

TEST REPORT EN 60947-5-5 Part 5: Control circuit devices and switching elements Electrical emergency stop device with mechanical latching function	
Report Number. : K13116/L22	
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Name of Testing Laboratory preparing the Report	Tyger CT Corp. #818, Building B, Dongtan Kumgang Penterium IX Tower, 27, Dongtancheomdansaneop 1-ro, Hwaseong-si, Gyeonggi-do, Korea
Applicant's name	KUN HUNG ELECTRIC CO., LTD.
Address	183 Hancheon-ro, Dongdaemun-gu, Seoul, South Korea
Test specification:	
Standard	EN 60947-5-5:1997 + A1 + A11 + A2:2017
Test procedure	CE_LVD
Non-standard test method	N/A
Test Report Form No.	IEC60947_5_5D(Modified at TUV Nord Korea)
Test Report Form(s) Originator	DEKRA Certification B.V.
Master TRF	Dated 2020-12-18
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Test Protocol



Test item description :	Emergency Stop Switch	
Trade Mark :		
Testing Laboratory:Manufacturer .. :	KUN HUNG ELECTRIC CO., LTD.	
Model/Type reference :	KEPB 16ER – cd KEBL 16 ER - abcd See general product information	
Ratings :	250 V~, 3 A	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	Testing Laboratory:	Tyger CT Corp.
	Testing location/ address :	#818, Building B, Dongtan Kumgang Penterium IX Tower, 27, Dongtancheomdansaneop 1-ro, Hwaseong-si, Gyeonggi-do, Korea
	Tested by (name, function, signature) :	SeonGwang Kim 
	Approved by (name, function, signature) ... :	JaeHo Lee 
<input type="checkbox"/>	Testing procedure: CTF Stage 1:	N/A
	Testing location/ address :	
	Tested by (name, function, signature) :	
	Approved by (name, function, signature) ... :	
<input type="checkbox"/>	Testing procedure: CTF Stage 2:	N/A
	Testing location/ address :	
	Tested by (name + signature) :	
	Witnessed by (name, function, signature) . :	
	Approved by (name, function, signature) ... :	
<input type="checkbox"/>	Testing procedure: CTF Stage 3:	N/A
<input type="checkbox"/>	Testing procedure: CTF Stage 4:	N/A
	Testing location/ address :	
	Tested by (name, function, signature) :	
	Witnessed by (name, function, signature) . :	

Approved by (name, function, signature)...		
Supervised by (name, function, signature) :		

List of Attachments (including a total number of pages in each attachment):

Table 1	Critical components list	27– 28 page
Appendix 1	Block diagram	29 page
Appendix 2	Photographs	30 – 32 page

Summary of testing:

Tests performed (name of test and test clause): Related all clauses	Testing location: Tyger CT Corp. / #818, BUILDING B, DONGTAN KUMGANG PENTERIUM IX TOWER 27, DONGTANCHEOMDANSANEOP 1- RO HWASEONG-SI Republic of Korea
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Summary of compliance with National Differences (List of countries addressed):

The product fulfils the requirements of EN 60947-5-5:1997 + A1 + A11 + A2:2017.

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

Statement not required by the standard used for type testing

(Note: When IEC or ISO standard requires a statement concerning the uncertainty of the measurement systems used for tests, this should be reported above. The informative text in parenthesis should be delete in both cases after selecting the applicable option)

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.



Test item particulars.....:	
Classification of installation and use.....:	AC-15
Supply Connection	250 Vac / 3 A
- kind of control circuit device	<input checked="" type="checkbox"/> manual control switches, e.g. push-buttons, rotary switches, foot switches, etc. <input type="checkbox"/> electromagnetically operated control switches, either time delayed or instantaneous, e.g. contactor relays <input type="checkbox"/> pilot switches, e.g. pressure switches, temperature sensitive switches (thermostats) <input type="checkbox"/> position switches <input type="checkbox"/> associated control equipment, e.g. indicator lights, etc.
- kind of switching elements	<input checked="" type="checkbox"/> auxiliary contacts of a switching device (e.g. contactor, circuit-breaker, etc) which are not dedicated exclusively for use with the coil of that device <input type="checkbox"/> interlocking contacts of enclosure doors <input type="checkbox"/> control circuit contacts of rotary switches <input type="checkbox"/> control circuit contacts of overload relays
- number of poles	KEPB 16ER - R1A1B : 4 KEBL 16ER - L3CR2A(L3CR2B) : 6
- kind of current	<input checked="" type="checkbox"/> ac and/or <input type="checkbox"/> dc
- interrupting medium.....	<input type="checkbox"/> air, <input type="checkbox"/> oil, <input type="checkbox"/> gas, <input type="checkbox"/> vacuum, <input type="checkbox"/> _____
- operating conditions	
- method of operations.....	<input checked="" type="checkbox"/> manual <input type="checkbox"/> electromagnetic <input type="checkbox"/> pneumatic <input type="checkbox"/> electro-pneumatic
- method of control	<input type="checkbox"/> automatic <input checked="" type="checkbox"/> non-automatic <input type="checkbox"/> semi-automatic

- rated and limiting values for switching elements:
- voltages:
 - rated operational voltage U_e (V): 250 Vac
 - rated insulation voltage U_i (V): 500 Vdc
 - rated impulse withstand voltage U_{imp} (kV): 4 kV
- currents:
 - conventional free air thermal current I_{th} (A): 3 A
 - conventional enclosed thermal current I_{the} (A).....: 3 A
 - rated operational current I_e (A): 3 A
 - rated frequency (Hz).....: 50 / 60 Hz
 - utilization category: AC-15
- short-circuit characteristic:
 - rated conditional short-circuit current (kA): 1 kA
 - kind of protective device: type Fuse 20 A; 250 V a.c.; 10 kA
 - electrically separated contact elements.....: 6000
- actuating quantities for pilot switches: 6000
- pilot switches having two or more contact elements .: N/A
- indication of contact elements of same polarity NC
- IP code , in case of an enclosed control device IP 40
- pollution degree 2
- Suitability for isolation, with the symbol 07-13-06 of IEC 60617-7 N/A



Possible test case verdicts:	
- test case does not apply to the test object..... : N/A	
- test object does meet the requirement..... : P (Pass)	
- test object does not meet the requirement..... : F (Fail)	
Testing..... :	
Date of receipt of test item : 2022-11-07	
Date (s) of performance of tests : 2022-11-17 to 2022-11-18	
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator. Electrical characteristics shall comply with the requirements of IEC 60947-5-1. An IEC test report form according to IEC 60947-5-1 shall be provided in conjunction with this test report.	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60947-5-1:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided :	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) : KUN HUNG ELECTRIC CO., LTD. 183 Hancheon-ro, Dongdaemun-gu, Seoul, South Korea	
General product information and other remarks:	
KEPB 16ER – cd KEBL 16 ER - abcd a = Blank or L; a stands for LED lamp type; b = 1C, 2C or 3C; b stands for Input voltage of lamp; c = R, G or Y; c stands for Button color type; d = 1A, 2A, 1B, 2B or 1A1B; d stands for Contact type	

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Clause	Requirement + Test	Result - Remark	Verdict
4	MARKING AND PRODUCT INFORMATION		-
4.1	General		-
	Information for installation, operation, maintenance and/or periodic testing shall be provided when necessary on or with the emergency stop device.		P
4.2	Indications on buttons		-
4.2.1	Buttons used as emergency stop device actuators shall be coloured red.		P
	When a background exists behind the actuator, it shall be coloured yellow.		N/A
	Where a symbol is needed for clarification, the symbol IEC 60417-5638 (DB:2002-10) shall be used		N/A
4.2.2	The direction of unlatching shall be identified when resetting is achieved by rotation of the button. This identification shall have the same or nearly the same colour as the actuator in order to avoid misinterpretation.		P
4.3	Additional requirements for trip wire switches		N/A
	Information provided by the manufacturer shall include:		-
	– the maximum length of wire or rope		-
	– the correct tension of wire or rope;		-
	– the distances between supports;		-
	– recommendation to use only straight runs of wire or rope;		-
	– if applicable, guidance on maintenance for pulleys and eyelets, and the measures necessary to ensure that the wire or rope remains in proper position.		-
4.4	Additional requirements for colour coding		-

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Clause	Requirement + Test	Result - Remark	Verdict
	A resetting button, for example where applicable with a trip wire switch, shall be coloured blue.		N/A
	When a coloured indicators are provided to assist setting of a trip wire switch: – green shall indicate the correct setting of the rest position; and – yellow shall indicate the correct setting of the actuated position.		N/A
5	ELECTRICAL REQUIREMENTS		-
5.1	Depending on the associated devices, the utilization categories shall be one or more categories selected from Table 1 of IEC 60947-5-1	AC-15	-
5.2	All normally closed contact elements of an emergency stop device shall have a direct opening action in accordance with annex K of IEC 60947-5-1. The tests shall be conducted according to annex K of IEC 60947-5-1.	See TRF for IEC 60947-5-1. Report number: K13116/L22	-
5.3	The degree of protection provided by the emergency stop device shall be stated by the manufacturer in accordance with annex C of IEC 60947-1.	IP 40	-
5.4	Tests for electrical characteristics shall be conducted according to IEC 60947-5-1.	See TRF for IEC 60947-5-1. Report number: K13116/L22	-
5.5	Electrical requirements for functional safety applications: in cases where it is necessary to obtain data, tests shall be made according to A.3.2.3 of this standard.		N/A
6	MECHANICAL REQUIREMENTS		-
6.1	General requirements		-

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Clause	Requirement + Test	Result - Remark	Verdict
6.1.1	Means shall be provided to enable the emergency stop device to be securely installed in its intended mounting position. The test shall be verified by inspection of the mechanical structure of the emergency stop device.		P
6.1.2	The emergency stop device shall meet the requirements of 7.3, 7.4, 7.5, 7.6 and, where applicable, of 7.7.5.		P
6.1.3	It shall be possible to operate and reset the emergency stop device under all normal service conditions. The test shall be conducted according to 7.2 to 7.7.4.		P
6.1.4	Vibration or shocks shall not cause the opening of the contacts in the closed position or the closing of the contacts in the open position, nor operation of the latching mechanism. The tests shall be conducted according to 7.5 and 7.6		P
6.2	Latching		N/A
6.2.1	When the emergency stop signal (including the necessary clearance distance) has been generated during actuation of the emergency stop device, the emergency stop function shall be maintained by latching of the actuating system.		N/A
	The emergency stop signal shall be maintained until the emergency stop device is reset (disengaged).		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	It shall not be possible for the emergency stop device to latch-in without generating the emergency stop signal.		N/A
	In case of failure in the emergency stop device (including the latching means), the generation of the emergency stop signal shall have priority over the latching function.		N/A
	The tests shall be conducted according to 7.2, 7.7.2 and 7.7.3.		N/A
6.2.2	The latching shall operate correctly when the emergency stop device is used under conditions, specified either in 7.4 or by the manufacturer, whichever is more severe.		N/A
	Severest condition		N/A
	The test shall be conducted according to 7.3, 7.4, 7.5, 7.6 and 7.7.		N/A
6.3	Additional requirements for button type emergency stop device		-
6.3.1	The resetting of the latching means shall be by turning a key, by rotation in the designated direction, or by a pulling motion.	Rotation type	P
	The test shall be verified by inspection of the mechanical structure of the emergency stop device and according to clause 7.2.1 and 7.2.2.1.		P

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Clause	Requirement + Test	Result - Remark	Verdict
6.3.2	<p>The emergency stop device shall be so designed that:</p> <ul style="list-style-type: none"> - the emergency stop actuator can be operated in a direction perpendicular to its mounting surface; - removal of the actuator is from the inside of the enclosure, or from the outside of the enclosure by use of a tool intended for that purpose. - it can be actuated by a one-handed continuous motion. 		P
	This shall be verified by inspection (see 7.2.1).		P
6.4	Additional requirements for trip wire switches		N/A
6.4.1	<p>The construction of the emergency stop device shall be such that:</p> <ul style="list-style-type: none"> – the setting of the wire or rope, and subsequent adjustment, can be carried out without causing malfunction; and – the installation of the emergency stop device can fulfil the requirements of 4.4.1 and 4.4.2 of ISO/IEC 13850. 		N/A
	The tests shall be conducted according to 7.2 and 7.3.		N/A
6.4.2	When the actuator is installed according to the manufacturer's instructions:		N/A
	– the perpendicular pulling force applied at the mid-length of the wire or rope necessary for generating the emergency stop signal (opening of the contacts) shall be less than 200 N;		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– the wire or rope shall resist a tension force 10 times higher than the perpendicular pulling force necessary for generating the emergency stop signal;		N/A
	– the perpendicular deflection of the wire or rope (at mid-length), necessary for generating the emergency stop signal shall be less than 400 mm;		N/A
	– the breaking or disengagement of the wire or rope shall generate the emergency stop signal;		N/A
	The pulling force shall be applied at the mid-point of the length of the wire or rope.		N/A
	The tests shall be conducted according to 7.8.1.		N/A
6.4.3	Changes in the length of the rope (for example temperature, age etc.) shall be taken into account.		N/A
	The tests shall be conducted according to 7.2.1		N/A
6.5	Additional requirement for footswitches		N/A
	A pedal (footswitch) type emergency stop device shall have no cover..		N/A
	The tests shall be conducted according to 7.2.1		N/A
6.6	Mechanical requirements for functional safety applications		P
	In cases where it is necessary to obtain data needed for functional safety applications, tests shall be made according to A.3.2.2.		P
7	TESTING OF THE MECHANICAL DESIGN		-
7.1	General		-
	In accordance with 8.1.1 and 8.1.2 of IEC 60947-1, type tests shall be made to prove compliance with the requirements of clauses 4, 5 and 6.		-

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Clause	Requirement + Test	Result - Remark	Verdict
	An emergency stop device may have combinations of both main and auxiliary contacts.	Only for KEBL 16ER – L3CR2A, KEBL 16ER – L3CR2A have auxiliary contacts	P
	The tests given in 7.5 and 7.6 are to verify that all these contacts are not adversely affected by mechanical shocks.		P
	Some tests, for example based on visual inspection, or by checking the literature provided with the emergency stop device, require only one sample.	KEPB 16ER - R1A1B	P
	For the tests described in 7.3.3, 7.4, 7.5, 7.6 and 7.7, three identical samples of emergency stop device shall be selected, and each sample shall be subjected successfully to the sequence of tests, in the order given in this clause.		N/A
	When more than one type of emergency stop device is manufactured to the same basic design, less than three identical samples may be tested, providing that more than three products of the same family are tested. Such an acceptance shall be fully documented.		N/A
7.2	General design inspection		-
7.2.1	The requirements of 4.1, 6.1.1, 6.4.1 and, where applicable, of 6.3, 6.4.3 and 6.5 are verified by inspection of the mechanical structure of the emergency stop device.		-
	Sample number	3	-
7.2.2	Button type emergency stop device.		P
7.2.2.1	The requirement of 6.3.1 is checked by latching and resetting the actuator manually.		P

Test Protocol



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Clause	Requirement + Test	Result - Remark	Verdict
7.2.2.2	The requirement of 6.3.2 is verified by inspection of the fastening parts, and by pulling and turning the button and other parts of the device by hand.		P
7.3	Operating tests		-
7.3.1	General		-
	The purpose of the operating tests is to verify the durability of the latching parts (springs, balls, pins etc.) in normal use. The test verifies the requirements of 6.1.2, 6.2.2 and 6.3. The operating tests described in this subclause may be carried out in conjunction with the electrical tests (see clause 5).		-
7.3.2	Robustness of a button actuator		P
	force as specified in Table 1 of the standard:	110 N	-
	A button actuator shall withstand the force as specified, applied in the three mutually perpendicular axes; and		P
	torque as specified in Table 1 of the standard:	2.2 N.m	-
	A button actuator shall withstand? the torque as specified, in both directions of rotation, in each of the latched and unlatched positions, where the resetting action requires rotation of the push-button.		P
	For mounting holes having dimension other than in Table 1:		N/A
	force (in newton) shall be five times the largest dimension of the mounting hole (i.e., for a square or rectangular hole, the diagonal measurement) in mm;		N/A

Test Protocol



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Clause	Requirement + Test	Result - Remark	Verdict
	torque (in newton meter) shall be equal to 0,1 time the largest dimension of the mounting hole (i.e., for a square or rectangular hole, the diagonal measurement) in mm.		N/A
	For an emergency stop button not mounted in a single hole:	Not mounted in a single hole model	-
	if the actuator diameter (or largest dimension) is less than 30 mm, use the values for D22 mm;	29.89 mm	P
	if the actuator diameter (or largest dimension) is equal to or greater than 30 mm, use the values for D30 mm.		N/A
7.3.3	Durability test		P
	The three samples (see 7.1) shall be subjected to the following test:		-
	Sample number	3	-
	The actuator of an emergency stop device shall be moved through its full travel, then it shall be reset in a manner to imitate human operation as closely as possible. For pushbuttons, the requirements of IEC 60947-5-1:2016, 8.3.2.1 a) applies.		-
	The test shall consist of 6050 cycles in which latching and resetting of the actuator occurs during each cycle.		-
	The movement and actuating forces shall be consistent throughout the test. Monitoring of these parameters shall be carried out to ensure consistency.		P
	For the actuating forces, verification at the beginning and at the end is required.		P
	Actuating force beginning (N).....:	10.5	P

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Clause	Requirement + Test	Result - Remark	Verdict
	The durability test is passed if each emergency stop device completes the 6050 cycles without failure.		P
	Actuating force end (N).....:	10.3	P
7.4	Conditioning procedure		N/A
	The purpose of the following procedures is to expose the emergency stop devices to various environmental conditions in order to verify their functioning after such exposure.		N/A
	Devices intended for mounting on enclosures shall be mounted for the purposes of this conditioning in such a manner as to permit the entire emergency stop device to be exposed to the conditioning media except for the exposure to salt mist in accordance with IEC 60068-2-11. Devices subjected to salt mist may be either provided with their own enclosure, or installed in an enclosure according to the manufacturer's instructions. The device is exposed to the salt mist only outside the enclosure.		N/A
	The device shall be rinsed clean before further tests are performed.		N/A
	The three emergency stop devices successfully tested in 7.3.3 shall be subjected to the following exposures:		N/A
	Sample number		N/A
	• 96 h at +70 °C in dry atmosphere (see test Bb of IEC 60068-2-2 and IEC 60721-3-3 class 3K7)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> • 96 h at changing moist and warm atmosphere (see IEC 60068-2-30 and IEC 60721-3-3 class 3K7): +25 °C/+55 °C 97 % / 93 % RH 		N/A
	<ul style="list-style-type: none"> • 96 h at -40 °C (see IEC 60068-2-1: test Ab and IEC 60721-3-3 class 3K7) 		N/A
	<ul style="list-style-type: none"> • 96 h at +35 °C in a solution of 5 % NaCl (see IEC 60068-2-11 and IEC 60721-3-3 class 3C3). 		N/A
	Following the environmental exposures and after the devices have been restored to room temperature, the sequence of tests in 7.5, 7.6 and 7.7 shall be conducted.		N/A
7.5	Shock test		N/A
7.5.1	The three emergency stop devices which have been conditioned in accordance with 7.4 shall be tested each on one of the three mutually perpendicular axes.		N/A
	Sample number		N/A
7.5.2	Each emergency stop device is tested in the rest position and shall withstand 15 g shock in both directions of the corresponding axis (see IEC 60068-2-27:11 ms: 15 g). During the test, the closed contacts shall not open, the open contacts, if applicable, shall not close and the latching mechanism shall not latch.		N/A
	The checking means shall be able to detect any opening or closing of contacts longer than 0,2 ms.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
7.5.3	The procedure is repeated in the actuated position (actuator latched). During the test, the open contacts shall not close; the closed contacts, if applicable, shall not open; and the latching mechanism shall not unlatch.		N/A
7.6	Vibration test		N/A
7.6.1	The three samples used for 7.5 shall be tested, one for each of the three mutually perpendicular axes.		N/A
	Sample number		N/A
7.6.2	Each emergency stop device is tested in the rest position as per the following specifications (see IEC 60068-2-6):		N/A
	– frequency range: 10 Hz to 500 Hz, logarithmic ramp and return;		N/A
	– duration 2 h: 10 sweep cycles, 1 oct/min;		N/A
	– maximum peak amplitude: 0,35 mm (0,7 mm from peak to peak);		N/A
	– maximum acceleration: 50 m/s ² ;		N/A
	– crossover frequency between 58 Hz and 62 Hz.		N/A
	During the test, the closed contacts shall not open, the open contacts, if applicable, shall not close, and the latching mechanism shall not latch.		N/A
	The checking means shall be able to detect any opening or closing of contacts longer than 0,2 ms.		N/A
7.6.3	The procedure is repeated in the actuated position (actuator latched). During the test, the open contacts shall not close, the closed contacts, if applicable, shall not open, and the latching mechanism shall not unlatch.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
7.7	Latching, resetting and impact tests		N/A
7.7.1	General		N/A
	The three sample emergency stop devices which have successfully completed the tests of 7.6 shall be used for the following tests. The requirements of 6.2.1 are verified by testing each sample in accordance with 7.7.2, 7.7.3 and 7.7.4. The sample shall also be tested in accordance with 7.7.5 where applicable.		N/A
	Sample number		N/A
7.7.2	Opening test		N/A
	The actuator of the emergency stop device shall be moved slowly just to the point where latching occurs.		N/A
	The normally closed contacts shall then be open.		N/A
	This shall be verified by an impulse voltage test at 2 500 V. (see details in K.8.3.4.4.1 of IEC 60947-5-1).		N/A
7.7.3	Latching test for button-type emergency device		N/A
	To simulate the typical human actuation of a button-type switch, the emergency stop device and its actuator shall be mounted and tested by a pendulum-type hammer as shown in Figure 1 of the standard.		N/A
	Largest dimension of mounting hole (mm).....:		N/A
	Hammer height according Table 2 (mm).....:		N/A
	For mounting holes having dimension other than in Table 2 the hammer height shall be 75 mm.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For non-circular mounting holes, the largest dimension of the mounting hole (i.e. for a rectangular hole, the diagonal) shall be used to determine the hammer height.		N/A
	if the actuator diameter (or largest dimension) is less than 30 mm, use the values for D22 mm;		N/A
	if the actuator diameter (or largest dimension) is equal to or greater than 30 mm, use the values for D30 mm.		N/A
	The actuator shall be unlatched prior to each strike.		N/A
	The hammer shall be released whilst stationary.		N/A
	To ensure that the hammer is released whilst stationary, it is recommended that a magnetic or other holding mechanism is used.		N/A
	This test shall be performed three times.		N/A
	After each strike, the actuating system shall be latched.		N/A
	The support of the device under test shall not move more than 0,1 mm when the shock is applied (see IEC 60068-2-75).		N/A
7.7.4	Resetting test		N/A
	a) if the resetting is by pulling, the pulling force shall be less than 50 N;		N/A
	b) if the actuator is reset by turning, the torque shall be less than 1 N•m;		N/A
	c) for other types: under consideration.		N/A
7.7.5	Impact test for button type actuators		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	In order to verify 6.1.2 and 6.1.3 where applicable, the three sample emergency stop devices are tested by striking the actuator three times with the hammer shown in Figure 1, where $h = 310 \text{ mm} \pm 2 \text{ mm}$. The actuator shall be unlatched prior to each strike.		N/A
	After each strike, the emergency stop device shall be latched and break contacts shall be open.		N/A
	After three strikes, the actuator shall not be damaged.		N/A
	After the third strike, the opening contact element shall meet the requirements of K.8.3.6 of IEC 60947-5-1.		N/A
K8.3.6 IEC 60947-5-1	Verification of direct opening action		N/A
	Impulse voltage test over the open position of the contacts at 2500 V or for position switches for isolation in accordance with table 14 of IEC 60947-1 or as declared Uimp by the manufacturer (V)		N/A
	5 positive and 5 negative impulses are applied.....	Utest (V):	N/A
7.8	MISCELLANEOUS TESTS		N/A
7.8.1	Disengagement of wire or rope		N/A
	In order to verify 6.4.2 where applicable, one emergency stop device is installed with the wire or rope in accordance with the manufacturer's instructions.		N/A
	The rope is disengaged. The main contact(s) shall open and the actuating system shall latch in the active position.		N/A
7.8.2	Effect of foreign matter		N/A
	Special tests are under consideration.		N/A

IEC 60947-5-5			
Clause	Requirement + Test	Result - Remark	Verdict
Annex A	PROCEDURE TO DETERMINE RELIABILITY DATA FOR ELECTRICAL EMERGENCY STOP DEVICES USED IN FUNCTIONAL SAFETY APPLICATIONS		N/A
A.1	General		N/A
A.1.2	K.1.2 of IEC 60947-1:2007/AMD2:2014 applies with the following addition: This annex addresses only the intended use of electromechanical contacts in control circuit devices.		N/A
A.1.3	The confidence level related to failure rate calculation during the useful life of the device shall be at least 60 %.		N/A
A.3	Method based on durability test results		N/A
A.3.1	In order to address random hardware failure the method is based on results given by continuous monitoring of the electrical contacts under the appropriate durability test.		N/A
A.3.2	Test requirements		N/A
A.3.2.1	The test environment shall be in accordance with Clause 6 of IEC 60947-5-1		N/A
	Every test shall be performed under the general conditions stated in 8.3.2.1 of IEC 60947-5-1:2016, and at a rate equal (or, at the discretion of the manufacturer, higher) than that declared by the manufacturer.		N/A
	The moving parts of the device shall reach their maximum operating positions in both directions, as recommended by the manufacturer.		N/A
A.3.2.1	Mechanical durability		N/A
	For the no-make current or no-break current utilization the mechanical durability is applicable.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	During the test, periodically the contacts shall be checked at any voltage and current, selected by the manufacturer, and there shall be no failure.		N/A
	Interval period.....:		N/A
	Voltage (V).....:		N/A
	No failure.....:		N/A
A.3.2.1	Electrical durability		N/A
	Electrical durability shall be determined in accordance with C.3.2 of IEC 60947-5-1:2016 using utilization category AC-15 and / or DC-13 unless otherwise stated by the manufacturer.		N/A
C.3 IEC 60947-5-1	Electrical durability		N/A
C.3.1	General		N/A
	Electrical durability of a control device is defined as the number of on-load operating cycles which will be attained or exceeded by 90% of all devices tested, without repair or replacement of any part		N/A
C.3.2	Test procedures		N/A
	Electrical durability tests are carried out by operating the device under the conditions defined in table C.1, in accordance with C.3.2.1 for a.c. or with C.3.2.2. for d.c.		N/A
	Each mechanical operation cycle shall include an interruption of the test current		N/A
	The ON-duration of the current shall not more 50% and not-less than 10% of an operating cycle (ms) :	ON-duration (ms):	N/A
	If the test circuit shown in figure C.1 is used, the ON-duration of current at 10 times I_e shall not cause overheating		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Alternatively these test may be performed on the actual load for which the control switch is intended		N/A
C.3.2.1	AC tests		N/A
	Used circuit :	<input type="checkbox"/> Figure C.1 <input type="checkbox"/> Figure C.2	N/A
	The circuit to be used as shown in fig C.1:		N/A
	- Making circuit consisting air-cored inductor, in series with resistor, power factor of 0,7 :	U test (V): I test (A): Pf:	N/A
	- Breaking circuit consisting air-cored inductor, in series with resistor, parallel damping resistor in which flows 3 % of breaking current, power factor of 0,4 :	U test (V): I test (A): Pf: R (Ohm):	N/A
	If the contact element has a bounce time less than 3 ms, the test may be made with the simplified circuit shown in Figure C.2 :	Bounce time (ms):	N/A
C.3.2.2	DC tests		N/A
	Used inductor :	<input type="checkbox"/> air-cored <input type="checkbox"/> iron-cored	N/A
	The circuit to be used as shown in fig C.1:		N/A
	- circuit consisting air-cored inductor, in series with resistor, parallel damping resistor across the complete circuit in which flows 1 % of test current power factor of T0,95 or :	U test (V): I test (A): R (Ohm): T0,95 (ms):	N/A
	-circuit consisting iron-cored inductor, in series with resistor, power factor of T0,95 T0,95 = 6 x P for P < 50 W T0,95 = 300 ms for P = 50 W:	U test (V): I test (A): Pf: R (Ohm):	N/A
A.3.3	Number of samples	4	-

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Clause	Requirement + Test	Result - Remark	Verdict
	The selection of samples to be tested for a series of devices with same fundamental design and without significant difference in construction shall be based on engineering judgment.		P
A.3.4	Characterization of a failure mode		N/A
	Failure to open		N/A
	Failure to close		N/A
	Insulation failure		N/A
A.4	Data information		N/A
	A set of reliability data of the product shall include a combination of the following characteristics where relevant:		N/A
	- failure rate per operation λ_u (see K.3.7);		N/A
	- useful life (see K.3.6.3);		N/A
	- confidence level if different from 60 %;		N/A
	- no-make-break-current or utilization category;		N/A
	- maximum switching rate;		N/A
	- maximum voltage if different from U_e ;		N/A
	- maximum operational current for the specified utilization category, if different from I_e ;		N/A
	- overall life time = 20 years unless otherwise specified by the manufacturer;		N/A
	- environment conditions if different from the normal conditions.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

Table 1	Critical Components List
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Unique component reference or location	Application/function	Manufacturer / trademark	Type / model	Technical data	Standard	Mark(s) of conformity evidence of acceptance
Housing		Korea Engineering Plastics CO LTD (E120354)	2330GF	Min. 0.8 mm thick, V-0, 65 °C	UL 94	UL
Button		Samyang Corporation (E121254)	3022IR	Min. 0.5 mm thick, V-2, 80 °C	UL 94	UL
Cam		Korea Engineering Plastics CO LTD (E120354)	2315GF	Min. 0.8 mm thick, HB, 65 °C	UL 94	UL
Support cam		Korea Engineering Plastics CO LTD (E120354)	F20	Min. 0.75 mm thick, HB, 110 °C	UL 94	UL
Contact housing		Korea Engineering Plastics CO LTD (E120354)	2330GF	Min. 0.8 mm thick, V-0, 65 °C	UL 94	UL
Push rod		Ascend Performance materials, LLC (E70062)	21SPC	Min. 0.4 mm thick, V-2, 130 °C	UL 94	UL
Base		Kolon Plastic INC (E190675)	KN332G30V0	Min. 0.75 mm thick, V-0, 120 °C	UL 94	UL
Base A		Kolon Plastic INC (E190675)	KN332G30V0	Min. 0.75 mm thick, V-0, 120 °C	UL 94	UL
Push rod A		Ascend Performance materials, LLC (E70062)	21SPC	Min. 0.4 mm thick, V-2, 130 °C	UI 94	UL
Guide		Ascend Performance materials, LLC (E70062)	21SPC	Min. 0.4 mm thick, V-2, 130 °C	UI 94	UL

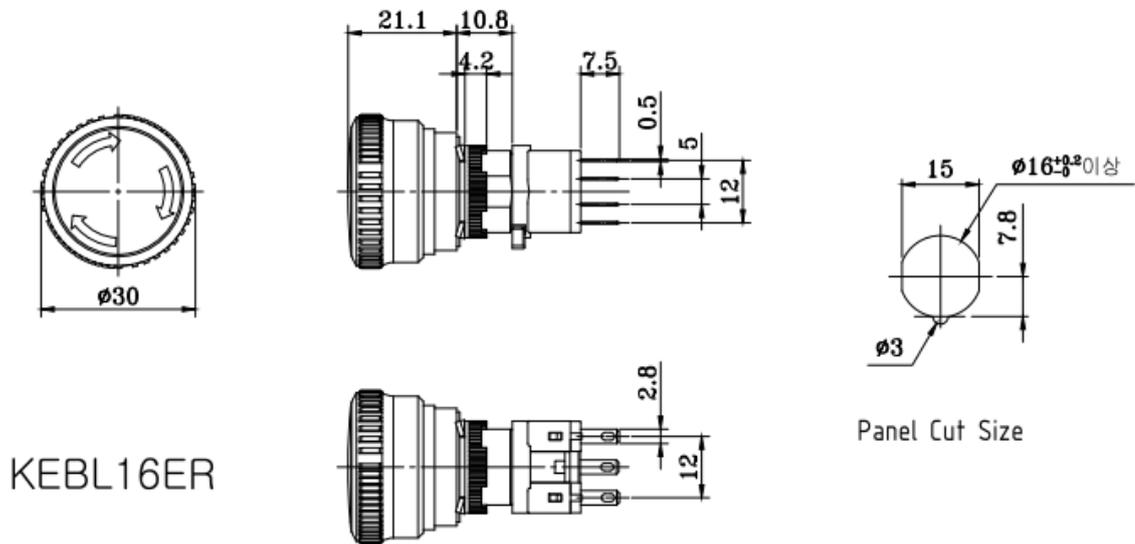
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Clause	Requirement + Test			Result - Remark	Verdict	
Fixed ring		Korea Engineering Plastics CO LTD (E120354)	2315GF	Min. 0.8 mm thick, HB, 65 °C	UL 94	UL
LED		Sabic Japan L LC (E207780)	LEN2211	Min. 0.75 mm thick, HB, 65 °C	UL 94	UL
Filament		Samyang Engineering Plastics (Shanghai) CO LTD (E257054)	1500GN30	Min. 0.75 mm thick, V-0, 130 °C	UL 94	UL
Lower part fixed ring		Korea Engineering Plastics CO LTD (E120354)	2315GF	Min. 0.8 mm thick, HB, 65 °C	UL 94	UL

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Clause	Requirement + Test	Result - Remark	Verdict

Appendix 1: Block diagram



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Clause	Requirement + Test	Result - Remark	Verdict

Appendix 2: Photographs



KEPB 16ER – R1A1B

IEC 60947-5-5			
Clause	Requirement + Test	Result - Remark	Verdict



KEBL 16ER – L3CR2A

IEC 60947-5-5			
Clause	Requirement + Test	Result - Remark	Verdict



KEBL 16ER – L3CR2B



List of test equipment used:

A completed list of used test equipment shall be provided in the Test Reports when a Customer's Testing Facility according to CTF stage 1 or CTF stage 2 procedure has been used.

Note: This page may be removed when CTF stage 1 or CTF stage 2 are not used. See also clause 4.8 in OD 2020 for more details.

Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date
7.3.3	Durability test	Push-Pull gauge / IMADA / ZTS-200N / 441720	200 N	2022-08-17	2023-08-17

Test Protocol



Statement of Measurement Uncertainty

The Test Report shall include a statement concerning the uncertainty of the measurement systems used for the tests conducted when it is required by the standard, client or other authorities. In such cases, the table below is to be used for reporting U of M.

This page may be removed from the final Test Report when not required. See also clause 4.8 in OD 2020 for more details.

Clause #	Parameter/ Measurement / test method	Requirement % or k	Calculated U of M*

*Note: Calculations leading to the reported value are on file with the NCB