Planned to go on the upper, power supply deck

- The rack at the pivot will be "double sided":
 - One side will provide 1100 BNC connections
 - » BNC ↔ BNC feedthroughs

- The other side will provide 30+2 high-density HV connections
 - » "Radial 52" connector
 - » 36 ch/connector



HV / Slow Controls / Cabling Overview

- High Voltage

- High Voltage (-1.6kV @ < 1 mA base draw)

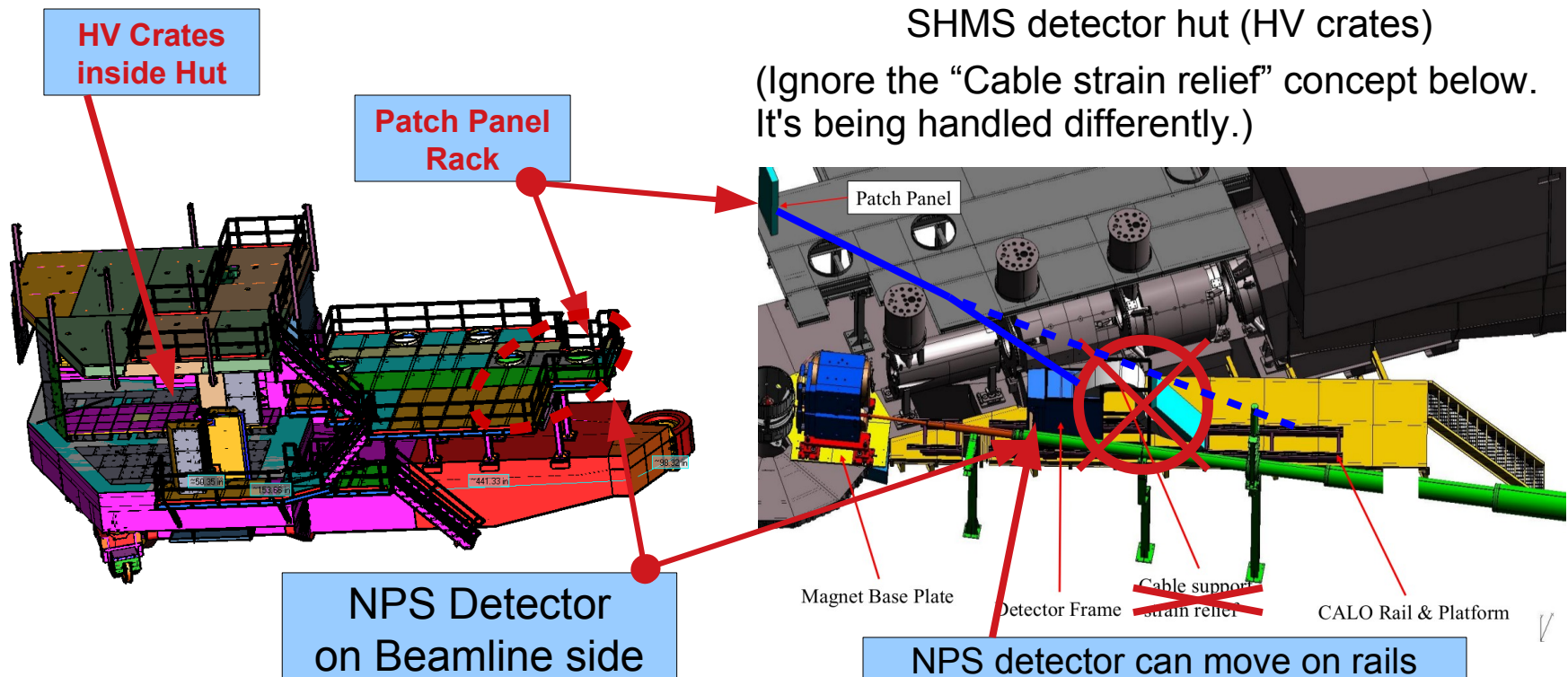
- » 30x CAEN 7030N Cards (36ch, 1mA max/ch)

- High Voltage Cables

- 2 cable runs:

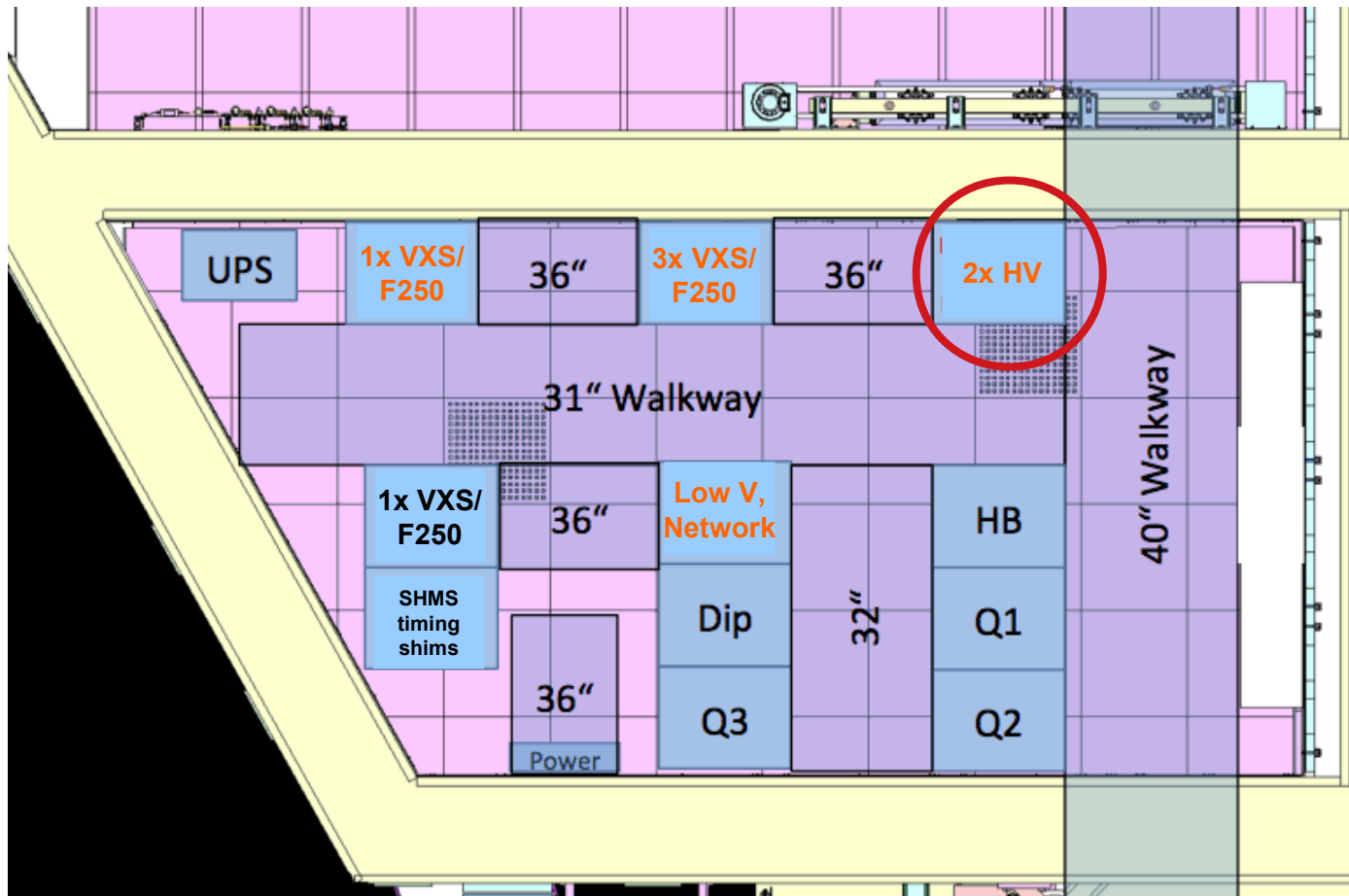
- » NPS roof patch → (~60-70' run) → Patch panel rack on SHMS carriage near pivot, and
 - » Patch panel rack → (~60-70' run) → SHMS detector hut (HV crates)

(Ignore the “Cable strain relief” concept below. It's being handled differently.)



Rackspace in SHMS hut

- 4+1 VXS crates + 2 High Voltage crates
 - It's pretty snug, but it'll fit...
 - Cables flow into crates via cable trays running above racks



HV / Slow Controls / Cabling Overview

- High Voltage

→ High Voltage (-1.6kV @ < 1 mA base draw)

- » 30x CAEN 7030N Cards (36ch, 1mA max/ch)

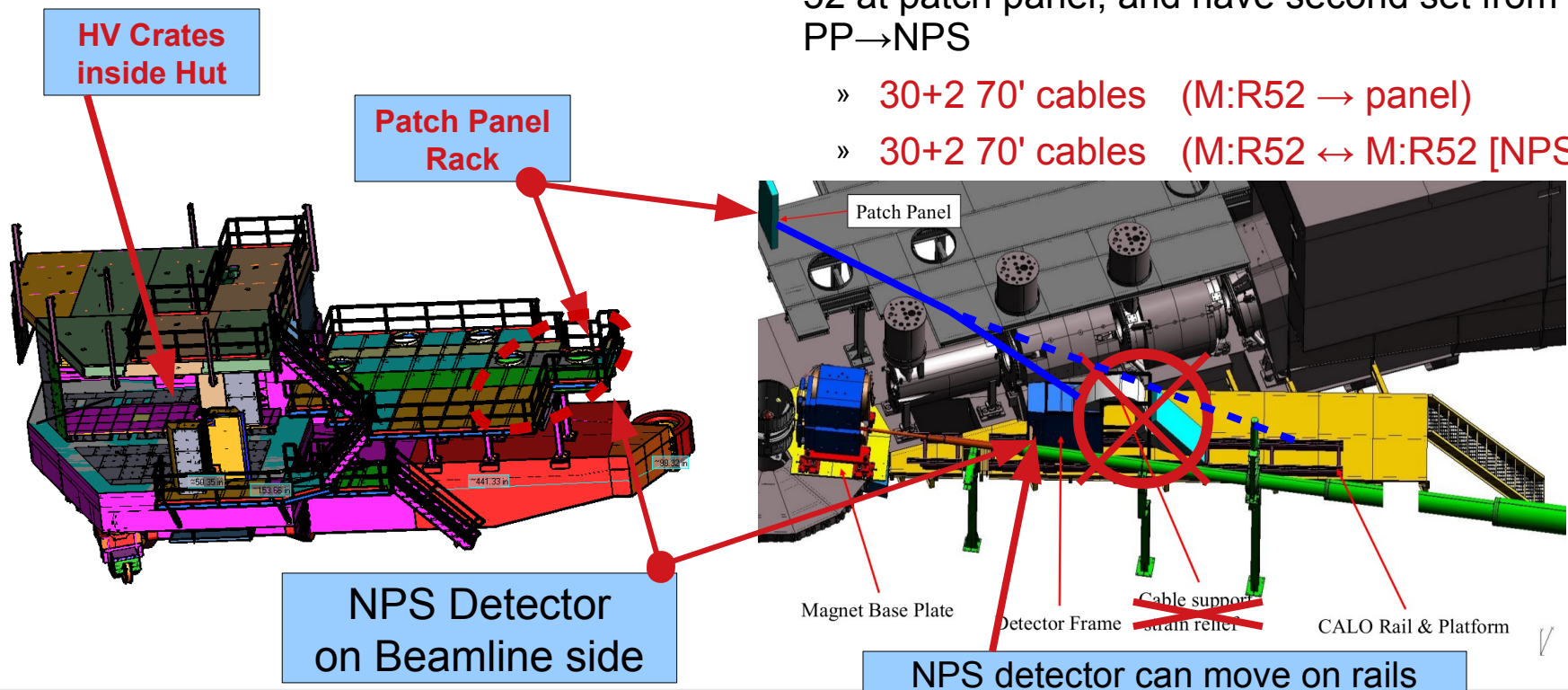
- High Voltage Cables

→ IF Radial 52 F-F feedthroughs exist for the patch panel, then one set of cables would work:

- » 60+4 identical 70' cables (M:R52 ↔ M:R52)

→ Else hardwire cable to panel-mount (F) Radial 52 at patch panel, and have second set from PP→NPS

- » 30+2 70' cables (M:R52 → panel)
- » 30+2 70' cables (M:R52 ↔ M:R52 [NPS])



NPS High Voltage Supply

- High Voltage Requirements
 - 1100 channels
 - -1.6kV @ < 1 mA base draw
- Supplied by 2 CAEN SY4527 HV Chasses w/ Booster
 - 16x CAEN 7030TN Cards each
 - » Each card: 36ch, 1mA max/ch (matches 36 crystal columns)
 - 576 ch/crate; 1152 ch total
- Procurement in progress:
 - 1 Crate + 17 cards ordered Feb/19
 - 2nd duplicate order pending (\$90k)



HV Patch Notes

- HV patch panel will accept a 'Radiall 52' male connector
 - The connector has common ground for 48 independent channels (of which we use 36)
 - The connector ground must be isolated from the rack
- Other end will plug into CAEN 7030 cards
 - Connector map follows CAEN pinout as shown on left (from CAEN 7030 manual)
- Cables 'reversible' and reusable
- Multi-conductor cable identified
 - Teledyne Reynolds in Torrance, CA.
 - » Part# 178-5790
- HV patch panel components TBP

<https://www.datasheets360.com/pdf/8778225758601965736>

<https://www.caen.it/products/a996/>

https://userweb.jlab.org/~brads/Manuals/Hardware/CAEN/A730_HV_Boards-Apr2016.pdf



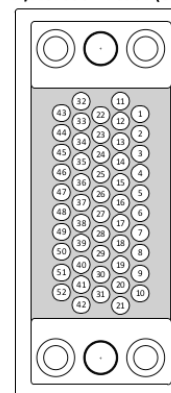
CAEN  Electronic Instrumentation



Multipin connector pin assignment

Table 2 – 52 pin connector assignment

A/AG7030 – 7030T (CH36..47 N.C. on A7030T & AG7030T)



#	function
1	CH02
2	CH07
3	CH12
4	CH17
5	CH22
6	CH27
7	CH32
8	CH37
9	CH42
10	CH47

#	function
11	RETURN
12	CH04
13	CH09
14	CH14
15	CH19
16	CH24
17	CH29
18	CH34
19	CH39
20	CH44
21	RETURN

#	function
22	CH01
23	CH06
24	CH11
25	CH16
26	CH21
27	CH26
28	CH31
29	CH36
30	CH41
31	CH46

#	function
32	RETURN
33	CH03
34	CH08
35	CH13
36	CH18
37	CH23
38	CH28
39	CH33
40	CH38
41	CH43
42	SAFETY LOOP

#	function
43	CH00
44	CH05
45	CH10
46	CH15
47	CH20
48	CH25
49	CH30
50	CH35
51	CH40
52	CH45

Radial HV Connector

HIGH VOLTAGE MULTIPIN CONNECTORS

- ❑ High voltage connectors (breakdown voltage 12,5 kVdc).
- ❑ High density rectangular connectors for 23 or 52 high voltage contacts.
- ❑ Braid to braid electrical continuity achieved once plug & receptacle are mated.
- ❑ Rear release, rear removable size 23 crimp contacts.
- ❑ Interlock contacts.



These connectors have been designed for high voltage applications on four CERN experiments (ATLAS, CMS, ALICE, LHC-B) of the LHC (Large Hadron Collider) particle accelerator. For connectors with 23 or 52 contacts (size 23 crimp), there are five configurations available (see table on reverse side). The connectors can be fitted with two interlock pin contacts that switch off the power supply before unmating the standard contacts. Both interlock and standard contacts are rear release rear removable crimp contacts. The electrical continuity between the plug and the receptacle is provided by the connector pin guides.

TECHNICAL CHARACTERISTICS :

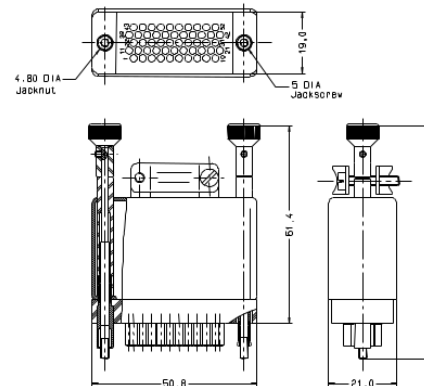
- Material insulator : Thermoplastic UL94V0 - halogen free - tensile strenght reduction does not exceed 6% after a cumulative exposition to 5 10⁷Gy at a rate of 1 to 2 Gy / h.
- Backshell & shroud : Aluminium alloy nickel plated.
- Locking device : Stainless steel and nickel plated copper alloy.
- Contacts : Copper alloy gold over nickel plated.
- Breakdown voltage : 12,5 kV dc.

ISO 9001 APPROVED

<https://www.datasheets360.com/pdf/8778225758601965736>
<https://www.caen.it/products/a996/>

DIMENSIONS :

The drawing below shows the dimensions (mm) of the plug for cable and for 52 socket contacts.



CERN / RADIAL CROSS REFERENCES :

CERN P/N	RADIAL P/N	Designation
09.41.34.700.2	691802002	Plug for cable and for 52 socket contacts
09.41.34.720.8	691802004	Plug for cable and for 52 pin contacts
09.41.34.705.7	691803002	Receptacle for cable and for 52 pin contacts
09.41.34.710.0	691803004	Receptacle for front panel and for 52 pin contacts
09.41.34.730.6	691803006	Receptacle for front panel and for 52 socket contacts
09.41.34.500.8	691802003	Plug for cable and for 23 socket contacts
09.41.34.520.4	691802005	Plug for cable and for 23 pin contacts
09.41.34.505.3	691803003	Receptacle for cable and for 23 pin contacts
09.41.34.510.6	691803005	Receptacle for front panel and for 23 pin contacts
09.41.34.530.2	691803007	Receptacle for front panel and for 23 socket contacts
09.41.33.840.5	691804200	Size 23 pin contact for 0,12mm ² cross section cable
09.41.33.820.9	691804201	Size 23 pin contact for 0,02mm ² cross section cable
09.41.33.830.7	691804300	Size 23 socket contact for 0,12mm ² cross section cable
09.41.33.810.1	691804301	Size 23 socket contact for 0,02mm ² cross section cable
09.41.33.890.5	691804230	Size 23 interlock pin contact for 0,12mm ² cross section cable
09.41.33.880.7	691804231	Size 23 interlock pin contact for 0,02mm ² cross section cable
T.B.D	282281	Crimping tool
T.B.D	282585001	Positioner
T.B.D	282549024	Insertion / extraction tool

For further information please contact your nearest Radial representative :



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This information is intended as a guide only. To ensure a continuing policy of product improvement, Radial reserves the right to modify its specifications without prior notification.

Registered Trade Mark

June 2002 Edition

D7 300 TE



Multiconductor HV Cable

- Multiconductor cable recommendation

→ Teledyne Reynolds

– Part# 178-5790

» Ph: (310) 823.5491

» Em: tr_sales@teledyne.com

→ Used by CERN, CAEN

FEP FEATURES AND PROPERTIES

Heritage Quality Performance

Extruded, FEP insulated, high voltage wire and cable offers exceptional dielectric strength without the disadvantages common to equally rated silicone rubber insulated cables. As a result, cable assemblies or cable bundles are smaller in diameter, volume and in bend radius thus allowing the system designer to better utilize space within their system. Also, its molecular structure gives it excellent durability and resistance to dielectric/cooling fluid degradation.

FEP insulation, being a harder material than silicone rubber, is not prone to "pin-holing" and high voltage "punch-thru" when the cable surface is abraded or when strands break during in-field servicing. FEP is also more resistant to damage when making contact with sharp edges. Even so, sharp edges should always be avoided.

Although FEP is generally difficult to bond to, Teledyne Reynolds, has developed a Ready-to-Bond™ product line that is manufactured using proprietary abrading and surface preparation techniques that enable excellent silastic bonds. Teflon® tape wrapped cable, which is similar to FEP in dielectric strength and corona inception, is difficult to bond to because of its multiple spiral cross section, irregular surface and variations in diameter. Therefore, FEP cable should not only be considered for use in cable assemblies, but as high voltage hook-up wire within encapsulated high voltage power supplies, TWTs and transformers.

PROPERTIES OF FEP FLUOROCARBON RESIN

Physical, Thermal and Electrical Properties	Typical Values
Specific Gravity	2.14
Tensile Strength (PSI)	3500
Elongation (%)	.325
Flexural Modulus (PSI)	90,000
Thermal Conductivity (cal/sec-cm °F)	6x10 ⁻⁴
Thermal Expansion (in/in/ °F)	7.5 x 10 ⁻⁵
Continuous Use Temperature (°C)	204
Melt Temperature (°C)	255-265
Low Temperature Limit (°C)	-240
Hardness Durometer	D56
Water Absorption (%)	<.01
Flame Resistance	Excellent
Dielectric Constant, 60-10 ⁶ Hz	2.1
Dissipation Factor, 60-10 ⁶ Hz	<.0007
Volume Resistivity (Ohm-cm)	<10 ¹⁸
Surface Resistivity (Ohm/square)	<10 ¹⁶
Resistance to:	Rating
Cold Flow or Cut Through	Fair
Ultraviolet Radiation	Excellent
Electro-Mechanical Stress Cracking	Excellent
Chemical-Mechanical Stress Cracking	Excellent

Conductor Material: Copper

Conductor Finish: Silver plated per test requirements of ASTM B298. Meets solderability per MIL-STD-202.

Note: Pre-conditioning of FEP cable after cutting to length is recommended because FEP cable will shrink when exposed to temperature cycling. Pre-conditioning should be conducted in an air circulating oven at 204°C (400°F) for one hour. No attempt should be made to condition wire or cable in bulk form or while spooled.

Teflon® is a registered trademark of DuPont

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Approved for Public Release: MP/022/15

Rev. 09/2515

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