APP'S REPORT

UNDERWRITERS LABORATORIES INC.
CHICAGO NORTHBROOK, ILL. MELVILLE, N.Y. SANTA CLARA, CALIF.
an independent, not-for-profit organization testing for public safety

File E60460
Project 75ME10554

April 25, 1977

REPORT

on

INDUSTRIAL CONTROL EQUIPMENT-AUXILIARY DEVICES

Elektro-Apparatebau Olten AG
Tannwaldstrasse 88, Postfach 147 521
4600 Olten, Switzerland

D E S C R I P T I O N

PRODUCT COVERED:

Switching-Element Types 704 followed by 900, 901, 902, 905, 910, 911, 912, 915, 916, 930 or 935 followed by 1, 2, 3, 4 or 5. Indicator Types 704 *followed by 020, 021, 022, 024, 642.0, 642.1 or 642.2. Lampholder Types 704.950.0 and 704.950.1 and 704.960.0. Mounting Flange Types 704.960.5 and 704.950.5.

OPERATORS: (Mechanical Only)

Indicatory: 704.000, 704.001., 704.004., and 704.200. followed by a suffix number (color code).

Mushroom: 704.070., 704.071., 704.072., 704.073. followed by a suffix number.

Rotary Release: 704.074., 704.075. followed by a suffix number (actuator pri number code).

Switch Key Release - 704.076., 704.078. followed by a suffix number (lock number code).

Level Selector Switch: 704.090., up to and including 704.103. and 704.290., 704.292., 704.294., 704.296., 704.298., 704.300., and 704.302. followed by a suffix number (lever color code).

Key Operated Rotary Switch: 704.110. up to and including 704.118. and 704.120. up to and including 704.124. and 704.330. up to and including 704.338. and 704.340 up to and including 704.346. followed by a suffix number (lock number code).

Pushbutton: 704.009. up to and including 704.013. and 704.039. up to and including 704.043. and 704.210. and 704.239. and 704.240. followed by a suffix number (lens color code).

Lighted Pushbotton: 704.029., 704.030., 704.229., 704.230., 704.059., 704.060., 704.259., 704.260., 704.032., 704.062., 704.033., 704.063., followed by a suffix number (lens color code).

Rotary Short Lever Actuator: 704.400. up to and including 704.413. and 704.500., 704.502., 704.504., 704.506., 704.508., 704.510., 704.512. followed by a suffix number (short lever color code).

Lighted Mushroom: 704.084. and 704.086. followed by a suffix number (color code).

GENERAL:

These are open type pushbutton, key-lock, lever and emergency devices for industrial control use. They are single throw, single pole or double pole switch mechanisms. They consist of one, two or three switch blocks and are available in combinations of normally open and/or normally closed contacts with slow-make/slow-break or snap action. All types are provided with operators. The illuminated pushbutton and indicator are provided with Type Ba-9 incandescent lamp (6, 12, 24, 28, 60, 130 V) or neon lamp (110, 120, 220 V)

Devices with Suffixes 901 and 911 are identical to devices with Suffixes 900 and 910 respectively. Except that they are provided with gold/silver plated contacts.

Devices with Suffixes 902 and 912 are identical to devices with Suffixes 900 and 910 respectively, except that they are provided with silver/palladium plated contacts.

Devices with Suffixes 905 and 915 are identical to devices with Suffixes 900 and 910 respectively, except that they are provided with quick connect terminals instead of screw-type terminals.

* Devices with Suffix 916 are identical to devices with Suffix 915 except that they are provided with gold/silver plated contacts.

Devices with Suffixes 930 and 935 are identical to devices with Suffixes 900 and 910 except that the housing material is replaced with Udel P1720 manufactured by Amoco Performance Products, Inc.

RATINGS:

The switch elements are rated 600 V ac, 10 A; 250 V dc, 0.25 A; 125 V dc, 0.50 A, heavy pilot duty at 600 V ac and 120 V ac.

CONSTRUCTION DETAILS:

The product shall be constructed in accordance with the following description.

Spacings -

Between any uninsulated live part and an uninsulated live part of opposite polarity, uninsulated grounded part other than the enclosure, or exposed metal part	Through air or oil	3/8 in
	Over Surface	1/2 in

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Tolerances - Unless specified otherwise, all indicated dimensions are nominal.

Corrosions Protection - All parts are of corrosion resistance material or are plated or painted as protection against corrosion.

Marking - Printed on side of contact block, designates Listee's name and/or trademark, part designation and electrical rating. (Note: Marking should appear alone on side of device and not together with other testing laboratory markings or may appear on same side but separate from other testing laboratory markings, or within a separate lined off area).

NOMENCLATURE BREAKDOWN:

704	910	4
I	II	III

I. Basic type - 704

II. Action and type of contact

900 - Snap action with silver-copper contacts
910 - Slow-make/slow-break with silver-copper contacts
901 - Snap action with gold/silver contacts
911 - Slow-make/slow-break with gold/silver contacts
902 - Snap action with silver/palladium contacts
912 - Slow-make/slow-break with silver/palladium contacts
930 - Snap action with silver-copper contacts, housing material: Udel P1720
935 - Slow make/slow-break with silver/copper contacts, housing material: Udel P1720
905 - Snap action with silver-copper contacts, quick contact terminals.
915 - Slow make/slow break with silver-copper contacts, quick contact terminals

* 916 - Slow make/slow break with gold/silver contacts, quick contact terminals.

III. Contact and color coding

1 - single pole, green, normally open contact.
2 - single pole, red, normally closed contact.
3 - double pole, green, normally open contacts.
4 - double pole, red, normally closed contacts.
5 - double pole, 1 green and 1 red, 1 normally open and 1 normally closed contacts.

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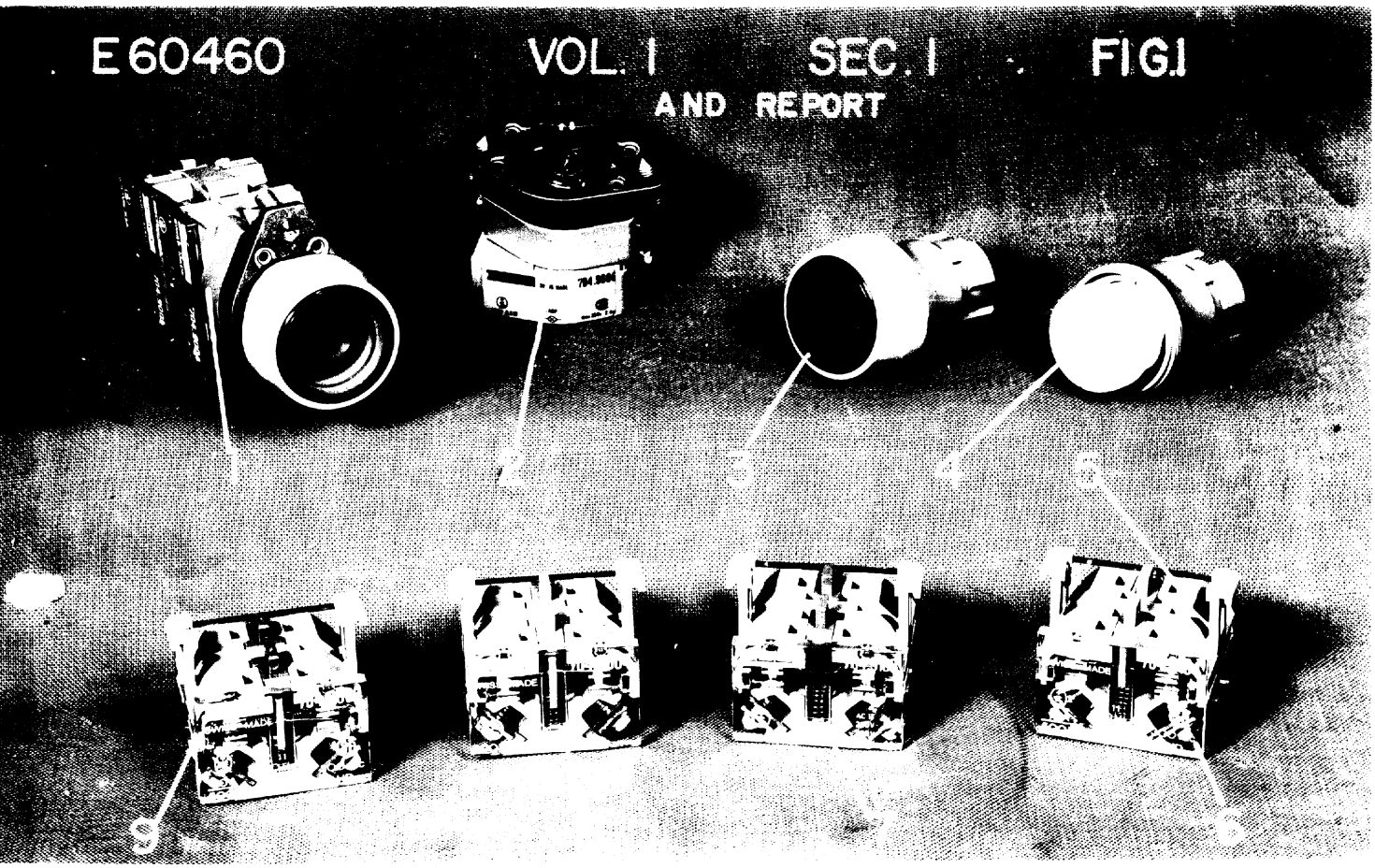

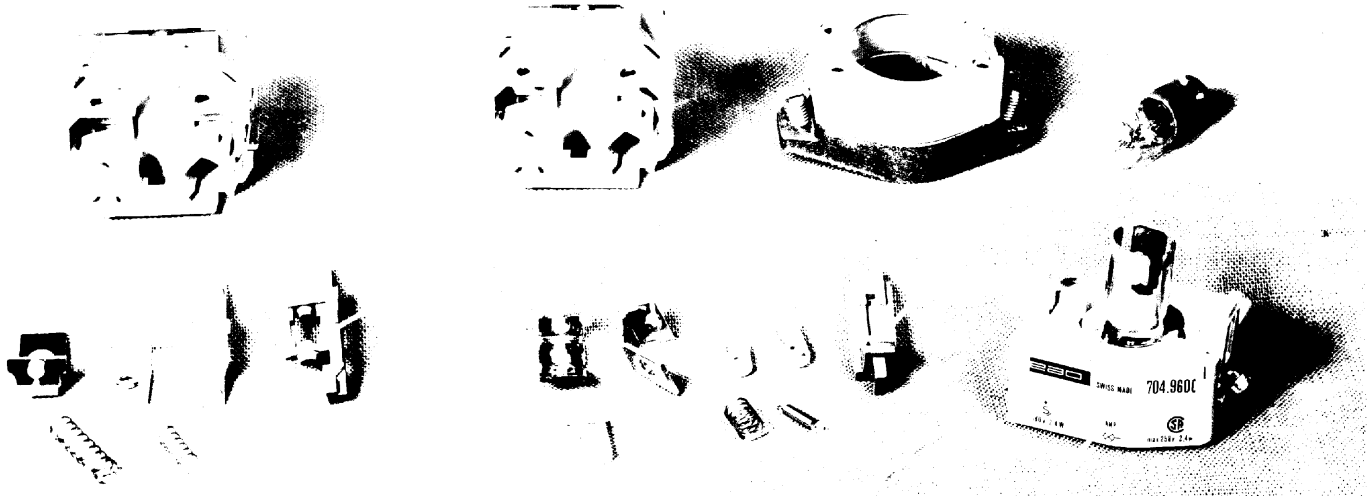
704.960C

SERIES 704 SWITCHES
(REPRESENTS ALL DEVICES) FIG. 1 (M77-3175)

1. Series 704 - Complete assembly.

2. Lampholder - For illuminated pushbutton and indicator. Complete assembly with mounting bracket and bulb. See Item 28 for details.

3. Pushbutton Assembly -

   A. Lens - Recognized Component plastic (QMFZ2), Grilamid TR-55, manufactured by EMS-Chemie.

   B. Lens Retainer - Plastic or aluminum, 1.6 mm thick, 18.6 mm max dia, 12.8 mm high, screws onto body.

   C. Gasket - Rubber.

4. Bulb Housing - For illuminated pushbutton. Recognized Component plastic material (QMFZ2), Delrin 500 manufactured by E.I. duPont de Nemours and Co. Inc., 1.3 mm thick. 16.6 mm min dia, 21.6 max dia with threads, 34.3 mm high.

   Alternate - Same as above except Recognized Component plastic (QMFZ2),
* Makrolon 2805 by Bayer.

5. Type 704-9104 - Complete assembly, slow-make/slow-break switch, double pole, normally closed contacts.

6. Side Cover - Recognized Component plastic material (QMFZ2), Makrolon 2805 manufactured by Bayer, 2.5 mm thick, 22.6 mm high, 32 mm wide, snap fitted to side of contact housing.

7. Type 704-9103 - Complete assembly, slow-make, slow break switch, double pole, normally open contacts.

8. Type 704-9004 - Complete assembly, snap action switch, double pole, normally closed contacts.

9. Type 704-9003 - Complete assembly, snap action switch, double pole, normally open contacts.

10. Contact Housing - See Item 11.

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11. Contact Housing - (Type 704-9003) - Recognized Component plastic material (QMFZ2) Makrolon 2805 manufactured by Bayer, 1.5 mm min thickness, 32.5 mm wide, 29 mm high, shaped as shown.

    Alternate Material - (Types 704.930 and 704.935 only) - Recognized Component plastic (QMFZ2) Type Udel P1720 manufactured by Amoco Performance Products, Inc.

12. Mounting Flange - (Type 704.960.5) - 2 piece construction - top is metal 2 mm thick, 27.5 mm outside dia, 44 mm long including flanges; bottom is
✓* Recognized Component plastic material (QMFZ2) Makrolon 2805 manufactured by Bayer 3.3 mm thick, 27.5 mm outside dia, 32.2 mm max length. Provided with 2 screws for mounting.

✓* Alternate Material - Recognized Component plastic (QMFZ2) Makrolon 8030 manufactured by Bayer. All dimensions same as above.

13. Bulb - Type Ba-9 lamp (voltages: 6, 12, 24, 48, 60, 130; 2.4 W max) also glow discharge can be used for 110 V, 120 V, or 220 V operations.

14. Movable Contact Carrier - (Type 704-9003) - Recognized Component plastic material (QMFZ2) Type GL 4030, manufactured by Liquid Nitrogen Processing Corp., 1.3 mm min thickness, 2.3 mm wide, 23.3 mm max height including flanges.

    Alternate - Same as above except 7 mm by 9.5 mm by 23 mm.

15. Movable Contact Arm - (Type 704-9003) - Plated brass, 0.3 mm thick, 10.8 mm long, 4.5 mm wide at contact.

16. Movable Contact - (Type 704-9003) - Silver copper, 0.6 mm thick, 2.8 mm dia.

    Alternate - (Type 704-901) - Same dimensions as above except gold/silver.

    Alternate - (Type 704-902) - Same dimensions as above except silver/palladium.

17. Stationary Contact - (Type 704-9003) - Silver copper, 1 mm thick, 3 mm dia.

    Alternate - (Type 704-901) - Same dimensions as above except gold/silver.

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Alternate - (Type 704-902) - Same dimensions as above except silver/palladium.

18. Movable Contact Carrier - (Type 704-9101) - Recognized Component plastic material (QMFZ2) Nylatron GS-17, manufactured by Polypenco BV ~~or Type GL 4030, manufactured by Liquid Nitrogen processing Corp.~~, approx 2 mm thick, 23 mm long with flange, 9.7 mm max width.

19. Movable Contact Arm and Contact - (Type 704-910).

Contact - Silver-copper, 0.8 mm thick, 3 mm dia, riveted to arm.

Alternate - (704-911) - Same dimensions as above except gold/silver.

Alternate - (704-912) - Same dimensions as above except silver/palladium.

Arm - Brass, 0.5 mm thick, 5.9 mm max width, 21.6 mm long.

20. Stationary Contact Arm - (Type 704-9101) - Nickel plated copper alloy 1 mm thick, 10 mm wide at contact, approx 12.5 mm high.

21. Stationary Contact - (Type 704-9101) - Silver-copper. 1 mm, thick, 3 mm dia, riveted to arm.

Alternate - (Type 704-911) - Same dimensions as above except gold/silver.

Alternate - (Type 704-912) - Same dimensions as above except silver/palladium.

22. Actuator Spring - (Type 704-9101) - Stainless steel, 0.35 mm dia, 4.45 mm,outside dia, approx 16.5 mm free length.

23. Movable Contact Spring - (Type 704-9101) - Stainless steel, 0.25 mm dia, 3.45 mm outside dia, approx 10.3 mm free length.

24. Stationary Contact Arm - (Type 704-9003) - Nickel plated copper alloy 1 mm thick, 10 mm wide at contact, approx 16.3 mm high.

25. Actuator - (Type 704-9003, shape not as shown) - Plated brass, 1.3 mm thick, 9.5 mm wide, 12 mm long, shaped as shown.

26. Actuator Spring - (Type 704-9003) - Stainless steel, 0.4 mm dia, 4.6 mm outside dia, approx 7.5 mm free length.

27. Movable Contact Spring - (Type 704-9003) - Stainless steel, 0.35 mm dia, 2 mm outside dia, approx 10 mm free length.

S.P.
R.W.

28. Lampholder - (Type 704.960.0) - Recognized Component plastic material
* (QMFZ2) Makrolon 2805 manufactured by Bayer, 15.3 mm high, 27.5 mm wide, 32.0 mm approx length. Provided with plated brass bulb holder, 0.5 mm thick, 10.5 mm dia, approx 17.5 mm high, riveted to terminals. Also provided with a plunger, Recognized Component plastic material (QMFZ2), Delrin 500, manufactured by E.I. duPont de Nemours and Co., Inc. 1.5 mm thick, 15.5 mm outside dia, 15.3 mm high.

*

29. Terminal Plate and Screw (Not shown) -

Plate - Plated steel 1.0 mm thick, 8.0 mm wide 7.8 mm high
Screw - Steel, Size M3.5 by 8.3 including head.

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SEC.
FIG.2
1
2
3
4
5

*OPERATORS FIG. 2 (M77-12938)

General - The following represents the typical construction of the operator heads. They are non-electrical in construction.

1. Key-Operated rotary Switch - Round or square, momentary or maintained action, 2 or 3 positions.

2. Lever Selector Switch - Round or square, momentary or maintained action, two or three positions. Plastic or aluminum or CrNi-steel front ring and plastic lever (black, red, yellow or green).

3. Indicator - Round or square, translucent or Knurled diffuser. Transparent or dimmer lens cap (red, yellow, green blue, clear, orange).

4. Mushroom Pushbutton - Momentary or maintained action, plastic or aluminum front ring and plastic cap (black, red, yellow or green).

5. Rotary Release - Holds down when operated and interlocks automatically. Rotating in the arrow direction, the switch is unlocked. Provided with springs. Plastic or aluminum front ring with plastic mushroom cap (red).

   Alternate (Not shown) - Has arrows replaced by the words "Stop" concentrically indicated. Rotating mushroom clockwise unlocks switch.

6. Switch Key Release - Holds down when operated and interlocks automatically. Rotating the key, thw switch is unlocked. Plastic or aluminum front ring with plastic mushroom cap (red).

7. Rotary Short Lever Actuator - Round or square, momentary or maintained action two or three positions. Plastic or aluminum or CrNi-steel front ring and plastic lever (black, red, yellow or green).

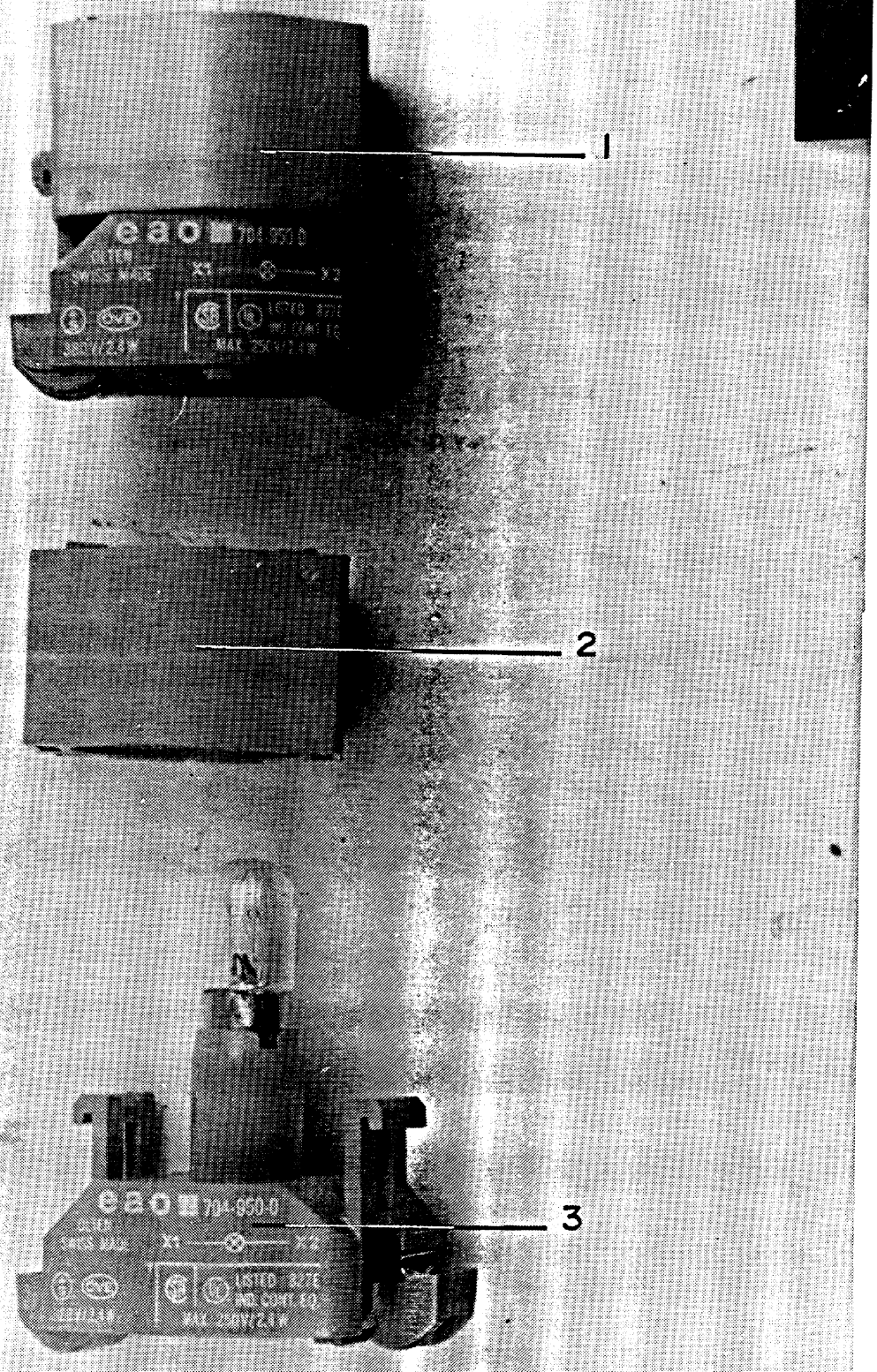
8. Pushbotton Actuator - Round or square, momentary or maintained action. Plastic or aluminum or CrNi-steel front ring. Plastic or aluminum lens (black, red, yellow, green, blue, clear, grey or orange).

9. Lighted Pushbutton Actuator - Round or square, momentary or maintained action. Plastic or aluminum or CrNi-steel front ring, plastic lens (red, yellow, green, blue, clear, or orange).

10. Lighted Mushroom - Momentary and maintained action. Plastic or aluminum front ring and plastic cap (red, yellow, green, clear, blue).

C.H.
A.M.

E60460 VOL. I SEC. I FIG. 3
AND REPORT



M87-16808

ALTERNATE CONSTRUCTION
SERIES 704 SWITCHES

FIG. 3 (M87-16808)

General - The alternate construction of the Series 704 switch is identical to the previous design described in Fig. 1, except for the following items.

1. Lampholder Assembly - Consists of lampholder mounting flange described below.

2. Mounting Flange - (Type 704.950.5) Recognized Component plastic Arnite AV2 360S, manufactured by AKZO Plastics BV, 29.5 mm outside dia, 32 mm long and 21.5 mm high. Provided with two screws for mounting.

*3. Lampholder - Recognized Component plastic Makrolon 2805, manufactured by Bayer, 30.3 mm high, 27.5 mm wide, 36.6 mm long. Provided with two contacts Cu Zn 37 and a plunger; Recognized Component plastic material, Delrin 500, manufactured by Dupont de Nemours.

Type 704.950.0 has screw-type terminals.

Type 704.950.1 has quick-connect terminals.

S.P.
R.W.

M87-17067

CAT. NO. 704.020.
REPRESENTS CAT. NO. 704.021, 704.642.0 FIG. 4 (M87-17067)

1. Housing - R/C plastic material (QMFZ2), Cat. No. Ultem 1000 or Ultem 1010R manufactured by General Electric Co. 20 mm min dia, 28 mm max dia, 1 mm thick, approx 0.60 mm at segregating walls inside of housing, 54.5 mm overall, threaded at large end.

2. Mounting Nut - R/C plastic material (QMFZ2) Crastin SG635FR manufactured by Ciba-Geigy, 1.5 mm thick, 28.5 mm dia max, 25 min dia, 12, mm long.

* Alternate - Same as above except, Cat. No. T845FR manufactured by E.I. Dupont DeNemours Co.

3. Seal - Nitril L6962 manufactured by Shintani Tokyo, 0.3 mm thick 26.5 mm dia.

4. Cap - Polycarbonate, 1.2 mm thick 23 mm dia., 9 mm long. White for Cat. No. 704.020. Clear for Cat. No. 704.021.

5. Lens - R/C plastic (QMFZ2) Grilamid TR55 manufactured by EMS-Chimie, 1.5 mm thick, 29 mm dia, 12.7 mm long. Threaded to fit housing.

6. Bulb - Type BA-9, 6-130 V, 2.6 W incandescent or 220 V, 2.6 W neon bulb.

7. Spring - Stainless steel, .5 mm wire dia, 7.4 mm outside dia, 4.2 mm free length.

8. Cover Plate - R/C plastic (QMFZ2) Ultem 1000 manufactured by General Electric, 1 mm thick, 20.5 mm dia, 13.5 mm long.

9. Contact Arm - Nickel plated brass, .8 mm thick, 8.3 mm max width, 2.3 mm min width 27.5 mm overall length.

10. Contact Arm - Bronze, .8 mm thick 10.5 mm tapering to 5.6 mm wide, 26 mm long.

11. Terminal - Plated steel, .8 mm thick, 7.0 mm wide, 2.2 mm high with 2 indications, with M3 steel screw.

M87-17068

CAT. NO. 704.022
REPRESENTS 704.642.1

FIG. 5 (M87-17068)

* General - Items 1-11 are identical to Items 1-11 of Fig. 4.

12. Resistor - Type 208-0, 5.6 kilohms, 5 W for reduction from 220 V to 130 V.

M87-17069

CAT. NO. 704.024
REPRESENTS 704.642.2

FIG. 6 (M87-17069)

General - Items 1-11 are identical to Items 1-11 of Fig. 4.

12. Resistor - Type 208-0, 2.7 kilohms, 5 W for reduction from 110 V to 60 V.

T E S T R E C O R D N O. 9

SAMPLES:

This manufacturer submitted samples of Type 704 for investigation. Due to the similarity of the device with models previously covered under this report, no tests were considered necessary.

Test Record Summary:

The results of this investigation indicate that the sample(s) evaluated comply with the applicable requirements, and therefore, such products are judged eligible to bear UL's Mark as described on the Conclusion Page of this Report.

Test Record by:

K. CONNELLY
Project Engineer

Reviewed by:

S. PORCILLO
Project Engineer

T E S T R E C O R D N O. 8

SAMPLES:

This manufacturer subsmitted samples of Cat. No. 704916 for investigation. Due to the similarity of the device with models previously covered under this report, no tests were considered necessary.

R.W.

TEMPERATURE TEST:

METHOD

A sample of the device with an operating circuit as noted, was subjected to this test. The contacts of the device were connected in series to a rated source of supply using 4 ft per terminal of wire size as noted. A current as indicated below was passed through all of the contacts. The device was caused to carry this current continuously until constant temperatures were reached on and about the parts of the device. All temperatures were measured by thermocouples. The tips of the thermocouples were secured to the heated parts by solder, tape or sodium silicate.

Cat. No. 704.905.5

Contact Current: 10 A

Wire Size: No. 14 AWG

Enclosure: Cardboard

RESULTS

Location of Thermocouples	Total Temp. °C
Terminal 13	35
Terminal 14	36
Terminal 21	34.5
Terminal 22	37.5
Ambient	23.5

T E S T R E C O R D N O. 7

SAMPLES:

The manufacturer submitted samples of the Cat. Nos. 704.905 and 704.915 for investigation. The following tests were conducted.

TEMPERATURE TEST:

METHOD

A sample of the device with an operating circuit as noted, was subjected to this test. The contacts of the device were connected in series to a rated source of supply using 4 ft per terminal of wire size as noted. A current as indicated below was passed through all of the contacts. The device was caused to carry this current continuously until constant temperatures were reached on and about the parts of the device. All temperatures were measured by thermocouples. The tips of the thermocouples were secured to the heated parts by solder, tape or sodium silicate.

Cat. No. 704.915.5

Contact Current: 10 A

Wire Size: No. 14 AWG

Enclosure: Cardboard

RESULTS

Location of Thermocouples	Total Temp. °C
Terminal 13	31
Terminal 14	32
Terminal 21	32
Terminal 22	32
Ambient	23.5

AC VOLTAGE PILOT DUTY TESTS:

METHOD

A separate set of contacts was subjected to the Overload and Endurance Tests at each indicated voltage. When indicated, both normally open and normally closed contacts were subjected to each test.

The loads were set to obtain the indicated currents at rated voltage. The Overload Test was conducted with the voltage at 110 percent of rating but with no adjustment of the load. The Endurance Test was conducted at rated voltage.

Cat. No.: 704-911 Contacts: NC

For Rating of:

Volts	Normal Current (Amperes)	Current Inrush (Amperes)
600	1.2	12
120	6	60

RESULTS

	Overload			Endurance		
Voltage	660	132	600	120	600	120
Power Factor	Less than 0.35			Less than 0.35		
Operations per minute	6	6	60	60	6	6
			Except the first 10 operations are made as rapidly as possible			
Total Operations	50	50	1000	1000	5000	5000
Results	ACC	ACC	ACC	ACC	ACC	ACC

DIELECTRIC WITHSTAND	Volts AC	Results
Switch Open-Live Parts to Enclosure	2200	NB
Switch Closed-Live Parts to Enclosure	2200	NB
Uninsulated Live Parts of Different Circuits	2200	NB

REMARKS: ACC - Acceptable; NB - No Breakdown

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AC VOLTAGE PILOT DUTY TESTS:

METHOD

A separate set of contacts was subjected to the Overload and Endurance Tests at each indicated voltage. When indicated, both normally open and normally closed contacts were subjected to each test.

The loads were set to obtain the indicated currents at rated voltage. The Overload Test was conducted with the voltage at 110 percent of rating but with no adjustment of the load. The Endurance Test was conducted at rated voltage.

Cat. No.: 704-911 Contacts: NC

For Rating of:

Volts	Normal Current (Amperes)	Current Inrush (Amperes)
600	1.2	12
120	6	60

RESULTS

	Overload			Endurance		
Voltage	660	132	600	120	600	120
Power Factor	Less than 0.35			Less than 0.35		
Operations per minute	6	6	60	60	6	6
			Except the first 10 operations are made as rapidly as possible			
Total Operations	50	50	1000	1000	5000	5000
Results	ACC	ACC	ACC	ACC	ACC	ACC

DIELECTRIC WITHSTAND	Volts AC	Results
Switch Open-Live Parts to Enclosure	2200	NB
Switch Closed-Live Parts to Enclosure	2200	NB
Uninsulated Live Parts of Different Circuits	2200	NB

REMARKS: ACC - Acceptable; NB - No Breakdown

(RF-416-82)

AC VOLTAGE PILOT DUTY TESTS:

METHOD

A separate set of contacts was subjected to the Overload and Endurance Tests at each indicated voltage. When indicated, both normally open and normally closed contacts were subjected to each test.

The loads were set to obtain the indicated currents at rated voltage. The Overload Test was conducted with the voltage at 110 percent of rating but with no adjustment of the load. The Endurance Test was conducted at rated voltage.

Cat. No.: 704-911 Contacts: NO

For Rating of:

Volts	Normal Current (Amperes)	Current Inrush (Amperes)
600	1.2	12
120	6	60

RESULTS

	Overload			Endurance		
Voltage	660	132	600	120	600	120
Power Factor	Less than 0.35			Less than 0.35		
Operations per minute	6	6	60	60	6	6
			Except the first 10 operations are made as rapidly as possible			
Total Operations	50	50	1000	1000	5000	5000
Results	ACC	ACC	ACC	ACC	ACC	ACC

DIELECTRIC WITHSTAND	Volts AC	Results
Switch Open-Live Parts to Enclosure	2200	NB
Switch Closed-Live Parts to Enclosure	2200	NB
Uninsulated Live Parts of Different Circuits	2200	NB

REMARKS: ACC - Acceptable; NB - No Breakdown

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AC VOLTAGE PILOT DUTY TESTS:

METHOD

A separate set of contacts was subjected to the Overload and Endurance Tests at each indicated voltage. When indicated, both normally open and normally closed contacts were subjected to each test.

The loads were set to obtain the indicated currents at rated voltage. The Overload Test was conducted with the voltage at 110 percent of rating but with no adjustment of the load. The Endurance Test was conducted at rated voltage.

Cat. No.: 704-911 Contacts: NO

For Rating of:

Volts	Normal Current (Amperes)	Current Inrush (Amperes)
600	1.2	12
120	6	60

RESULTS

	Overload			Endurance		
Voltage	660	132	600	120	600	120
Power Factor	Less than 0.35			Less than 0.35		
Operations per minute	6	6	60	60	6	6
			Except the first 10 operations are made as rapidly as possible			
Total Operations	50	50	1000	1000	5000	5000
Results	ACC	ACC	ACC	ACC	ACC	ACC

DIELECTRIC WITHSTAND	Volts AC	Results
Switch Open-Live Parts to Enclosure	2200	NB
Switch Closed-Live Parts to Enclosure	2200	NB
Uninsulated Live Parts of Different Circuits	2200	NB

REMARKS: ACC - Acceptable; NB - No Breakdown

(RF-416-82)

AC VOLTAGE PILOT DUTY TESTS:

METHOD

A separate set of contacts was subjected to the Overload and Endurance Tests at each indicated voltage. When indicated, both normally open and normally closed contacts were subjected to each test.

The loads were set to obtain the indicated currents at rated voltage. The Overload Test was conducted with the voltage at 110 percent of rating but with no adjustment of the load. The Endurance Test was conducted at rated voltage.

Cat. No.: 704-901 Contacts: NO

For Rating of:

Volts	Normal Current (Amperes)	Current Inrush (Amperes)
600	1.2	12
120	6	60

RESULTS

	Overload			Endurance		
Voltage	660	132	600	120	600	120
Power Factor	Less than 0.35			Less than 0.35		
Operations per minute	6	6	60	60	6	6
			Except the first 10 operations are made as rapidly as possible			
Total Operations	50	50	1000	1000	5000	5000
Results	ACC	ACC	ACC	ACC	ACC	ACC

DIELECTRIC WITHSTAND	Volts AC	Results
Switch Open-Live Parts to Enclosure	2200	NB
Switch Closed-Live Parts to Enclosure	2200	NB
Uninsulated Live Parts of Different Circuits	2200	NB

REMARKS: ACC - Acceptable; NB - No Breakdown

(RF-416-82)

AC VOLTAGE PILOT DUTY TESTS:

METHOD

A separate set of contacts was subjected to the Overload and Endurance Tests at each indicated voltage. When indicated, both normally open and normally closed contacts were subjected to each test.

The loads were set to obtain the indicated currents at rated voltage. The Overload Test was conducted with the voltage at 110 percent of rating but with no adjustment of the load. The Endurance Test was conducted at rated voltage.

Cat. No.: 704-901 Contacts: NC

For Rating of:

Volts	Normal Current (Amperes)	Current Inrush (Amperes)
600	1.2	12
120	6	60

RESULTS

	Overload			Endurance		
Voltage	660	132	600	120	600	120
Power Factor	Less than 0.35			Less than 0.35		
Operations per minute	6	6	60	60	6	6
			Except the first 10 operations are made as rapidly as possible			
Total Operations	50	50	1000	1000	5000	5000
Results	ACC	ACC	ACC	ACC	ACC	ACC

DIELECTRIC WITHSTAND	Volts AC	Results
Switch Open-Live Parts to Enclosure	2200	NB
Switch Closed-Live Parts to Enclosure	2200	NB
Uninsulated Live Parts of Different Circuits	2200	NB

REMARKS: ACC - Acceptable; NB - No Breakdown

(RF-416-82)

Lib/E60460-PC

AC VOLTAGE PILOT DUTY TESTS:

METHOD

A separate set of contacts was subjected to the Overload and Endurance Tests at each indicated voltage. When indicated, both normally open and normally closed contacts were subjected to each test.

The loads were set to obtain the indicated currents at rated voltage. The Overload Test was conducted with the voltage at 110 percent of rating but with no adjustment of the load. The Endurance Test was conducted at rated voltage.

Cat. No.: 704-901 Contacts: NC

For Rating of:

Volts	Normal Current (Amperes)	Current Inrush (Amperes)
600	1.2	12
120	6	60

RESULTS

	Overload			Endurance		
Voltage	660	132	600	120	600	120
Power Factor	Less than 0.35			Less than 0.35		
Operations per minute	6	6	60	60	6	6
			Except the first 10 operations are made as rapidly as possible			
Total Operations	50	50	1000	1000	5000	5000
Results	ACC	ACC	ACC	ACC	ACC	ACC

DIELECTRIC WITHSTAND	Volts AC	Results
Switch Open-Live Parts to Enclosure	2200	NB
Switch Closed-Live Parts to Enclosure	2200	NB
Uninsulated Live Parts of Different Circuits	2200	NB

REMARKS: ACC - Acceptable; NB - No Breakdown

(RF-416-82)

AC VOLTAGE PILOT DUTY TESTS:

METHOD

A separate set of contacts was subjected to the Overload and Endurance Tests at each indicated voltage. When indicated, both normally open and normally closed contacts were subjected to each test.

The loads were set to obtain the indicated currents at rated voltage. The Overload Test was conducted with the voltage at 110 percent of rating but with no adjustment of the load. The Endurance Test was conducted at rated voltage.

Cat. No.: 704-901 Contacts: No

For Rating of:

Volts	Normal Current (Amperes)	Current Inrush (Amperes)
600	1.2	12
120	6	60

RESULTS

	Overload			Endurance		
Voltage	660	132	600	120	600	120
Power Factor	Less than 0.35			Less than 0.35		
Operations per minute	6	6	60	60	6	6
			Except the first 10 operations are made as rapidly as possible			
Total Operations	50	50	1000	1000	5000	5000
Results	ACC	ACC	ACC	ACC	ACC	ACC

DIELECTRIC WITHSTAND	Volts AC	Results
Switch Open-Live Parts to Enclosure	2200	NB
Switch Closed-Live Parts to Enclosure	2200	NB
Uninsulated Live Parts of Different Circuits	2200	NB

REMARKS: ACC - Acceptable; NB - No Breakdown

(RF-416-82)

Lib/E60460-PC

OVERLOAD AND ENDURANCE TESTS:

A complete sample of the 704-9113 was subjected to Overload and Endurance Tests in accordance with Sections 52 and 53 of the INDUSTRIAL CONTROL EQUIPMENT STANDARD (UL 508). The circuit parameters and results are tabulated below.

OVERLOAD, STALLED ROTOR, ENDURANCE, DIELECTRIC WITHSTAND

TEST	O'LOAD-ST. ROTOR-END.	OVERLOAD	ENDURANCE
	CAT. NO.	704-9113	
	POLES USED	1	1
	BOX CONN. TO WHICH POLE	Live	Live
FOR RATING OF	AMPERES	10	10
	VOLTS	600	600
	HORSEPOWER	-	-
	PHASE/DC	1	1
TEST DATA	VOLTS - OPEN CCT.	614	614
	VOLTS - CLOSED CCT.	600	600
	PHASES/DC	1	1
	AMPERES	15	10
	POWER FACTOR	0.76	0.79
	SHUNT OHMS PER PHASE	2270	2935
	OPERATIONS PER MINUTE	6	60
	TOTAL OPERATIONS	50	6000
	RESULTS	ACC	ACC

DIELECTRIC WITHSTAND	Volts ac	Results
Switch Open - Live Parts to Enclosure	2200	NB
Switch Closed - Live Parts to Enclosure	2200	NB
Uninsulated Live Parts of Different Circuits	2200	NB

REMARKS: ACC - Acceptable
NB - No Breakdown

(E-482-82)

OVERLOAD AND ENDURANCE TESTS:

A complete sample of the 704-9113 was subjected to Overload and Endurance Tests in accordance with Sections 52 and 53 of the INDUSTRIAL CONTROL EQUIPMENT STANDARD (UL 508). The circuit parameters and results are tabulated below.

OVERLOAD, STALLED ROTOR, ENDURANCE, DIELECTRIC WITHSTAND

TEST	O'LOAD-ST. ROTOR-END.	OVERLOAD	ENDURANCE
	CAT. NO.	704-9113	
	POLES USED	1	1
	BOX CONN. TO WHICH POLE	Live	Live
FOR RATING OF	AMPERES	10	10
	VOLTS	600	600
	HORSEPOWER	-	-
	PHASE/DC	1	1
TEST DATA	VOLTS - OPEN CCT.	614	614
	VOLTS - CLOSED CCT.	600	600
	PHASES/DC	1	1
	AMPERES	15	10
	POWER FACTOR	0.76	0.79
	SHUNT OHMS PER PHASE	2270	2935
	OPERATIONS PER MINUTE	6	60
	TOTAL OPERATIONS	50	6000
	RESULTS	ACC	ACC

DIELECTRIC WITHSTAND	Volts ac	Results
Switch Open - Live Parts to Enclosure	2200	NB
Switch Closed - Live Parts to Enclosure	2200	NB
Uninsulated Live Parts of Different Circuits	2200	NB

REMARKS: ACC - Acceptable
NB - No Breakdown

(E-482-82)

OVERLOAD AND ENDURANCE TESTS:

A complete sample of the 704-9013 was subjected to Overload and Endurance Tests in accordance with Sections 52 and 53 of the INDUSTRIAL CONTROL EQUIPMENT STANDARD (UL 508). The circuit parameters and results are tabulated below.

OVERLOAD, STALLED ROTOR, ENDURANCE, DIELECTRIC WITHSTAND

TEST	O'LOAD-ST. ROTOR-END.	OVERLOAD	ENDURANCE
	CAT. NO.	704-9013	
	POLES USED	1	1
	BOX CONN. TO WHICH POLE	Live	Live
FOR RATING OF	AMPERES	10	10
	VOLTS	600	600
	HORSEPOWER	-	-
	PHASE/DC	1	1
TEST DATA	VOLTS - OPEN CCT.	614	614
	VOLTS - CLOSED CCT.	608	612
	PHASES/DC	1	1
	AMPERES	15	10
	POWER FACTOR	0.76	0.79
	SHUNT OHMS PER PHASE	2270	2935
	OPERATIONS PER MINUTE	6	6
	TOTAL OPERATIONS	50	6000
	RESULTS	ACC	ACC

DIELECTRIC WITHSTAND	Volts ac	Results
Switch Open - Live Parts to Enclosure	2200	NB
Switch Closed - Live Parts to Enclosure	2200	NB
Uninsulated Live Parts of Different Circuits	2200	NB

REMARKS: ACC - Acceptable
NB - No Breakdown

(E-482-82)

OVERLOAD AND ENDURANCE TESTS:

A complete sample of the 704-9013 was subjected to Overload and Endurance Tests in accordance with Sections 52 and 53 of the INDUSTRIAL CONTROL EQUIPMENT STANDARD (UL 508). The circuit parameters and results are tabulated below.

OVERLOAD, STALLED ROTOR, ENDURANCE, DIELECTRIC WITHSTAND

TEST	O'LOAD-ST. ROTOR-END.	OVERLOAD	ENDURANCE
	CAT. NO.	704-9013	
	POLES USED	1	1
	BOX CONN. TO WHICH POLE	Live	Live
FOR RATING OF	AMPERES	10	10
	VOLTS	600	600
	HORSEPOWER	-	-
	PHASE/DC	1	1
TEST DATA	VOLTS - OPEN CCT.	614	614
	VOLTS - CLOSED CCT.	608	612
	PHASES/DC	1	1
	AMPERES	15	15
	POWER FACTOR	0.76	0.79
	SHUNT OHMS PER PHASE	2270	2935
	OPERATIONS PER MINUTE	6	6
	TOTAL OPERATIONS	50	6000
	RESULTS	ACC	ACC

DIELECTRIC WITHSTAND	Volts ac	Results
Switch Open - Live Parts to Enclosure	2200	NB
Switch Closed - Live Parts to Enclosure	2200	NB
Uninsulated Live Parts of Different Circuits	2200	NB

REMARKS: ACC - Acceptable
NB - No Breakdown

(E-482-82)

TEMPERATURE TEST:

METHOD

A sample of the device with an operating circuit as noted, was subjected to this test. The contacts of the device were connected in series to a rated source of supply using 4 ft per terminal of wire size as noted. A current as indicated below was passed through all of the contacts. The device was caused to carry this current continuously until constant temperatures were reached on and about the parts of the device. All temperatures were measured by thermocouples. The tips of the thermocouples were secured to the heated parts by solder, tape or sodium silicate.

Catalog Number: 704-901 (silver-palladium contacts)
Contact Current, A: 10
Wire Size, AWG No.: 14
Enclosure Size: (Cardboard) 5 in by 5 in by 5 in

RESULTS

Location of Thermocouples	Total Temperature °C
Terminal 21	59
Terminal 13	58
Terminal 22	60
Terminal 14	61
Plastic Next To Contact 14	48
Plastic Next To Contact 21	50
Ambient	24

T E S T R E C O R D N O. 6

SAMPLES:

The manufacturer submitted samples of contact blocks 704 with gold/silver and silver/palladium contacts for investigation. The following tests were considered necessary.

TEMPERATURE TEST:

METHOD

A sample of the device with an operating circuit as noted, was subjected to this test. The contacts of the device were connected in series to a rated source of supply using 4 ft per terminal of wire size as noted. A current as indicated below was passed through all of the contacts. The device was caused to carry this current continuously until constant temperatures were reached on and about the parts of the device. All temperatures were measured by thermocouples. The tips of the thermocouples were secured to the heated parts by solder, tape or sodium silicate.

Catalog Number: 704-901
Contact current, A: 10
Wire Size, AWG No.: 14
Enclosure Size: (Cardboard) - 5 in by 5 in by 5 in

RESULTS

Location of Thermocouples	Total Temperature °C
Terminal 21	61
Terminal 13	60
Terminal 22	61
Terminal 14	62
Plastic Next To Contact 14	49
Plastic Next To Contact 21	50
Ambient	24

The devices were operated continuously until constant temperatures were reached. All temperatures were measured by thermocouples. The tips of the thermocouples were secured by sodium silicate.

The results of this test are recorded in the following tables:

Catalog No. 704.020.
Rated Voltage 250
Rated Current .01 A
Wire Size - No. 14 AWG
Enclosure Size - 70 by 35 by 35 mm

RESULTS

Location of Thermocouples	Temperature °C
Lampholder plastic body adjacent to lamp	29
Lampholder transparent lens	30
Terminal 1	31
Terminal 2	45
Lamp terminal	34
Lamp body adjacent to terminal 1	29
Ambient	25

SECURENESS, HEATING AND PULLOUT TESTS:

The following tests were conducted according to the Standard for Wire Connectors and Soldering Lugs for Use With Copper Wire (UL 486).

	SECURENESS						HEATING			PULLOUT	
No.	Wire Size AWG	Torque Lb/In.	Bush In.	Height In.	Wt. Lbs.	Results	Current Amperes	Temp Rise C		Force Lbs.	Results
1	1 No. 18 Str	5	1/4	10-1/4	2	Acc	-	-	-	11.5	Acc
2	1 No. 18 Str	5	1/4	10-1/4	2	Acc	-	-	-	11.5	Acc
3	1 No. 14 Sol	5	3/8	11	3	Acc	-			11.5	Acc
4	1 No. 14 Sol	5	3/8	11	3	Acc	-			11.5	Acc

J.W.

Lib/E60460-PC

T E S T R E C O R D N O. 5

SAMPLES:

The manufacturer submitted samples of Cat. No. 704.022. for investigation. The following tests were conducted:

TEMPERATURE TEST:

METHOD

Samples of the device, Cat. No. 704.022 were subjected to this test. The devices were connected to a rated supply and load using 4 ft per terminal of wire size as noted.

The devices were operated continuously until contant temperatures were reached. All temperatures were measured by thermocouples. The tips of the thermocouples were secured by sodium silicate.

The results of this test are recorded in the following tables:

Catalog No. 704.022
Rated Votlage - 250
Rated Current - .01 A
Wire Size - No. 14 AWG
Enclosure Size - 70 by 35 by 35 mm

RESULTS

Location of Thermocouples	Temperature °C
Lampholder body adjacent to lamp	100
Lamp transparent lens	77
Terminal 1	53
Terminal 2	65
Resistor	126
Lamp Terminal	95
Lamp body adjacent to resistor	35
Ambient	25

TEMPERATURE TEST:

METHOD

Samples of the device, Cat. No. 704.020. were subjected to this test. The devices were connected to a rated supply and load using 4 ft per terminal of wire size as noted.

T E S T R E C O R D N O. 4

SAMPLES:

The manufacturer submitted samples of his alternate construction Series 704 switches. Due to the similar construction to the previously Listed Series 704 switches, only the following test was necessary.

HEATING TEST:

METHOD

A sample of the device as noted, was subjected to this test. The device was connected in series to a rated voltage source of supply using 4 ft per terminal of wire size as noted. A current as indicated below was passed through the device. The device was caused to carry this current continuously until constant temperatures were reached on and about the parts of the device. All temperatures were measured by thermocouples. The tips of the thermocouples were secured to the heated parts by solder, tape or sodium silicate.

The results of this test are recorded in the following tables.

Cat. No. 704-9003
Rated voltage - low voltage AC
Current, Amps - 10 A
Wire Size, AWG No. - 14 AWG
Enclosure - 4.5 by 4.5 by 2.5 in

RESULTS

Location of Thermocouples	Temperature - Degrees C
Lampholder plastic body, near bulb	59
Lampholder plastic body, near front lens	51
Center switch plastic near terminal	43
Ambient	23

S.B.

OVERLOAD AND ENDURANCE TESTS:

A complete device was subjected to overload and endurance tests in accordance with sections 24 and 25 of the INDUSTRIAL CONTROL EQUIPMENT STANDARD (UL 508). The circuit parameters and results are tabulated below.

	OVERLOAD, STALLED ROTOR, ENDURANCE, DIELECTRIC STRENGTH				
TEST	O'LOAD-ST.ROTOR-END.	O'Load ⁄	End ⁄		
	CAT. NO.	704-9003	704-9003		
	POLES USED	1 #	1 #		
	BOX CONN. TO WHICH POLE	Live	Live		
FOR RATING OF	AMPERES	10	10		
	VOLTS	600	600		
	HORSEPOWER	-	-		
	PHASE/DC	1	1		
TEST DATA	VOLTS - OPEN CCT.	614	614		
	VOLTS - CLOSED CCT.	608	612		
	PHASES/DC	1	1		
	AMPERES	15	10		
	POWER FACTOR	0.76	0.79		
	SHUNT OHMS PER PHASE	2270	2935		
	OPERATIONS PER MINUTE	6⁄⁄	6 ⁄⁄		
	TOTAL OPERATIONS	50	6000		
	RESULTS	Accept-able	Accept-able		

DIELECTRIC STRENGTH	Volts AC	Results
Switch Open - Live Parts to Enclosure	2200	NB
Switch Closed - Live Parts to Enclosure	2200	NB
Switch Closed - Live Parts Opposite Polarity	-	-
Uninsulated Live Parts of Different Circuits	2200	NB

REMARKS:

⁄ One-pole breaking
Wired with No. 14 AWG
⁄⁄ 1 second on, 9 seconds off

J.K.

T E S T R E C O R D N O. 3

SAMPLES:

The manufacturer submitted samples of the device described in the preceding section of this report. The samples were provided with the alternate material Makrolon 2800. Only the following tests were considered necessary.

NO-LOAD ENDURANCE TEST:

METHOD

The device was mechanically operated and caused to cycle 6000 operations at an arbitrary rate, switching three Type 704.9003 contact blocks.

RESULTS

The device completed 6000 cycles without indication of failure to operate.

H. D.

T E S T R E C O R D N O. 2

SAMPLES:

The manufacturer submitted samples of the Type 704 switches for addition of a new type lamp and operators. The following tests were conducted.

TEMPERATURE TEST: Snap Action Devices

METHOD

A stack of 3 switches with a lamp was subjected to this test. The contacts of the devices were connected in series to a low voltage source of supply using 4 feet per terminal of wire size as noted. A current as indicated below was passed through all of the contacts. The devices were caused to carry this current continuously until constant temperatures were reached on and about the parts of the device. The lamp was connected to a 220 volt, 60 hertz source of supply. All temperatures were measured by thermocouples.

Switch	Lamp
Catalog Number - 704-9003	704-060
Circuit Volts - Low voltage ac	220 volts ac
Contact Current - 10 amperes	-
Wire Size - No. 14 AWG	No. 18 AWG

RESULTS

Location of Thermocouples	Maximum Temperature Degrees C
Lampholder plastic body adjacent to bulb	36
Lampholder plastic body actuator front lense red	29
Center switch plastic adjacent to terminal	46
Center switch terminal	52
Center switch plastic actuator (green)	50
Center switch clear plastic side	48
Ambient	24
Light terminal	41

OVERLOAD AND ENDURANCE TESTS (PILOT DUTY):

METHOD

A. A new set of contacts was each connected subsequently to the loads described below. For the overload tests, the voltage was increased to 110 percent and the device was operated 50 times at a rate of 1 second on and 9 seconds off.

B. For the endurance test, each contact was operated for the first ten operations as fast as possible, the next 990 operations at a rate of 1 per second, and the remaining 5000 operations at a rate of 6 per minute.

Load ac - Tests were conducted with an electromagnetic lead with a power factor of less than .35.

RESULTS

CAT NO.	A OVERLOAD	B ENDURANCE
704-9103 (Slow-Make/Slow-Break)		
Volt-ampere rating	720	720
Inrush current (amperes)	60	60
Steady state current	6	6
Voltage	132	120
Results	OK	OK

D.A.

OVERLOAD AND ENDURANCE TESTS (PILOT DUTY):

METHOD

A. A new set of contacts was each connected subsequently to the loads described below. For the overload tests, the voltage was increased to 110 percent and the device was operated 50 times at a rate of 1 second on and 9 seconds off.

B. For the endurance test, each contact was operated for the first ten operations as fast as possible, the next 990 operations at a rate of 1 per second, and the remaining 5000 operations at a rate of 6 per minute.

Load ac - Tests were conducted with an electromagnetic lead with a power factor of less than .35.

RESULTS

CAT NO.	A OVERLOAD	B ENDURANCE
704-9103 (Slow-Make/Slow-Break)		
Volt-ampere rating	720	720
Inrush current (amperes)	12	12
Steady state current	1.2	1.2
Voltage	660	600
Results	OK	OK

OVERLOAD AND ENDURANCE TESTS (PILOT DUTY):

METHOD

A. A new set of contacts was each connected subsequently to the loads described below. For the overload tests, the voltage was increased to 110 percent and the device was operated 50 times at a rate of 1 second on and 9 seconds off.

B. For the endurance test, each contact was operated for the first ten operations as fast as possible, the next 990 operations at a rate of 1 per second, and the remaining 5000 operations at a rate of 6 per minute.

Load ac - Tests were conducted with an electromagnetic lead with a power factor of less than .35.

RESULTS

CAT NO. 704-9003 (snap switches)	A OVERLOAD	B ENDURANCE
Volt-ampere rating	720	720
Inrush current (amperes)	60	60
Steady state current	6	6
Voltage	132	120
Results	OK	OK

OVERLOAD AND ENDURANCE TESTS (PILOT DUTY):

METHOD

A. A new set of contacts was each connected subsequently to the loads described below. For the overload tests, the voltage was increased to 110 percent and the device was operated 50 times at a rate of 1 second on and 9 seconds off.

B. For the endurance test, each contact was operated for the first ten operations as fast as possible, the next 990 operations at a rate of 1 per second, and the remaining 5000 operations at a rate of 6 per minute.

Load ac - Tests were conducted with an electromagnetic lead with a power factor of less than .35.

RESULTS

CAT NO.	A OVERLOAD	B ENDURANCE
704-9003 (snap switches)		
Volt-ampere rating	720	720
Inrush current (amperes)	12	12
Steady state current	1.2	1.2
Voltage	660	600
Results	OK	OK

SECURENESS, HEATING AND PULLOUT TESTS:

The following tests were conducted according to the Standard for Wire Connectors and Soldering Lugs for Use With Copper Wire (UL 486).

	SECURENESS						HEATING			PULLOUT	
No.	Wire Size AWG	Torque Lb/In.	Bush In.	Height In.	WT. Lbs.	Results	Current Amperes	Temp C	Rise C	Force Lbs.	Results
1	1 No. 18 Str	20	1/4	10-1/4	2	OK	-	-	-	20	OK
2	1 No. 18 Str	20	1/4	10-1/4	2	OK	-	-	-	20	OK
3	1 No. 14 Sol	20	3/8	11	3	OK	15	41	16	60	OK
4	1 No. 14 Sol	20	3/8	11	3	OK	15	40	15	60	OK

OVERLOAD, STALLED ROTOR, ENDURANCE, DIELECTRIC STRENGTH						
TEST	O'LOAD-ST.ROTOR-END.	O'Load	End.			
	CAT. NO.	704-9003	704-9003			
	POLES USED	1	1			
	BOX CONN. TO WHICH POLE	-	-			
FOR RATING OF	AMPERES	0.5	0.5			
	VOLTS	125 v dc	125 v dc			
	HORSEPOWER	-	-			
	PHASE/DC	dc	dc			
TEST DATA	VOLTS - OPEN CCT.					
	VOLTS - CLOSED CCT.					
	PHASES/DC	dc	dc			
	AMPERES	0.75	0.50			
	POWER FACTOR	Resistive	Resistive			
	SHUNT OHMS PER PHASE					
	OPERATIONS PER MINUTE	6 ≠	6 ≠			
	TOTAL OPERATIONS	50	6000			
	RESULTS	OK	OK			

DIELECTRIC STRENGTH	Volts AC	Results
Switch Open - Live Parts to Enclosure		
Switch Closed - Live Parts to Enclosure		
Switch Closed - Live Parts Opposite Polarity		
Uninsulated Live Parts of Different Circuits		

REMARKS: Snap Action Devices

≠ - 1 second on, 9 seconds off.

OVERLOAD, STALLED ROTOR, ENDURANCE, DIELECTRIC STRENGTH						
TEST	O'LOAD-ST.ROTOR-END.	O'Load	End	O'Load	End	
	CAT. NO.	704-9003	704-9003	704-9003	704-9003	
	POLES USED	1	1	1	1	
	BOX CONN. TO WHICH POLE	-	-	-	-	
FOR RATING OF	AMPERES	10	10	0.25	0.25	
	VOLTS	600 v ac	600 v ac	250 v dc	250 v dc	
	HORSEPOWER	-	-	-	-	
	PHASE/DC	1Ø	1Ø	dc	dc	
TEST DATA	VOLTS - OPEN CCT.	602	603			
	VOLTS - CLOSED CCT.	602	603			
	PHASES/DC	1Ø	1Ø	dc	dc	
	AMPERES	15	10	0.375	0.250	
	POWER FACTOR	.758	.772	Resistive	Resistive	
	SHUNT OHMS PER PHASE	2300	3125			
	OPERATIONS PER MINUTE	6 ≠	6	6 ≠	6 ≠	
	TOTAL OPERATIONS	50	6000	50	6000	
	RESULTS	OK	OK	OK	OK	

DIELECTRIC STRENGTH	Volts AC	Results
Switch Open - Live Parts to Enclosure	2200	OK
Switch Closed - Live Parts to Enclosure	2200	OK
Switch Closed - Live Parts Opposite Polarity	2200	OK
Uninsulated Live Parts of Different Circuits	2200	OK

REMARKS: Snap Action Devices

≠ - 1 second on, 9 seconds off.

OVERLOAD, STALLED ROTOR, ENDURANCE, DIELECTRIC STRENGTH						
TEST	O'LOAD-ST.ROTOR-END.	O'Load	End.		O'Load	End.
	CAT. NO.	704-9103	704-9103		704-9103	704-9103
	POLES USED	1	1		1	1
	BOX CONN. TO WHICH POLE	-	-		-	-
FOR RATING OF	AMPERES	.25	.25		0.5	0.5
	VOLTS	250 v dc	250 v dc		125 v dc	125 v dc
	HORSEPOWER	-	-		-	-
	PHASE/DC	dc	dc		dc	dc
TEST DATA	VOLTS - OPEN CCT.					
	VOLTS - CLOSED CCT.					
	PHASES/DC	dc	dc		dc	dc
	AMPERES	0.375	0.250		0.75	0.50
	POWER FACTOR	Resistive	Resistive		Resistive	Resistive
	SHUNT OHMS PER PHASE	-	-		-	-
	OPERATIONS PER MINUTE	6 ≠	6 ≠		6 ≠	6 ≠
	TOTAL OPERATIONS	50	6000		50	6000
	RESULTS	OK	OK		OK	OK

DIELECTRIC STRENGTH	Volts AC	Results
Switch Open - Live Parts to Enclosure	2200	OK
Switch Closed - Live Parts to Enclosure	2200	OK
Switch Closed - Live Parts Opposite Polarity	2200	OK
Uninsulated Live Parts of Different Circuits	2200	OK

REMARKS:

Slow Make Devices
≠ - 1 second on, 9 seconds off

TEMPERATURE TEST: Slow-Make/Slow-Break

METHOD

A stack of 3 switches with a lamp was subjected to this test. The contacts of the devices were connected in series to a low voltage source of supply using 4 feet per terminal of wire size as noted. A current as indicated below was passed through all of the contacts. The devices were caused to carry this current continuously until constant temperatures were reached on and about the parts of the device. The lamp was connected to a 120 volt, 60 hertz source of supply. All temperatures were measured by thermocouples.

Catalog Number - 704-9103
Circuit Volts - Low voltage ac
Contact Current - 10 amperes
Wire Size - No. 14 AWG

RESULTS

Location of Thermocouples	Maximum Temperature Degrees C
Lampholder plastic body adjacent to bulb	100
Lampholder plastic actuator	84
Center switch plastic adjacent to terminal	58
Center switch terminal	58
Center switch plastic retainer	58
Center switch plastic actuator	56
Center switch plastic adjacent to contact	55
Center switch clear plastic side	53
Ambient	24

T E S T R E C O R D N O. 1

SAMPLES:

The manufacturer submitted samples of the Type 704 switches and the following tests were conducted.

TEMPERATURE TEST: Snap Action Devices

METHOD

A stack of 3 switches with a lamp was subjected to this test. The contacts of the deivces were connected in series to a low voltage source of supply using 4 feet per terminal of wire size as noted. A current as indicated below was passed through all of the contacts. The devices were caused to carry this current continuously until constant temperatures were reached on and about the parts of the device. The lamp was connected to a 120 volt, 60 hertz source of supply. All temperatures were measured by thermocouples.

Catalog Number - 704-9003
Circuit Volts - Low voltage ac
Contact Current - 10 amperes
Wire Size - No. 14 AWG

RESULTS

Location of Thermocouples	Maximum Temperature Degrees C
Lampholder plastic body adajcent to bulb	98
Lampholder plastic body actuator front lense	71
Center switch plastic adjacent to terminal	49
Center switch terminal	61
Center switch plastic retainer	52
Center switch plastic actuator	54
Center switch plastic adjacent to contact	56
Center switch clear plastic side	48
Ambient	24

C O N C L U S I O N

Samples of the products covered by this report have been found to comply with the requirements covering the class and the products are judged to be eligible for Listing and Follow-Up Service. The manufacturer is authorized to use the Laboratories' Mark on such products which comply with the Follow-Up Service Procedure and any other applicable requirements of Underwriters Laboratories Inc. Only those products which properly bear the Laboratories' Mark are considered as Listed by Underwriters Laboratories Inc.

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