CERTIFICATE OF COMPLIANCE

Certificate Number	20161207-E208033
Report Reference	E208033-20010717
Issue Date	2016-DECEMBER-07

Issued to: TYCO ELECTRONICS CORP
2901 FULLING MILL RD
MIDDLETOWN PA 17057-3170

This is to certify that representative samples of COMPONENT - SWITCHES, INDUSTRIAL CONTROL
"See Addendum Page"

Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.

Standard(s) for Safety: UL 508 - Standard for Industrial Control Equipment
CSA C22.2 No. 14 - Industrial Control Equipment

Additional Information: See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's Certification and Follow-Up Service.

The UL Recognized Component Mark generally consists of the manufacturer's identification and catalog number, model number or other product designation as specified under "Marking" for the particular Recognition as published in the appropriate UL Directory. As a supplementary means of identifying products that have been produced under UL's Component Recognition Program, UL's Recognized Component Mark: RU, may be used in conjunction with the required Recognized Marks. The Recognized Component Mark is required when specified in the UL Directory preceding the recognitions or under "Markings" for the individual recognitions.

Recognized components are incomplete in certain constructional features or restricted in performance capabilities and are intended for use as components of complete equipment submitted for investigation rather than for direct separate installation in the field. The final acceptance of the component is dependent upon its installation and use in complete equipment submitted to UL LLC.

Look for the UL Certification Mark on the product.

Bruce Mahrenholz, Director North American Certification Program

UL LLC

CERTIFICATE OF COMPLIANCE

Certificate Number	20161207-E208033
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This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.

Component – USR, CNR, Switches, Industrial Control, Contactor, Models EV200, LEV200, and LEV100, followed by an alpha numeric code of five digits, may be followed by two numbers.

EVC followed by 135, followed by four digit alphanumeric code, may be followed by two numbers, followed by A or B.

Component – USR, CNR, Switches, Industrial Control, Contactor, Models IHV100 and IHV200, followed by an alpha numeric code of five digits, may be followed by two numbers.

Note: IHV100 Series is same as LEV100 Series except model names and Nomenclature.
IHV200 Series is same as EV200 Series except model names and Nomenclature.

Bruce Mahrenholz, Director North American Certification Program

UL LLC

File E208033
Project 01SC07010

Issued: July 17, 2001
Revised: February 7, 2006

REPORT

ON

COMPONENT - SWITCHES, INDUSTRIAL CONTROL

Tyco Electronics
Kilovac Corp., Div. Of
Carpenteria, California

DESCRIPTION

PRODUCT COVERED:

Component – USR, CNR, Switches, Industrial Control, Contactor, Models EV200, LEV200, and LEV100, followed by an alpha numeric code of five digits, may be followed by two numbers.

EVC followed by 135, followed by four digit alphanumeric code, may be followed by two numbers, followed by A or B.

Component – USR, CNR, Switches, Industrial Control, Contactor, Models IHV100 and IHV200, followed by an alpha numeric code of five digits, may be followed by two numbers.

Note: IHV100 Series is same as LEV100 Series except model names and Nomenclature.
IHV200 Series is same as EV200 Series except model names and Nomenclature.

GENERAL:

These devices are open-type, single-pole, single-throw, normally open High Voltage DC relays intended for use in industrial applications with specific make/break characteristics. They are not intended for general use. The contact compartment is completely sealed, and filled with Nitrogen, Sulfur Hexafluoride (SF6) or other gas to decrease the effects of arcing and oxidation on the contacts. The relays are provided with a solid state economizer circuit for more efficient coil operation. In addition, the relay might be provided with optional auxiliary contacts.

RATINGS for LEV200 and EV200 Series (Rated for maximum ambient of 85°C):

Contacts-Continuous	:	200 A, 30 V dc.
Normal Make/Normal Break:		15 A, 900 V dc 96 A, 256 V dc 150 A, 200 V dc 50 A, 600 V dc, 7500 cycles, 0.25 s on, 3 s off
Abnormal Make/Break	:	320 V dc, 1200 A, 3 cycle
Abnormal Break	:	600 V dc, 200 A, 50 cycles, 0.25 s on, 10 s off
Carry Only	:	1000 V dc, 350 A, 50˚C maximum ambient
Abnormal Make	:	400 V dc, 400 A, 100cy, 30 s on, 5 min off, 65˚C
Abnormal Make	:	620 V dc, 400 A, 100cy, 30 s on, 5 min off, 65˚C
Abnormal Break	:	520 V dc, 300A, 100cy, 30 s on/off, 65˚C
Coil	:	12-24 Vdc, 48 V-72 Vdc, 72 Vdc, 96 Vdc to 125 Vdc, 110 Vac to 240 Vac.

RATINGS for LEV100A Series (Rated for maximum ambient of 75°C):

Contacts-Continuous : 100 A, 30 V dc

Normal Make/Normal Break: 100 A, 400 V dc, 6000 cycles, 0.18 s on, 1 s off
50 A, 400 V dc, 50000 cycles, 0.185 s on, 1 s off

Abnormal Make/Break : 200 A, 400 V dc, 500 cycles, 0.225 s on, 1 s off

Abnormal Break : 1000A, 400 V dc, 5 cycles, 0.05 s on, 60 s off

Coil : 12 Vdc, 24 Vdc, 48 Vdc

See nomenclature, for additional voltage ratings.

RATINGS for LEV100H, LEV100G, LEV100K Series (Rated for maximum ambient of 40°C):

Contacts-Continuous : 100 A, 400 V dc

Normal Make/Normal Break: 50 A, 400 V dc, 6000 cycles, 0.18 s on, 1 s off

Coil : 12 Vdc, 24 Vdc, 48 Vdc

Auxiliary Contacts : 125Vac, 24Vdc, 3A, resistive

RATINGS for EVC135 Series (Rated for maximum ambient of 75°C):

EVC135 with Suffix A – Ceramic magnets

Contacts-continuous:	100 A, 30 V dc
Normal Make/break:	100 A, 400 V dc, 6000 cycles, 0.18 s on, 1 s off 50 A, 400 V dc, 50000 cycles, 0.185 s on, 1 s off
Abnormal Make/break:	200 A, 400 V dc, 500 cycles, 0.225 s on, 1 s off
Abnormal break:	1000A, 400 V dc, 5 cycles, 0.05 s on, 60 s off
Coil	12VDC (15.3 Ohms) 12VDC (26 Ohms) 12VDC (3.8 Ohms) 24VDC (96 Ohms)

EVC135 with Suffix B - Neodymium magnets

Contacts-continuous:	100 A, 30 V dc
Normal Make/break:	100 A, 400 V dc, 6000 cycles, 0.18 s on, 1 s off 50 A, 400 V dc, 50000 cycles, 0.185 s on, 1 s off
Abnormal Make/break:	200 A, 400 V dc, 500 cycles, 0.225 s on, 1 s off 90A, 600VDC, 50 cycles, 1 s on, 9 s off
Abnormal break:	1000A, 400 V dc, 5 cycles, 0.05 s on, 60 s off
Coil	12VDC (15.3 Ohms) 12VDC (26 Ohms) 12VDC (3.8 Ohms) 24VDC (96 Ohms)

NOMENCLATURE:

EV	200	A	D	A	N	A	01
1	2	3	4	5	6	7	8

1. Series Designation.

2. Current Rating.

   200 = 200 A

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3. Form

   A = Normally Open
   H = Normally Open with SPST-NO Aux. Contacts
   J = Normally Open with SPST-NC Aux Contacts
   K = Normally Open with SPDT Aux Contacts
   L = Normally Open with two Aux contacts, SPST-NO, and SPST-NC
   Other letters and numbers - allowed if main contacts are “Normally Open” and up to two auxiliary contacts are included.

4. Coil Voltage

   A = 12-24 V dc using PWM economizer attached.
   B = 28V dc. Economizer not required
   C = 125V dc nominal. Economizer not required
   D = 48 - 72 V dc using PWM economizer attached.
   F = 15 V dc. Economizer not required
   H = 36 V dc. Economizer not required
   J = 72 V dc using PWM economizer attached.
   K = 72 V dc. Economizer not required.
   L = 110 V dc. Economizer not required
   O = 125 V ac. Using Rectifier attached.
   R = 28 V dc. 2 coil, Mechanical switch, cut throat economizer.
   S = 28 Vdc. 2 coil, Electrical switch, cut throat economizer
   1 = Same as ‘A’ with no economizer circuit provided (see Conditions Of Acceptability)
   2 = Same as ‘D’ with no economizer circuit provided(see Conditions Of Acceptability)
   3 = Same as ‘J’ with no economizer circuit provided(see Conditions Of Acceptability)
   4 = 12 V dc. Economizer not required
   5 = 24 V dc. Economizer not required
   6 = 48 V dc. Economizer not required
   7 = 96 V dc. Economizer not required
   8 = 115 V ac. Using Rectifier attached
   9 = 240 V ac. Using Rectifier attached

*

Other letters and numbers – Define alternate nominal voltages with the same functional coil characteristics.

5. Coil Wire Lead Length

A = 390 mm (15.3″)
B = 152 mm (6″)
D = Wires routed to coil connector attached to relay.
F = 600 mm (23.6″)
G = 900 mm (35.4″)
H = 1200 mm (47″)
J = 1500 mm (59″)
N = No Coil wires. Alternate connection indicated next.

Other Letters and numbers – Define alternate wire lengths

6. Coil Terminal Connector

A = Threaded Studs
B = Yazaki 7282-558-10 male (or equivalent)
C = Molex Mini-Fit JR, 2 CKT, female 18-24 (or equivalent).
E = D Plug attached to housing
F = D Plug on flying lead
N = No connector
Other letters and numbers – Define alternate connector configurations.

7. Mounting and Power Terminals

A = Bottom Mount, with Male threaded power terminals M8x1.25, 16.5 mm length
B = Bottom Mount, with Female threaded power terminals ¼-20 ,0.40″ minimum depth
C = Bottom Mount, Plug in power terminals
D = Bottom Mount, Female threaded power terminals M6 X 1, 10 mm minimum depth.
F = Side Mount, with Male threaded power terminals M8x1.25, 16.5 mm length.
Other letters and numbers – Define alternate mounting and power terminal connections for the 200A series contactors.

8. Customer Special Designator.

01 thru 99 may be used to identify a customer specific product.

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NOMENCLATURE:

IHV	**200**	**A**	**D**	**A**	**N**	**A**	**01**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**

1. Series Designation.

2. Current Rating.

200 = 200 A

3. Form

A = Normally Open
H = Normally Open with SPST-NO Aux. Contacts
J = Normally Open with SPST-NC Aux Contacts
K = Normally Open with SPDT Aux Contacts
L = Normally Open with two Aux contacts, SPST-NO, and SPST-NC
Other letters and numbers - allowed if main contacts are "Normally Open" and up to two auxiliary contacts are included.

4. Coil Voltage

A = 12-24 V dc using PWM economizer attached.
D = 48 - 72 V dc using PWM economizer attached.
F = 15 V dc. Economizer not required
H = 36 V dc. Economizer not required
J = 72 V dc using PWM economizer attached.
1 = Same as 'A' with no economizer circuit provided (see Conditions Of Acceptability)
2 = Same as 'D' with no economizer circuit provided(see Conditions Of Acceptability)
3 = Same as 'J' with no economizer circuit provided(see Conditions Of Acceptability)
4 = 12 V dc. Economizer not required
5 = 24 V dc. Economizer not required
6 = 48 V dc. Economizer not required

*

Other letters and numbers – Define alternate nominal voltages with the same functional coil characteristics.

5. Coil Wire Lead Length

A = 390 mm (15.3″)
B = 152 mm (6″)
D = Wires routed to coil connector attached to relay.
F = 600 mm (23.6″)
G = 900 mm (35.4″)
H = 1200 mm (47″)
J = 1500 mm (59″)
N = No Coil wires. Alternate connection indicated next.

Other Letters and numbers – Define alternate wire lengths

6. Coil Terminal Connector

A = Threaded Studs
B = Yazaki 7282-558-10 male (or equivalent)
C = Molex Mini-Fit JR, 2 CKT, female 18-24 (or equivalent).
E = D Plug attached to housing
F = D Plug on flying lead
N = No connector
Other letters and numbers – Define alternate connector configurations.

7. Mounting and Power Terminals

A = Bottom Mount, with Male threaded power terminals M8x1.25, 16.5 mm length
B = Bottom Mount, with Female threaded power terminals ¼-20 ,0.40″ minimum depth
C = Bottom Mount, Plug in power terminals
D = Bottom Mount, Female threaded power terminals M6 X 1, 10 mm minimum depth.
F = Side Mount, with Male threaded power terminals M8x1.25, 16.5 mm length.
Other letters and numbers – Define alternate mounting and power terminal connections for the 200A series contactors.

8. Customer Special Designator.

01 thru 99 may be used to identify a customer specific product.

NOMENCLATURE:

LEV	100	A	6	A	N	G	01
1	2	3	4	5	6	7	8

1. Series Designation.

2. Current Rating.

   100 = 100 A

3. Form

   A = Normally Open
   H = Normally Open with SPST-NO Aux. Contacts
   G = Normally Open + 1 SPST N/C aux contact
   K = Normally Open + 1 SPDT aux contact

4. Coil Voltage

   4 = 12 V dc.
   5 = 24 V dc.
   6 = 48 V dc.

5. Coil Wire Lead Length

   A = 390 mm (15.3”)
   B = 6 inchs (152.4 mm)
   C = 10 inches (254 mm)

6. Coil Terminal Connector

   N = No connector

7. Mounting and Power Terminals

   G = Bottom Mount, Female threaded power terminals, M5 x .8, 10mm minimum depth.
   H = Side Mount, Female threaded power terminals, M5 x .8, 10mm minimum depth.

8. Customer Special Designator.

   Blank – not defined
   01 thru 99 may be used to identify a customer specific product.

NOMENCLATURE:

EVC	135	-	4	B	N	G	-	xx	A
1	2		3	4	5	6		7	8

1. EVC = Series Designator

2. 135 = 100A Continuous Current

3. Coil Voltage

   4 = 12VDC (15.3 Ohms Coil)
   5 = 12VDC (26 Ohms Coil)
   6 = 12VDC (3.8 Ohms Coil)
   7 = 24VDC (96 Ohms Coil)

4. Coil Wire Length:

   A = 15 inches (380 mm)
   B = 8 inches (150 mm)

5. Coil Termination:

   N = None
   C = Customer Specified Connector

6. Mounting and Power Terminals:

   G = Bottom Mount (2 x #8) M5 x 10
   H = Side Mount (2 x #8) M5 x 10

7. Customer Special Designator:

   Blank - not defined
   01 thru 99 may be used to identify a customer specific product.

8. Magnet Designator
   A = Ceramic
   B = Neodymium

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NOMENCLATURE:

IHV	100	A	6	A	N	G	01
1	2	3	4	5	6	7	8

1. Series Designation.

2. Current Rating.

   100 = 100 A

3. Form

   A = Normally Open
   H = Normally Open with SPST-NO Aux. Contacts
   G = Normally Open + 1 SPST N/C aux contact
   K = Normally Open + 1 SPDT aux contact

4. Coil Voltage

   4 = 12 V dc.
   5 = 24 V dc.
   6 = 48 V dc.

5. Coil Wire Lead Length

   A = 390 mm (15.3”)
   B = 6 inchs (152.4 mm)
   C = 10 inches (254 mm)
   Other Letters and numbers – Define alternate wire lengths

6. Coil Terminal Connector

   N = No connector
   D = Connector on flying lead
   Other letters and numbers – Define alternate connector configurations.

7. Mounting and Power Terminals

   G = Bottom Mount, Female threaded power terminals, M5 x .8, 10mm minimum depth.
   H = Side Mount, Female threaded power terminals, M5 x .8, 10mm minimum depth.

8. Customer Special Designator.

   Blank – not defined
   01 thru 99 may be used to identify a customer specific product.

ENGINEERING CONSIDERATIONS (NOT FOR FIELD REPRESENTATIVE’S USE):
Use - For use only in complete equipment where the acceptability of the combination has been determined by Underwriters Laboratories, Inc.

This component has been judged on the basis of the required spacings in the Standard for Industrial Control Equipment, UL 508, Seventeenth Edition, Table 36.1, Column A, which would cover the device itself if submitted for unrestricted Listing.

Conditions of Acceptability -

1. Open-Type devices are to be mounted in complete enclosures of adequate strength and thickness, with acceptable spacings being provided.

2. These devices are suitable for factory wiring only.

3. Temperature testing was conducted at the maximum current rating (200 A) for the LEV and EV 200 Series using parallel No. 2/0 AWG conductors connected to the contact terminals by crimp ring lugs inside an enclosure measuring 150% of relay dimensions. The ambient was 85°C. Consideration should be given to a repeat of the Temperature Test should the end installation have a smaller enclosure, or if smaller wiring is used (by ratio at lower amperage). The temperature on the housing should not exceed 130°C.

   Testing was additionally completed at 350 A in a 50°C ambient using No. 500Kcmil AWG conductors connected to the contact terminals by crimp ring lugs inside an enclosure measuring 150% of relay dimensions. Consideration shall be given to a repeat of the Temperature Test should the end installation have a smaller enclosure or if smaller wiring is used (by ratio at lower amperage). The temperature on the Cover near terminals or on the Base shshall not exceed 130°C.

4. For Model no. LEV100A, all testing was conducted with a single No. 4 AWG conductor. For the temperature test the conductors were connected to each of the contact terminals using crimp type ring lugs. The relay was placed in an enclosure measuring 11 by 9 by 5 inches, and brought to maximum ambient of 75˚C in a heated chamber. Consideration should be given to repeat the temperature and overload/endurance tests in the end-product device should the enclosure be smaller, or if a smaller wire gauge is used. The temperature of the housing should not exceed 130˚C.

5. These devices have been evaluated for specific Make/Break characteristics as requested by the manufacturer. They are not intended for general industrial applications. The Test Record should be reviewed to determine whether these devices are suitable for use in the end-product application without additional testing.

Conditions of Acceptability – (Continued)

6. When the component breakdown test was conducted on the coil economizer between the 5 V and 12 V traces, the contacts closed and remained closed carrying 200 A continuously. The contacts opened when the coil voltage was removed. The end product shall have provision to open the contacts by removing the power to the coil, in case if shorting occurs in the coil economizer circuit.

7. Models not provided with economizer circuits for the coils shall be supplied by a current source driver circuit with the following maximum parameters:

   a. Model with coil suffix "1": 2.5Amps – 4.1Amps peak, max 110ms peak time. Maximum 0.75Amps continuous steady state current.

   b. Model with coil suffix "2": 1.0Amps – 1.2Amps peak, max 110ms peak time. Maximum 0.25Amps continuous steady state current.

   c. Model with coil suffix "3": 0.48Amps – 0.63Amps peak, max 110ms peak time. Maximum 0.140Amps continuous steady state current.

9. When the component breakdown test was conducted on the coil rectifier outputs, the contacts opened and remained open. The device was rendered inoperative.

10. LEV200 and EV200 Series models were tested at 1000 VDC, 350 A for carry current only. The relays were not evaluated for load switching (make/break current). Testing is required for use at this rating if switching a load.

11. Models LEV100H(G)(K) were tested in an enclosure measuring 11 by 9 by 5 inches.

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