

File E28476

March 08, 1982

REPORT

on

COMPONENT - CONNECTORS FOR USE IN DATA, SIGNAL, CONTROL AND POWER
APPLICATIONS

TYCO Electronics Corp
Middletown, PA

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DESCRIPTION

PRODUCT COVERED:

Component-AMP Positive Lock and Positive Lock EX Connector Series.
 USR, CNR - Cat. No. 176498, 1969735-1, 1969453-1.
 USR, CNR - Cat. Nos. 521119, 521253, 521955 and 521766 and 521253 with contact, Cat. Nos. 63854, 63306, 63933 and 1217092.
 USR Only - Cat. Nos. 176497-1 and 176497-9 with contact Cat. No. 175057-1
 USR, CNR - Cat. Nos. 1-176497-X, where X can be any number to represent different color of the housing, with contact, Cat. No. 175057-1 or 175057-2.
 USR, CNR - Cat. No. 521120 with contact, Cat. Nos. 63854, 63933, 1217092, 1380087-1, -2, 1380088-1, -2, 1380089-1, -2, 1380095-1, -2.
 USR, CNR - Cat. No. 521187 with contact, Cat. Nos. 1217096 and 1217097.
 USR, CNR - Cat. Nos. 353251, 353253 and 353255 with contacts, Cat. Nos. 353249 and 353250.
 USR, CNR - Cat. Nos. 521204, 2371464-2, 1-2371464-2, 521205-1, 521205-4, 521205-6, 521205-7, *521205-9, 1-521205-1, 2371464-3, 2292843, 521206, 2371464-4, 1-2371464-4, 521207, 2371464-5, 521208, 521209 and 521210, 521435, 521223, 521267, 521295 with contact, Cat. Nos. 1217095, 1217094, 1217378, 2238135, 2238136 and 1742630-1, -2.
 USR, CNR - Cat. No. 1380042-1 with contact Cat. Nos. 1380087-1, -2, 1380088-1, -2, 1380089-1, -2, 1380095-1, -2.
 USR, CNR - Cat. No. 172074, 172075, and 172076 with contact Cat. No. 170325.
 USR, CNR - Cat. No. 172074, 172075, 172076 and 521119 with contact Cat. No. 936663.
 USR Only - Cat. No. 172075 with contact Cat. No. 936663.
 USR, CNR - Cat. No. 172074, 172076, and 177627 with contact Cat. No. 170328.
 USR, CNR - Cat. No. 521781-1 with contact Cat. No. 63648, 1217113-1, -2, 1217114-1, -2, 63933, 63854 & 1217092
 USR, CNR Housing Cat. No. 1743102-1 and 1-1743102-1 with contact Cat. No. 170324, 170325, 170326.
 USR, CNR Housing Cat. No. 1743103-1, 1-1743103-1 and 179182-1,-6,-9 with contact Cat. No. 175179.
 USR, CNR Housing Cat. No. 1743066-1 with contact Cat. Nos. 170329 or 1217039.
 USR Only - Cat. No. 1743206-1 and 1743206-2 with contacts, Cat. Nos. 936603-1, 936604-1 and 936605-1.
 USR, CNR Housing Cat. No. 179183-1,-6,-9 with contact Cat. No. 170325.
 USR, CNR Housing Cat. Nos. 521204, 2371464-2, 1-2371464-2 and 521210 with contact Cat. Nos. 1217378-1, -2, 2238135, 2238136 and 1742630-1, -2.
 USR Only - Housing Cat. No. 1969117, 1969127 with contact Cat. No. 1544114.
 Housing Cat. No. 1969126 with contact Cat. No. 1544113.
 USR Only - Cat. No. 174817-1,-2 with contact Cat. No. 175020.
 *USR Only - Cat. No. 368628 with contact Cat. Nos. 170324-1, 170325-1, 170326-1, 170327-1, 170328-1 and 170328-3.

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PRODUCT COVERED (CONTINUED):

USR Only - Cat. No. 368630-1 and 1-368630-1 with contact Cat. Nos. 170324, 170325, 170326, 170327 and 170328.

USR, CNR - Cat. No. 520935-9

USR Only - Cat. No. 936361-1 with contacts, Cat. Nos. 170327 - 170329.

USR, CNR Housing Cat. No. 1743068-1 with contact Cat. Nos. 170324, 170325, 170326.

USR, CNR Housing Cat. No. 1743069-1 with contact Cat. Nos. 170324, 170327, 170328, 170329.

USR, CNR Housing Cat. Nos. 521763-1 and 521823-1 with contact Cat. No. 170324.

USR, CNR Housing Cat. Nos. 1743330-1,-2,-4,-6 and 1743419-1,-2,-4,-6 with contact Cat. No. 1743457-1.

USR, CNR Housing Cat. No. 926291 with contact Cat. No. 926820.

USR, CNR Housing Cat. No. 521588 with contacts, Cat. Nos. 1742354-X, 63097-X, 63119-X.

USR Housing Cat. No. 174817 with contact Cat. No. 1930000.

USR, CNR Housing Cat. No. 174737 with contact Cat. No. 173724.

USR, CNR Housing Cat. Nos. 521699 with contact Cat. Nos. 1217378, 2238135, 2238136, 1742630-1, -2, 1217094 or 1217095.

USR, CNR Housing Cat. Nos. 2381765-3, 1-2381765-3 with contact Cat. No. 1217095.

USR, CNR Housing Cat Nos. 1969332-2 and 1969718-1 with contact 250 Mark II contacts.

USR, Housing Cat. No. 1-154719-1 with Contacts x-154717-x, Contacts 880645-x and Contacts 880646-x.

USR, Housing Cat. No. 1-2133341-1 with Contacts 154717.

USR, CNR Housing, Cat. Nos. 1969440-x, 1969441-x, 1969717-x with Contacts 154717, 154718, and 160759.

USR, Housing Cat. Nos. 172434-1 and 172434-2 with contacts Cat. Nos. 170032-2, 170032-5, 170452-1, 170452-2, 170454-1, 170454-2, 170456-1 and 170456-2.

USR, CNR Connector Cat. No. 1969534-1, 2232942-1.

USR, CNR Housing, Cat. No. 1969630 with Contact 154718-3.

USR, CNR Housing Cat. Nos. 1-368602-1, 368602-1 with Contacts 170325-1 or 170326-1.

Component - Connector Rast 5 Pos-Lock Series

USR, CNR Housing Cat. Nos. 1969265-1 with contact Cat. Nos. 1544113-x (ILL 167) & 1544114-x (ILL 157).

USR, CNR Housing Cat. No. 1969364-1 for use with contact Cat. No. 154718-3.

USR, CNR 187 MARK II Positive Lock Series, Housing Cat No.1969877-1 with contacts 2238177-1 and 2238178-1.

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USR, CNR Housing, Cat. Nos. 1969759-1, 1969760-1, 1969761-1.

USR, CNR Housing Cat. No. 1969820-1 with terminal Cat. Nos. 2238104-1 and 2238139-1.

USR, CNR Housing Cat. No. 2238266-1 with terminal Cat. Nos. 2238104-1 and 2238139-1.

USR, CNR Housing Cat. No. 1969823 with contact Cat. Nos. 2238105-1, 2238141-1

USR, CNR Housing Cat. No. 1-1969483-1, 1969484-2, 1969398-2, 1969399-2

USR, CNR Housing Cat. No. 173974-1, 3-173974-6, 7-172469-1, 2-1743068-1, 1-1743206-1, 1-1743206-2, 1-172210-1, 176498-1, 1-154719-0, 8-154719-3.

USR, CNR Housing Cat. Nos. 2331088-1, 2331088-2, 2331088-3, 2331088-4, 2331088-5, 2331087-1 with contact Cat. Nos. 170328-1 and 170328-3.

USR, CNR Housing Cat. No. 2306923-1 with contact Cat. No. 170325-1.
 USR and CNR Housing Cat. No. 521204, 2371464-2, 1-2371464-2, 521210, 521699 with contact 2238212-1 and 2238212-2.

USR, CNR Housing Cat. No. 521204, 2371464-2, 1-2371464-2, 521205-1, 521205-4, 521205-6, 521205-7, 521205-9, 1-521205-1, 2371464-3, 2292843, 521206, 2371464-4, 1-2371464-4, 521207, 2371464-5, 521208, 521209 and 521210, 521223, 521267, 521295. with contact Cat. No. 2391532-1.

USR, CNR 250 MARK II Positive Lock Series, Housing Cat Nos. 1969864-1, 1969865-1, and 1969870-1 with contacts 2238155-1 and 2238156-1.

USR, CNR 187 MARK II Positive Lock Series, Housing Cat No. 1969870-1 with contacts 2238155-1, 2238156-1 and 634981-1.

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New: 2022-02-23

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USR, CNR Connector Cat. No. 2379907-1 and 2380041-1 with contact Cat. No. 2379911-1.

The following Cat. Nos. are identical to the existing Cat. Nos. shown below except they are provided with a "W" marking

New Cat. No.	Existing Cat. No.
3-170325-1	170325-1
1-173974-0	173974-1
175179-4	175179-1
3-176448-1	176448-1
3-179970-1	179970-1

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ELECTRICAL RATING:

* USR, CNR - Cat. Nos. 521119, 521955, and 521120, 521781-1 and 521253 with contact, Cat. Nos. 63854, 63933 and 1217092 as follows:

Current (A)	Wire AWG
7	18
15	14
10	18
20	12

* USR, CNR - Cat. No. 521780-1 with contact, Cat. No. 63933 as follows:

Current (A)	Wire AWG
3	22
4	20
7	18

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USR, CNR Housing Cat. Nos. 1969820-1 and 2238266-1 with terminal Cat. Nos. 2238104-1 and 2238139-1 as follows:

Terminal	Current (A)	Voltage (V)	Wire AWG - Cu str
2238104-1	10	600	16
2238104-1	15 (USR) / 12 (CNR)	600	14
2238139-1	5	600	20
2238139-1	7	600	18

USR and CNR Housing Cat. No. 521204, 2371464-2, 1-2371464-2, 521210, 521699 with contact 2238212-1 and 2238212-2 as follows:

Current (A)	Wire AWG
3	22
4	20
7	18

USR and CNR Housing Cat. No. 1-521204-6 and 1-521204-7 with contact 2238135-2 as follows:

Current (A)	Wire AWG
10	16
*USR - 15/CNR - 10	14
7	(2) 18

USR and CNR Housing Cat. No. 1-521204-6 and 1-521204-7 with contact 2238136-2 as follows:

Current (A)	Wire AWG
3	22
4	20
7	18

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* USR, CNR - Cat. No. 521780-1 with contact, Cat. No. 63854 as follows:

Current (A)	Wire AWG
7	18
10	16
USR = 15, CNR = 13	14

* USR, CNR - Cat. No. 521780-1 with contact, Cat. No. 1217092 as follows:

Current (A)	Wire AWG
10	16
15	14
USR = 20, CNR = 18	12

USR, CNR - Cat. No. 521766 with contact, Cat. No. 63306 as follows:

Current (A)	Wire AWG
7.1	18
10	16
15	14

* USR, CNR - Cat. Nos. 353251, 353253 and 353255 with contacts, Cat. Nos. 353249 and 353250.

Current (A)	Wire AWG
2	26
3	22
4	20
8	16

USR, CNR - Cat. Nos. 521204, 2371464-2, 1-2371464-2, 521205-1, 521205-4, 521205-6, 521205-7, 521205-9, 1-521205-1, 2371464-3, 2292843, 521206, 2371464-4, 1-2371464-4, 521207, 2371464-5, 521208, 521209 and 521210, 521223, 521267, 521295 with contact, Cat. No. 1217095 as follows:

Current (A)	Wire AWG
USR, CNR - 15 A	12
USR - 18 A, 20 A	12

USR, CNR - Cat. Nos. 172074, 1743102-1 and 179183-1,-6,-9 with contact Cat. No. 170325, and Cat. Nos. 172076 and 177627 with contact Cat. No. 170328 as follows:

Current (A)	Wire AWG
12	18

USR, CNR - Cat. No. 172074, 172075, 172076, and 521119 with contact Cat. No. 936663 as follows:

<u>Current (A)</u>	<u>Wire AWG</u>
12	18

USR - Cat. No. 1743066-1 with contact Cat. No. 1217039 as follows:

<u>Current (A)</u>	<u>Wire AWG</u>
15	20-14

USR - Cat. No. 1743066-1 with contact Cat. No. 170329 as follows:

<u>Current (A)</u>	<u>Wire AWG</u>
15	20-14

USR - Cat. No. 1743066-1 with contact Cat. No. 170329 as follows:

<u>Current (A)</u>	<u>Wire AWG</u>
24	16-10

CNR - Cat. No. 1743066-1 with contact Cat. No. 1217039 as follows:

<u>Current (A)</u>	<u>Wire AWG</u>
3	20-14

CNR - Cat. No. 1743066-1 with contact Cat. No. 170329 as follows:

<u>Current (A)</u>	<u>Wire AWG</u>
15	16-10

USR, CNR Housing Cat. No. 1743068-1 with contact Cat. Nos. 170324, 170325, 170326.

<u>Current (A)</u>	<u>Wire AWG</u>
USR, CNR - 15 A	14
USR, CNR - 7 A	18
USR, CNR - 3 A	24

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USR, CNR Housing Cat. No. 521588 with contacts, Cat. No. 1742354-X as follows:

Current (A)	Wire AWG
USR, CNR - 7 A	18
USR, CNR - 4 A	2 - No. 20
USR, CNR - 10 A	16

USR Housing Cat. No. 174817 with contact Cat. No. 1930000.

Current (A)	Wire AWG
USR - 20 A	12
USR - 15 A	14
USR - 10 A	16

USR, CNR Housing Cat. No. 174737 with contact Cat. No. 173724:

Current (A)	Voltage (V)	Wire AWG
15	250	14
12	250	16
7	250	18
5	250	20

USR, CNR Cat. Nos. 1-176497-X, where X can be any number to represent different color of the housing, with contact, Cat. No. 175057-1 or 175057-2.

Current (A)	Voltage (V ac/dc)	Wire AWG
7	250	18 stranded
12	250	16 stranded
15	250	14 stranded
20	250	12 stranded

USR, CNR Housing Cat. No. 1-368602-1, 368602-1 with Contacts 170325-1.

Current (A)	Voltage (V ac/dc)	Wire AWG
5	250	20
7	250	18
6	250	(2) 22

USR, CNR Housing Cat. No. 1-368602-1, 368602-1 with Contacts 170326-1.

Current (A)	Voltage (V ac/dc)	Wire AWG
15	250	22+16

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USR Housing Cat. No. 521699 with contact Cat. Nos. 1217378, and 1742630-1, -2.

<u>Current (A)</u>	<u>Wire AWG</u>
USR/CNR - 7 A	18
USR/CNR - 4 A	20
USR/CNR - 3 A	22

USR Housing Cat. No. 521699 with contact Cat. No. 1217094.

<u>Current (A)</u>	<u>Wire AWG</u>
USR - 15 A	14
CNR - 10 A	14
USR/CNR - 10 A	16
USR/CNR - 7 A	18

USR Housing Cat. No. 521699 with contact Cat. No. 1217095.

<u>Current (A)</u>	<u>Wire AWG</u>
USR - 20 A	12
CNR - 13 A	12
USR - 15 A	14
USR/CNR - 10 A	16
USR/CNR - 7 A	2 No. 18
USR/CNR - 7 A	1 No. 16 with 1 No. 18

USR, CNR Housing Cat. No. with contact Cat. No. 1217095.

<u>Current (A)</u>	<u>Voltage (V ac/dc)</u>	<u>Wire AWG</u>
USR - 20 A	500	12
USR - 15 A	500	12-14
CNR - 13 A	500	12-14

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USR, CNR Housing Cat. Nos. 1-1743165-1, 1-1743165-2, 1-1743165-5, 1-1743165-8, 1743165-1, 1743165-2, 1743165-5, 1743165-8 with contact Cat. No. 1743221-1.

Cat. No.	Current (A)	Wire AWG
1-1743165-1,-2,-5,-8 1743165-1,-2,-5,-8	7	18
1-1743165-1,-2,-5,-8 1743165-1,-2,-5,-8	12	16
1-1743165-1,-2,-5,-8 1743165-1,-2,-5,-8	15	14
1-1743165-1,-2,-5,-8 1743165-1,-2,-5,-8	20	12

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USR, Housing Cat. Nos. 1-154719-1 with Contacts x-154717-x, Contacts 880645-x and Contacts 880646-x.

Cat. No.	Current (A)	Wire AWG (or Wire Cross-sectional area)
1-154719-1 with Contacts x-154717-x	15 (240V AC/DC)	14
1-154719-1 with Contacts x-154717-x	25 (240V AC/DC)	4.0 mm ²
1-154719-1 with Contacts 880645-x	9 (240V AC/DC)	16
1-154719-1 with Contacts 880645-x	17.5 (240V AC/DC)	2.5 mm ²
1-154719-1 with Contacts 880646-x	4 (240V AC/DC)	20
1-154719-1 with Contacts 880646-x	8 (240V AC/DC)	1.0 mm ²

USR, CNR - Cat. No. 1969823 with contacts 2238105-1, 2238141-1.

Cat. No.	Current (A)	Wire AWG
1969823 with quick connect terminal 2238105-1	USR-15 (600V AC/DC) CNR-12 (600V AC/DC)	14
1969823 with quick connect terminal 2238105-1	USR/CNR-10	16
1969823 with quick connect terminal 2238141-1	USR/CNR-7 (600V AC/DC)	18
1969823 with quick connect terminal 2238141-1	USR/CNR-5	20

USR, CNR 187 MARK II Positive Lock Series, Housing Cat No. 1969877-1 with contacts 2238177-1 and 2238178-1

Voltage (V)	Max Current (A)	Wire AWG - Cu str
600	10	16
600	7	18
600	4	20

USR, CNR Housing Cat. Nos. 1969265-1 with contact Cat. Nos. 1544113-x (ILL 167) & 1544114-x (ILL 157).

Cat. No.	Current (A), Voltage 600 VAC/DC	Wire AWG
Housing Cat. No. 1969265-1 with Contacts Cat. No. 1544113-1,-2	3	22 AWG stranded
Housing Cat. No. 1969265-1 with Contacts Cat. No. 1544113-1,-2	5	20 AWG stranded
Housing Cat. No. 1969265-1 with Contacts Cat. No. 1544113-1,-2	7	18 AWG stranded
Housing Cat. No. 1969265-1 with Contacts Cat. No. 1544114-1,-2	10	16 AWG stranded
Housing Cat. No. 1969265-1 with Contacts Cat. No. 1544114-1,-2	15	14 AWG stranded
Housing Cat. No. 1969265-1 with Contacts Cat. No. 1544114-1,-2	18	12 AWG stranded

USR Housing Cat. Nos. 1743206-1 and 1743206-2 with contact, Cat. No. 936605-1 (ILL. 173).

Cat. No.	Current (A), Voltage 240 VAC/DC	Wire AWG
1743206-1 and 1743206-2 with contact, Cat. No. 936605-1	3	20+20 AWG solid

USR, CNR Housing, Cat. Nos. 1969440-x, 1969441-x, 1969717-x where x can be any number to represent different color of the housing with Contacts 154717, 154718, and 160759.

Cat. Nos.	Voltage (V ac)	Wire AWG
1969440-x, 1969441-x, 1969717-x	120	20 - 12 stranded

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Cat. No. 1969453-1 is rated 250 VAC with no assigned ampere rating.

USR, CNR Connector Cat. No. 1969534-1, 2232942-1 with contact 1742975-1

<u>Cat. No.</u>	<u>Voltage</u> <u>(V ac)</u>	<u>Current</u> <u>(A)</u>	<u>Wire AWG</u>
1969534-1, 2232942-1	220	4	18-22 stranded

USR, CNR Housing Cat. Nos. 2331088-1, 2331088-2, 2331088-3, 2331088-4, 2331088-5, 2331087-1 with contact Cat. Nos. 170328-1 and 170328-3.

<u>Cat. No.</u>	<u>Voltage</u> <u>(V ac)</u>	<u>Current</u> <u>(A)</u>	<u>Wire AWG</u>
2331088-1, 2331088-2, 2331088-3, 2331088-4, 2331088-5, 2331087-1	600	7	18
		10	16
		15	14

USR, CNR Housing Cat. No. 2306923-1 with contact Cat. No. 170325-1.

<u>Cat. No.</u>	<u>Voltage</u> <u>(V ac)</u>	<u>Current</u> <u>(A)</u>	<u>Wire AWG</u>
2306923-1	600	4	20
		7	18
		10	16

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USR, CNR 250 MARK II Positive Lock Series, Housing Cat Nos. 1969864-1, 1969865-1, and 1969870-1 with contacts 2238155-1 and 2238156-1.

<u>Cat. No.</u>	<u>Voltage</u> <u>(V ac)</u>	<u>Current</u> <u>(A)</u>	<u>Wire AWG</u>
1969164-1, 1969165-1	600	3	22
		15	14

USR, CNR 187 MARK II Positive Lock Series, Housing Cat Nos. 1969864-1, 1969865-1, and 1969870-1 with contacts 2238155-1, 2238156-1 and 63498-1.

<u>Cat. No.</u>	<u>Voltage</u> <u>(V ac)</u>	<u>Current</u> <u>(A)</u>	<u>Wire AWG</u>
1969870-1	600	3	22
		4	20
		10	16
		15	14

Cat. No. 520935-9 is rated 600 VAC with no assigned ampere rating.

USR, CNR Connectors, Cat Nos. 2379907-1 and 2380041-1 with contacts 2379911-1.

<u>Cat. No.</u>	<u>Voltage</u> <u>(V ac/dc)</u>	<u>Current</u> <u>(A)</u>	<u>Wire AWG</u>
2379907-1, 2380041-1	600	7	18
		10	16
		15	14

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USR, CNR Housing Cat. No. 521204, 2371464-2, 1-2371464-2, 521205-1, 521205-4, 521205-6, 521205-7, 521205-9, 1-521205-1, 2371464-3, 2292843, 521206, 2371464-4, 1-2371464-4, 521207, 2371464-5, 521208, 521209 and 521210, 521223, 521267, 521295; with contact Cat. No. 2391532-1.

<u>Contact Cat. No.</u>	<u>Voltage</u> (V ac)	<u>Current (A)</u>	<u>Wire AWG</u>
2391532-1	500	15	16 + 16 (2)

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GENERAL:

These devices are single and multipole connectors employing contacts of the crimp termination type.

USR - Indicates investigation to United States Standard UL 1977

*CNR - Indicates investigation to Canadian National Standards C22.2 No. 182.3-16.

ENGINEERING CONSIDERATIONS (NOT FOR UL REPRESENTATIVE USE):

Use - For use in complete equipment where the acceptability of the combination is determined by Underwriters Laboratories Inc.

Conditions of Acceptability - In order to be judged acceptable as a component of electrical equipment, the following conditions should be met:

1. These devices should be used only where they will not interrupt the current.
2. These devices have not been tested for current-carrying capability except for the following:

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<u>Connector Cat. No.</u>	<u>Contact Cat. No.</u>	<u>Wire Gauge</u>	<u>Investigated Current</u>	<u>Maximum Temp Rise</u>
521204, 2371464-2, 1- 2371464-2, 521205-1, 521206, 2371464-4, 1- 2371464-4 521207, 2371464-5, 521208, 521209, 521210, 521435	1217095,1217094,1217378	12	15 A	27.4°C
521204, 2371464-2, 1- 2371464-2, 521205-1, 521206, 2371464-4, 1- 2371464-4 521207, 2371464-5, 521208, 521209, 521210	1217095	12	18 A	37.8°C
521204, 2371464-2, 1- 2371464-2, 521205-1, 521206, 2371464-4, 1- 2371464-4, 521207, 2371464-5, 521208, 521209, 521210	1217095	12	20 A	46.8°C
521119, 521120, 521253, 521955	63854	18	7A	8°C
521119, 521120, 521253, 521955	63854	14	15A	22°C
521119, 521120, 521253, 521955	63933	18	10A	14.2°C
521119, 521120, 521253, 521955	1217092	12	20A	23.6°C
521780-1	63854	18	7 A	13.0°C
521780-1	63854	16	10 A	20.5°C
521780-1	63854	14	USR = 15 A	31.1°C
521780-1	63854	14	CNR = 13 A	28.7°C
521780-1	63933	22	3 A	4.2°C
521780-1	63933	20	4 A	5.5°C
521780-1	63933	18	7 A	10.9°C
521780-1	1217092	16	10 A	18.4°C
521780-1	1217092	14	15 A	28.0°C
521780-1	1217092	12	USR = 20 A	39.3°C

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Connector Cat. No.	Contact_Cat. No.	Wire Gauge	Investigated Current	Maximum Temp Rise
521699 (USR/CNR)	1217378, 1742630-1, -2	18	7A	21.5°C
521699 (USR/CNR)	1217378, 1742630-1, -2	20	4A	7.9°C
521699 (USR/CNR)	1217378, 1742630-1, -2	22	3A	7.4°C
521699 (USR)	1217094	14	15A	44.3°C
521699 (CNR)	1217094	14	10A	29.5°C
521699 (USR/CNR)	1217094	16	16A	27.3°C
521699 (USR/CNR)	1217094	18	7A	19.7°C
521699 (USR)	1217095	12	20A	40.7°C
521699 (CNR)	1217095	12	13A	27.3°C
521699 (USR)	1217095	14	15A	35.9°C
521699 (CNR)	1217095	14	13A	29.2°C
521699 (USR/CNR)	1217095	16	10A	25.1°C
521780-1	1217092	12	CNR = 18 A	29.5°C
353251, 353253, 353255	353249	26	2A	6.5°C
353251, 353253, 353255	353249	22	3A	5.8°C
353251, 353253, 353255	353250	20	4A	6.7°C
353251, 353253, 353255	353250	16	8A	12.6°C
172074	170325	18	12A	18.4°C
172074	936663	20	5 A	6.2°C
172074	936663	16	12 A	16.3°C
172074	936663	18	7 A	22.0°C
172074, 521119	936663	18	12A	22.0C
172076	170328	18	12A	20.4°C
1743066-1 (USR)	170329	16-10	24	141.1°C
1743066-1 (USR)	1217039	20-14	15	97.6°C
174737	173724	14	15	16.8
	173724	16	12	14.3
	173724	18	7	6.9
	173724	20	5	5.3

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Connector Cat. No.	Contact Cat. No.	Wire Gauge	Investigated Current	Maximum Temp Rise
1743066-1 (CNR)	170329	16-10	15	49.7°C
1743066-1 (CNR)	1217039	16-10	3	39.5°C
--	175179-1	18	12	22°C
1743068-1	170326	14	15 A	20.2°C
1743068-1	170325	18	7 A	15.5°C
1743068-1	170324	24	3 A	6.4°C
1743069-1	170324/	24	3	7.4
	170328	18	7	6.3
1743069-1	170324/	24	3	7.9
	170329	14	15	13.9
1743069-1	170324/	24	3	6.1
	170327	24	3	4.2
521763-1, 521823-1	170324	20	4	27.7
1743330-1, -2, -4, and -6, 1743419- 1, -2, -4, and -6	1743457	18	12 A	23.5°C
521766-1	63306-1	18	7.1 A	9.0°C
521766-1	63306-1	16	10.0 A	13.7
521766-1	63306-1	14	15.0 A	20.9
926291	926820	16	14	21.3
926291	926820	20	6	17.3
521210	1217378, 1742630-1, -2	18	7	23.8
		20	4	10.7
		22	3	8.1
521588	1742354-X	16	10	10.6
521588	1742354-X	18	7	8
521588	1742354-X	(20+20)	4	3.4
1930000		12	20	34.5
1930000		14	15	32.2
1930000		16	10	26.7
1-1743165-1, -2, - 5, -8	1743221-1	18	7	14.2
1-1743165-1, -2, - 5, -8	1743221-1	16	12	11.2
1-1743165-1, -2, - 5, -8	1743221-1	14	15	16
1-1743165-1, -2, - 5, -8	1743221-1	12	20	16.5

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Connector Cat. No.	Contact Cat. No.	Wire Gauge	Investigated Current	Maximum Temp Rise	Maximum Temp, °C
1-154719-1	x-154717-x	14	15	41.276	66.276
1-154719-1	x-154717-x	4.0 mm2	25	41.527	66.527
1-154719-1	880645-x	16	9	13.832	38.832
1-154719-1	880645-x	2.5 mm2	17.5	40.385	65.385
1-154719-1	880646-x	20	4	5.046	30.046
1-154719-1	880646-x	1.0 mm2	8	18.303	43.303
1969265-1	1544113-1,-2	22	3		30.6
1969265-1	1544113-1,-2	20	5	9.5	34.5
1969265-1	1544113-1,-2	18	7	13.4	38.4
1969265-1	1544114-1,-2	16	10	17.4	42.4
1969265-1	1544114-1,-2	14	15	24.9	49.9
1969265-1	1544114-1,-2	12	18	25.9	50.9
1-176497-X, where X can be any number	175057-1 or 175057-2	18 stranded	7	8.0	33
		16 stranded	12	15.1	40.1
		14 stranded	15	18.1	43.1
		12 stranded	20	16.7	41.7
(USR) 1743206-1 and 1743206-2 with contact, Cat. No. 936605-1	936605-1	20+ 20 AWG solid	3	1.5	26.5
Cat. No. 1969534-1	1742975-1	18 - 22 AWG str	4	8.3	33.3
Housing Cat. No. 368602-1 with Contact 170325-1	170325-1	18 AWG, Str	7	9.9	34.9
Housing Cat. No. 368602-1 with Contact 170325-1	170325-1	20 AWG, Str	5	7.8	32.8
Housing Cat. No. 368602-1 with Contact 170325-1	170325-1	(2) 22 AWG, Str	6	13.3	38.3

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Connector Cat. No.	Contact Cat. No.	Wire Gauge	Investigated Current	Maximum Temp Rise	Maximum Temp, °C
Housing Cat. No. 368602-1 with Contact 170326-1	170326-1	22+16 AWG, Str	15	37.2 for UL 27.8 for CUL	
Housing Cat. No. 1969820-1	2238104-1	16 AWG str	10	17.1	
Housing Cat. No. 1969820-1	2238104-1	14 AWG str	15 (USR) / 12 (CNR)	33.7 (USR) - Recorded temperature is 57.7/ 18.8 (CNR)	
Housing Cat. No. 1969820-1	2238139-1	20 AWG str	5	8.1	
Housing Cat. No. 1969820-1	2238139-1	18 AWG str	7	10.4	
*1969823	2238105-1	14	15A (USR)	28.6	
*1969823	2238105-1	14	12A (CNR)	19.7	
*1969823	2238105-1	16	10A	12.2	
*1969823	2238141-1	18	7A	11.3	
*1969823	2238141-1	20	5A	5.9	
*2331087-1	170328-1 or 170328-3	18	7		
*2331087-1	170328-1 or 170328-3	16	10		
*2331087-1	170328-1 or 170328-3	14	15		
*2306923-1	170325-1	20	4		
*2306923-1	170325-1	18	7		
*2306923-1	170325-1	16	10		
Housing 1969877-1	2238177-1	16	10	20.24	45.24
Housing 1969877-1	2238178-1	16	10	18.7	43.7
Housing 1969877-1	2238177-1	16	8	13.48	38.48
Housing 1969877-1	2238178-1	16	8	12.24	37.24
Housing 1969877-1	2238177-1	18	7	10.58	35.58
Housing 1969877-1	2238178-1	18	7	11.48	36.48
Housing 1969877-1	2238177-1	20	4	4.74	29.74
Housing 1969877-1	2238178-1	20	4	5.14	30.14

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Connector Cat. No.	Contact Cat. No.	Wire Gauge	Investigated Current	Maximum Temp Rise	Maximum Temp, °C
Housing 1969864-1	2238155-1	22 AWG	3	2.3	27.3
Housing 1969864-1	2238155-1	14 AWG	15	11.2	36.2
Housing 1969865-1	2238156-1	22 AWG	3	2.2	27.2
Housing 1969865-1	2238156-1	14 AWG	15	11.2	36.2
Housing 1969870-1	63498-1	22 AWG	3	2.2	27.2
Housing 1969870-1	63498-1	20 AWG	4	3.0	28.0
Housing 1969870-1	63498-1	16 AWG	10	10.2	35.2
Housing 1969870-1	63498-1	14 AWG	15	8.8	33.8
2379907-1, 2380041-1	2379911-1	18 AWG	7	8.3	33.3
2379907-1, 2380041-1	2379911-1	16 AWG	10	11.1	36.1
2379907-1, 2380041-1	2379911-1	14 AWG	15	17.0	42.0

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3. The suitability of the mounting means shall be determined in the end use.
4. The electrical and mechanical suitability of the wiring terminals shall be determined in the end use.
5. The placement of these devices within the equipment enclosure should be such that spacings between the live parts and the equipment are suitable for the particular application.
6. The suitability of the spacings between adjacent poles and the associated voltage rating shall be determined in the end use. Dielectric testing has not been performed except on Cat. Nos. 521763-1, 521823-1 for use with connector Cat. No. 170324, 300V and Housing Cat. No. 926291 with contact Cat. No. 926820, 1480VAC. Cat. No. 521780 may be used at potentials not exceeding 600 V based on a minimum spacing between adjacent contacts of 0.25 in. (6.35 mm). Dielectric testing was performed loaded with contacts Cat. Nos. 63933, 63854 and 1217092 at 600V. Cat. No. 521781-1 may be used at potentials not exceeding 600 V. Dielectric testing was performed loaded with contacts Size .187 Cat. No. 12171142 and Size .250 Cat. No. 638542. Dielectric testing was performed on below connectors:

Cat. No.
1-154719-1 with Contacts x-154717-x
1-154719-1 with Contacts 880645-x
1-154719-1 with Contacts 880646-x
1969440-x with Contacts 154717, 154718, 160759
1969441-x with Contacts 154717, 154718, 160759
1969717-x with Contacts 154717, 154718, 160759
Housing Cat. No. 1-368602-1 with Contacts 170325-1, 170326-1
Housing Cat. No. 368602-1 with Contacts 170325-1, 170326-1

7. The suitability of the insulating materials used in the molded bodies shall be judged in the end use equipment.

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8. The operating temperature of these devices should not exceed the temperature ratings of the insulating materials. These materials may be used interchangeably at a max temperatures of 105°C with the exception of Cat. Nos. 100099 and 100100, Cat. Nos. 1-368630-1, 1-1743068-1, and 1-1743069-1 (contained in Series 368630, 1743068 and 1743069 respectively) which have a max temperature of 65°C, Cat. No. 174817,1930000, 174737 which has a max temperature of 50°C, Cat. Nos. 521763-1, 521823-1 has a max temperature of 120°C, Cat. No. 1-154719-1 has a max temperature of 95 °C, and Cat. Nos. 521955 and 1743206-2 which have a max temperature of 85 degrees C, **and Cat. No. 2379907-1 , 2380041-1.**

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9. The factory assembled contacts have been investigated for the following wire ranges and maximum tensile forces.

Part No.	Wire Ranges (AWG)	Tensile Force (lbs)
170335- 1	10-12	20
170266-1	10-12	20
170330-1	20-24	8
170332-1	14-18	20
170265-1	20	8
170265-1	14	20
63097-1	14-18	20
63119-1	22	8
63119-1	18	20
1742354-X	16	20
1742354-X	18	20
1742354-X	2 - No. 18	20
1742354-X	2 - No. 20	10
63854	14-18	20
63933	18	20
63933	20,22	8
160759	20	13
160759	16	20
154718	12,14,18	20
1217092	12-16	20
1217092	Two 18	20
1217092	Two 16	20
1217092	One 16 and One 18	20
1217096	Two 18	20
1217096, 1217114	14-18	20
1217097, 1217113	20-22	8
1217097, 1217113	18	20
353249	22-24	8
353249	26	7,8
353250	20	8
353250	18-16	20
1217039	18,14	20
1217039	20	8
170329	10	40
170329	16	20
1217094	14	25
1217094	18-16	20
1217095	12	35.1
1217095	16-14	20
1217095	Two 18	20
1217095	One 16 and One 18	20
1217095	Two 16	20
175020	20-22	8
175020	18	20
*2391532-1	16	20
2391532-1	12	35
2391532-1	16 x 2	20

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Part No.	Wire Ranges (AWG)	Tensile Force (lbs)
1380087-1, -2	24-20	8
1380088-1, -2	20-18	8, 20
1380089-1, -2	16-14	20, 25

Part No.	Wire Ranges (AWG)	Tensile Force (lbs)
1380095-1, -2	12	35.1
936603-1	18	20
936603-1	20,22	8
936604-1	14-18	20
936605-1	12,14	20
936663-1	16, 18	20
936663-1	20	10
170328	14	25
170328	18	20
170328-1	16	20
175179-1	18	20
170327	18	20
170327	20	10
170327	22	8
170326	14	25
170326	18	20
170325	16,18	20
170325	20	10
170324	20	10
170324	24	8
1743457	18	20
63648	20	10
63648	14	25
63306	14-18	20
926820	20,16	10,20
1217378	22	8
1217378	18	20
1742630-1, -2	22	8
1742630-1, -2	20	10
1742630-1, -2	18	20
1930000	12,16	20
1544113	18-22	20, 8
1544114	12-16	20
1743221-1	18 - 12	20, 35
Contacts x-154717-x	14	20
Contacts x-154717-x	4.0 mm2	20
Contacts 880645-x	16	20
Contacts 880645-x	2.5 mm2	20
Contacts 880646-x	20	8
Contacts 880646-x	1.0 mm2	20
	20, 18, 16, 14	10, 20, 20, 20
1544113-1,	22 stranded conductor	3
1544113-2	20 stranded conductor	5
	18 stranded conductor	7
1544114-1,	16 stranded conductor	10
1544114-2	14 stranded conductor	15
	12 stranded conductor	18

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Part No.	Wire Ranges (AWG)	Tensile Force (lbs)
175057-1, -2	18, 16	20
175057-1, 12	14, 12	25, 35
936605-1	20+20 AWG solid	10 for each wire
1742975-1	18 - 22 AWG str Cu	20, 8
Contact 170325-1	16	20
Contact 170325-1	18	20
Contact 170325-1	20	10
Contact 170325-1	(2)22	8
Contact 170326-1	22+16	8 for 22 AWG 20 for 16 AWG
Terminal 2238104-1	16 - 14 str	20 for 16 AWG 25 for 14 AWG
Terminal 2238139-1	20 - 18 str	10 for 20 AWG 20 for 18 AWG
Terminal 2238135	16-14 AWG str, two- No. 18AWG str	20 for 16 AWG, 25 for 14AWG, 20 for 2-No. 18 AWG
Terminal 2238136	20-18 AWG str	10 for 20AWG, 20 for 18AWG
Terminals 2238177-1, 2238178-1	20-16 AWG str	8 for 20AWG, 20 for 18AWG, 20 for 16AWG
Terminals 2238155-1 and 2238156-1.	14 AWG, 22 AWG	25 for 14 AWG, 8 for 22 AWG
Terminals 63498-1	14-20 AWG	25 for 14 AWG, 20 for 16 AWG, 10 for 20AWG
*Contact 2379911-1	18, 16	20
Contact 2379911-1	14	25

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10. Connectors molded of Tyco Raw Material #702902 (50% Re grind), have been subjected to a 12mm Flame Test.

11. Insulating Materials

These devices employ insulating materials with properties as tabulated below at the minimum thickness employed in the connector housing, the suitability of the insulating materials based on the documented values shall be determined in the end-use application. Please note the values specified in the table when multiple materials are indicated represent the minimum values for the group of materials.

Cat. No.	Raw Material (#)	Measured Minimum Thickness	Flame Class	HWI	HAI	RTI Elec	Max Operating Temp, °C
1-154719-1	705287	0.45 mm	V-0	4	0	120	120
1969265-1	705287	0.45	V-0	4	0	120	120
1969364-1	705287	0.65	V-0	4	0	120	120
1-2133341-1	705287	0.45 mm	V-0	4	0	120	120
1969453-1	705287	0.63mm	V-0	4	0	120	120
1-176497-X	703416	1.0	V-0	4	0	130	130
174513-1,	1573672	0.4 mm	V-0	4	3	115	115
1-172075-1	1573672	0.59 mm	V-0	4	3	115	115
1-172210-1	1573672	0.67 mm	V-0	4	3	115	115
173974-1	1573672	0.54 mm	V-0	4	3	115	115
176448-1	1573672	0.43 mm	V-0	4	3	115	115
176498-1, 1969735-1	1573672	0.56 mm	V-0	4	3	115	115
1969440-x, 1969441-x, 1969717-x	A	0.6 mm	V-0	-	-	130	130
1969440-1, 1969441-1, 1969717-1	A	0.6 mm	V-0	-	-	65	65 (1)
1969534-1	B	0.43 mm	V-0	4	0	120	120
2232942-1, 1969864-1, 1969865-1, 1969870-1	704588	0.45 mm	V-0	4	0	130	130
RAST 5 Mark III, 6.35 [.250] Series Connectors - 521204, 521205, 521206, 521207, 521208, 521209, 521210, 521267-1, 521295-1, 521435-1, 521836-1 & -3, 521125, 521955, 2292843	2136597	0.38 mm	V-0	4	0	130	130
521782-6	A (2)	0.43 mm	V-0	-	-	65	65
521782-7, 2178234-1 thru -5, 1969536-1 thru -6	A	0.43 mm	V-0	-	-	65	65
5-1969536-2, 5-1969536-5	2136403	0.43 mm	V-0	-	-	120	120
2178234-1 thru -5, 1969536-1 thru -6	2136700	0.43 mm	V-0	-	-	65	65
5-1969536-1 thru -6 5-2178234-1 thru -5	2136700	0.43 mm	V-0	-	-	130	130
521836-3	B	0.38	V-0	4	0	120	120

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These devices employ insulating materials with properties as tabulated below at the minimum thickness employed in the connector housing, the suitability of the insulating materials based on the documented values shall be determined in the end-use application. Please note the values specified in the table when multiple materials are indicated represent the minimum values for the group of materials.

Cat. No.	Raw Material (#)	Measured Minimum Thickness	Flame Class	HWI	HAI	RTI Elec	Max Operating Temp, °C
1-1743068-1, 1-1743069-1, 1-1743102-1, 1-1743103-1, 1-174712-1,-6, -7, 1-368630-1, 1743206-1,-2, 1743419-1,-2, -4, 179182-1, 179183-1, 2-172076-1, 353148-5	C	0.4	V-0	4	3	130	115
1969630-1	17066	0.889 mm	V-0	0	0	130	130
1-521229-1, -2	D	0.4 mm	V-2	4	0	130	130
1-368602-1	1573672	0.45 mm	V-0	4	3	130	105
368602-1	702902	0.45 mm	V-2	-	-	130	105
926522	704862	0.45 mm	V-0	3	0	130	130
926522, x-520935-x, 521229-1,2,3,-4, 1-521766-1, 521766-1, 1969332-2,4, X-521253-x, x-1969453-x, 521780-1,2; 1969717-x 1969864-1, 1969865-1, 1969870-1	2136597 704588	0.45 mm	V-0	4	0	130	130
Housing 1969820-1	F	0.76 mm	V0	--	--	240	240
Housing 2238266-1	704105-3	0.76 mm	V-0	--	--	240	240
176498, 179720, 179970	2136682	0.45 mm	V-0	4	0	150	105
172074, 174587, 174712, 172076	702925	0.6 mm	V-2	4	1	130	130
176497	702925	0.5 mm	V-2	4	1	130	130
85091	702925	0.8 mm	V-2	4	0	130	130
1969823, 1969877-1	704105-3	0.73mm	V-0	-	-	130	240
*RAST 5 Mark III, 6.35 [.250] Series Connectors - 521204, 2371464-2, 1-2371464-2, 521205, 2371464-3, 521206, 2371464-4, 1-2371464-4, 521207, 2371464-5, 521208, 521209, 521210, 521267-1, 521295-1, 521435-1, 521836-1 & -3 926522, 2292843	2136700	0.38 mm	V-0	0	0	130	130
x-520935-x, 521229-1,2,3,-4, 1-521766-1,2, 521766-1, 1969332-2,4, X-521253-x, x-1969453-x, 521780-1,2; 0,1-1969717-x; 1969630-1,2; 2-521229-1,2; 1-521766-2; 1969332-x	2136700	0.4 mm	V-0	-	-	130	130
172075-1	702925	0.59 mm	V-2	4	1	130	130
1-1969483-21	2136700	0.63	V-0	-	-	130	130
1969484-2	2136700	0.63	V-0	-	-	130	130
1969398-2	2136700	0.60	V-0	-	-	130	130
1969399-2	2136700	0.58	V-0	-	-	130	130
3-173974-6	2136700	0.38	V-0	0	0	130	130
7-172469-1	2136700	0.38	V-0	0	0	130	130
2-1743068-1	2136700	0.38	V-0	0	0	130	130
1-1743206-1, 1-1743206-2	2136700	0.38	V-0	0	0	130	130
2381765-3 and 1-2381765-3	2136700	0.5	V-0	0	0	130	130
173974-1	2136597	0.38	V-0	4	0	130	130
1-172210-1	2136597	0.38	V-0	4	0	130	130

*

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These devices employ insulating materials with properties as tabulated below at the minimum thickness employed in the connector housing, the suitability of the insulating materials based on the documented values shall be determined in the end-use application. Please note the values specified in the table when multiple materials are indicated represent the minimum values for the group of materials. And Mold Stress testing was performed at 140°C for 7 hours.

Cat. No.	Raw Material (#)	Measured Minimum Thickness	Flame Class	HWI	HAI	RTI Elec	Mold Stress testing performed, °C
176498-1	2136597	0.38	V-0	4	0	130	130
1-154719-0, 8-154719-3	2136597	0.38	V-0	4	0	130	130
2331088-1, 2331088-2, 2331088-3, 2331088-4, 2331088-5, 2331087-1	2136488	0.4	V-0	0	0	130	105
	705999	0.4	V-0	0	0	130	105
2306923-1	2136488	0.5	V-0	0	0	130	105
520935-9	2136578-8	0.4	V-0	4	2	120	120
2379907-1 , 2380041-1	K	0.35	V-0	4	3	130	140

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(+): Thickness is less than the minimum Recognized material thickness, as such no assigned Flame class. UL 746C 12mm Flammability test conducted.

(++): These PLCs are based on the minimum Recognized material thickness.

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- A. Tyco Raw Material # 17066
 - 1. Dielectric strength (kV/mm): 26
 - 2. CTI: 1
- B. Tyco Raw Material # 705287
 - 1. Dielectric strength (kV/mm): --
 - 2. CTI: 0
- C. Tyco Raw Material # 1573672
 - 1. Dielectric strength (kV/mm): --
 - 2. CTI: 0
- D. Tyco Raw Material # 705304
 - 1. Dielectric strength (kV/mm): --
 - 2. CTI: 2
- E. Tyco Raw Material # 704862
 - 1. Dielectric strength (kV/mm): 18
 - 2. CTI: 0
- F. Tyco Raw Material # 704105-3 (Color: Black)
 - 1. Dielectric strength (kV/mm): 21
 - 2. CTI: 3
- G. Tyco Raw Material # 704588, 2136597 (4)
 - 1. Dielectric strength (kV/mm): 13
 - 2. CTI: 0
- *H. Tyco Raw Material # 2136700 [color: All]
 - 1. Dielectric strength (kV/mm): 17
 - 2. CTI: 2
- *I. Tyco Raw Material # 2136488 [color: Natural]
 - 1. Dielectric strength (kV/mm): 8
 - 2. CTI: 1
- J. Tyco Raw Material # 2136597 (Color: All)
 - 1. Dielectric strength (kV/mm): 13
 - 2. CTI: 0
- K. **Tyco Raw Material # 2136923-1 (Color: All)**
 - 1. Dielectric strength (kV/mm): --**
 - 2. CTI: 2**

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Note (1): Natural color has RTI of 65°C, the Cat. Nos. 1969440-1, 1969441-1, 1969717-x made of natural color.

Note (2): Employs [REDACTED]

Note (3): The Glow-wire test has been conducted on Cat. No. 1-521229-1 molded from [REDACTED]

[REDACTED]: Employs R/C (QMOS2) colorant Grade [REDACTED] (E73454).

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12. For Housing Cat. No. 1-154719-1 with Contacts x-154717-x, Contacts 880645-x and Contacts 880646-x, when conducting temperature test, each mating male contact was connected with two connectors, six connectors were tested in series and there are 40 in conductor lengths between each connector assembly. Repeat of temperature test shall be considered in the end product.

13. These devices of Connector Housing 1743206-1 and 1743206-2 with contact 936605-1 with 2 nos. 20 AWG solid wires have been subjected to the Temperature test with the rated currents and maximum temperature rise values tabulated below.

Cat. No.	Terminal	Wire, AWG	Current, A	Maximum Temperature, °C	Represent Cat. No.
1743206-1	936605-1	20+20	3	26.5	--

Mating Connectors

14. Connector Cat. No. 1969534-1 has only been assessed for use with specific types of connectors within its product family. They have not been assessed to operate with any other similar devices from any other manufacturer.

Miscellaneous

15. Terminal Cat. Nos. 2238104-1 and 2238139-1 have been evaluated for assembly solely with TE Ocean Applicator tooling. The suitability of use with any other tool shall be an end-product consideration.

16. Housing Cat. Nos. 1969820-1 and 2238266-1 with terminal Cat. Nos. 2238104-1 and 2238139-1 are intended for *high temperature applications*. *The suitability of use in such environments shall be an end-product consideration*. Terminal Cat. Nos. 2238104-1 and 2238139-1 may be used only where steel is acceptable for current-carrying parts.