Panasonic

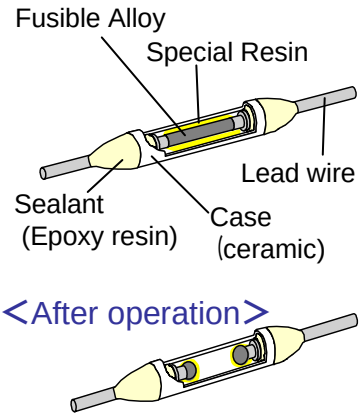
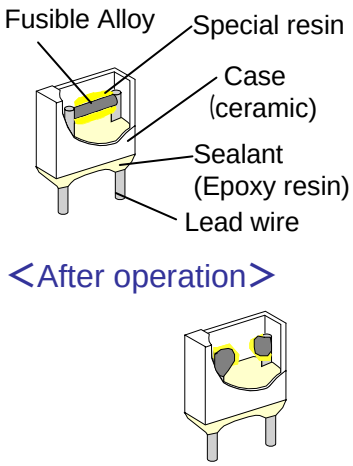
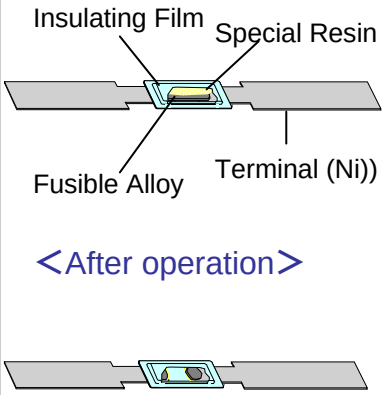
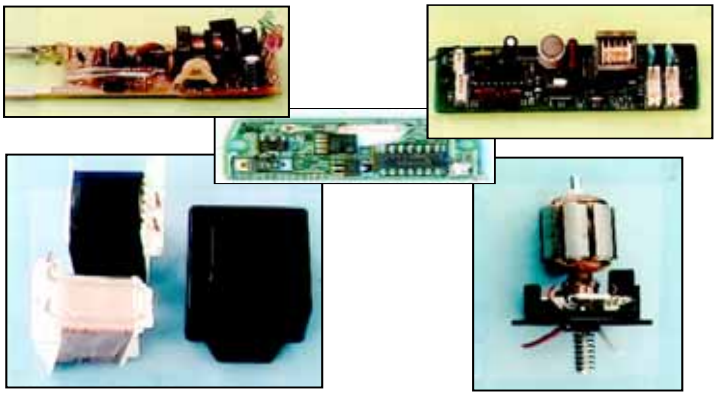
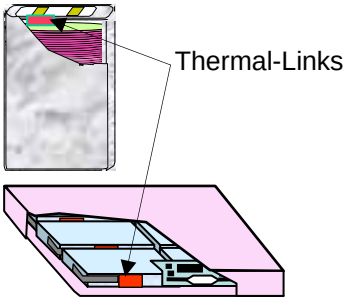
Thermal-Links (Thermal Cutoffs)
Pb-Free Cd-Free

Circuit Components Business Unit
Panasonic Electronic Devices Co., Ltd.

401 Sadamasa-cho, Fukui City 910-8502, Japan

A050408-1

Thermal-Links (Thermal Cutoffs) Pb-free &Cd-free

	Axicial Lead Type	Radial Lead Type	Thin-type
Form			
Electrical rating	E series 250V 0.5A F series 250V 1A N series 250V 2A 50V 3A～6A	H series 250V 2A 50V 3.5A～4.5A	ML series 50V 2A MU series 50V 4A
Tf	86℃、102℃、115℃、 134℃、139℃、145℃	102℃、115℃、 134℃、139℃、145℃	92℃、98℃
Const-ruction			
Applica-tions	Transformers, Solenoids, Ventilation fans, Electric fans, Small electric motors, Chargers, Adaptors, Second batteries, Gas home alliances, Fluorescent lights, Heating devices, ICs, etc. 		Battery pack  

Thermal-Links (Thermal Cutoffs) Pb-free &Cd-free

E Series

Part Number	Type Number	Tf (℃)	Functioning Temperature (℃)	Electrical Ratings			Th (℃)	Tm (℃)	Approved Safety standards					
				AC/DC	Voltage (V)	Current (A)			PSE	UL C-UL	CSA	VDE	BE AB	CCC
EYP05BE115	E115	115	110±2	AC	250	0.5	95	200	●	●	●	●	●	●
				AC	125	1.5	93		---	●	●	●	●	●
				DC	50	3.0	84		---	●	●	●	●	●
EYP05BE134	E134	134	129 +4 -3	AC	250	0.5	105	200	●	○	○	●	○	○
				AC	125	1.5	100		---	○	○	●	○	○
				DC	50	3.0	85		---	○	○	●	○	○
EYP05BE138	E138	139	135±3	AC	250	0.5	115	200	●	○	○	●	○	○
				AC	125	1.5	110		---	○	○	●	○	○
				DC	50	4.0	80		---	○	○	●	○	○
EYP05BE145	E145	145	141±2	AC	250	0.5	125	200	●	●	○	●	●	●
				AC	125	1.5	125		---	●	○	●	●	●
				DC	50	5.0	95		---	●	○	●	●	●

UL,C-UL：E60271, CSA：67163, VDE：481106-1171-0002, BEAB：C1066, CCC:2002010205004246 ●：Approved ○：Under Application

F Series

Part Number	Type Number	Tf (℃)	Functioning Temperature (℃)	Electrical Ratings			Th (℃)	Tm (℃)	Approved Safety standards					
				AC/DC	Voltage (V)	Current (A)			PSE	UL C-UL	CSA	VDE	BE AB	CCC
EYP1BF101	F101	102	98±3	AC	250	1.0	75	200	●	○	○	●	○	○
				AC	125	2.0	70		---	○	○	●	○	○
				DC	50	3.5	65		---	○	○	●	○	○
EYP1BF115	F115	115	110 +3 -2	AC	250	1.0	90	200	●	●	●	●	●	●
				AC	125	2.0	90		---	●	●	●	●	●
				DC	50	4.0	80		---	●	●	●	●	●
EYP1BF134	F134	134	129 +4 -3	AC	250	1.0	105	200	●	○	○	●	○	○
				AC	125	2.0	100		---	○	○	●	○	○
				DC	50	4.0	80		---	○	○	●	○	○
EYP1BF138	F138	139	135±3	AC	250	1.0	110	200	●	○	○	●	○	○
				AC	125	2.0	105		---	○	○	●	○	○
				DC	50	5.0	70		---	○	○	●	○	○
EYP1BF145	F145	145	141±2	AC	250	1.0	125	200	●	●	○	●	●	●
				AC	125	2.0	125		---	●	○	●	●	●
				DC	50	5.0	95		---	●	○	●	●	●

UL,C-UL：E60271, CSA：67163, VDE：481106-1171-0003, BEAB：C1065, CCC:2002010205004248 ●：Approved ○：Under Application

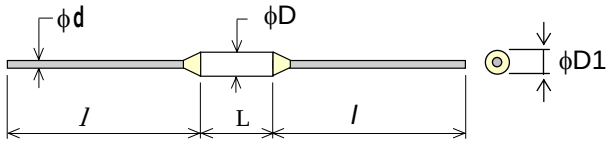
Thermal-Links (Thermal Cutoffs) Pb-free &Cd-free

N Series

Part Number	Type Number	Tf (℃)	Functioning Temperature (℃)	Electrical Ratings AC/DC	Voltage (V)	Current (A)	Th (℃)	Tm (℃)	Approved Safety standards PSE	UL C-UL	CSA	VDE	BE AB	CCC
EYP2BN082	N082	86	82±2	AC	250	2.0	60	200	●	●	●	●	●	●
				AC	125	3.0	56		---	●	●	●	●	●
				DC	50	4.0	50		---	●	●	●	●	●
EYP2BN099	N099	102	98 $^{+4}_{-3}$	AC	250	2.0	75	200	●	○	○	●	○	○
				AC	125	3.0	70		---	○	○	●	○	○
				DC	50	4.0	65		---	○	○	●	○	○
EYP2BN109	N109	114	110±3	AC	250	2.0	90	200	●	●	●	●	●	●
				AC	125	3.0	86		---	●	●	●	●	●
				DC	50	5.0	74		---	●	●	●	●	●
EYP2BN110	N110	115	110 $^{+3}_{-2}$	AC	250	2.0	90	200	●	●	●	●	●	●
				AC	125	3.0	86		---	●	●	●	●	●
				DC	50	5.0	74		---	●	●	●	●	●
EYP2BN127	N127	134	129±4	AC	250	2.0	100	200	●	○	○	●	○	○
				AC	125	3.0	90		---	○	○	●	○	○
				DC	50	4.0	80		---	○	○	●	○	○
EYP2BN134	N134	139	135±3	AC	250	2.0	110	200	●	○	○	●	○	○
				AC	125	3.0	100		---	○	○	●	○	○
				DC	50	6.0	70		---	○	○	●	○	○
EYP2BN143	N143	145	141±2	AC	250	2.0	120	200	●	●	●	●	●	●
				AC	125	3.0	115		---	●	●	●	●	●
				DC	50	6.0	90		---	●	●	●	●	●

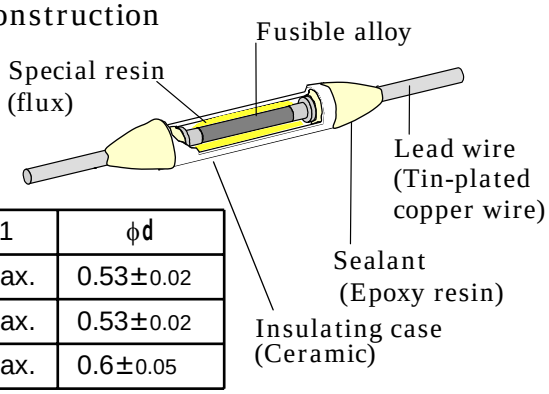
UL,C-UL:E60271, CSA:67163, VDE:481106-1171-0001, BEAB:C1068, CCC:2002010205004249 ●:Approved ○:Under Application

Dimension (mm)



	L	l	ϕD	ϕD1	ϕd
E series	5±1	38±3 (68±3)	1.5±1	1.8max.	0.53±0.02
F series	6±1	38±3 (68±3)	1.85± $^{0.2}_{0.15}$	2.3max.	0.53±0.02
N series	9±1	38±3 (78±3)	2.5±0.2	3.0max.	0.6±0.05

Construction



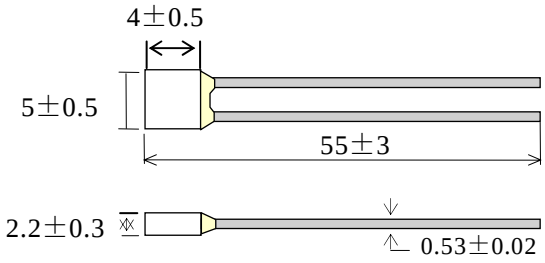
Thermal-Links (Thermal Cutoffs) Pb-free &Cd-free

H Series

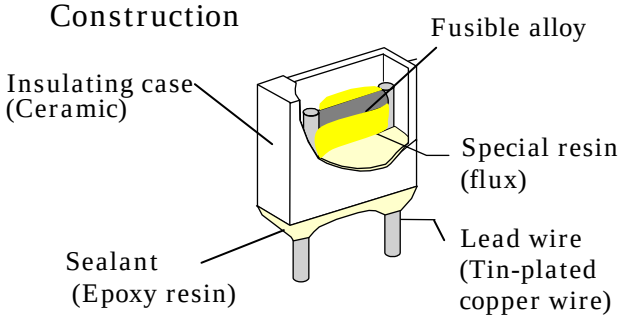
Part Number	Type Number	Tf (℃)	Functioning Temperature (℃)	Electrical Ratings AC/DC	Voltage (V)	Current (A)	Th (℃)	Tm (℃)	Approved Safety standards PSE	UL C-UL	CSA	VDE	BE AB	CCC
EYP2BH101	H101	102	98±3	AC	250	2.0	75	200	●	○	○	●	○	○
				AC	125	3.0	70		---	○	○	●	○	○
				DC	50	3.5	65		---	○	○	●	○	○
EYP2BH115	H115	115	110±2	AC	250	2.0	90	200 (150)	●	●	●	●	●	●
				AC	125	3.0	86		---	●	●	●	●	●
				DC	50	3.5	84		---	●	●	●	●	●
EYP2BH134	H134	134	129 +4 -3	AC	250	2.0	95	200	●	○	○	●	○	○
				AC	125	3.0	85		---	○	○	●	○	○
				DC	50	3.5	80		---	○	○	●	○	○
EYP2BH138	H138	139	135±3	AC	250	2.0	105	200	●	○	○	●	○	○
				AC	125	3.0	95		---	○	○	●	○	○
				DC	50	3.5	90		---	○	○	●	○	○
EYP2BH145	H145	145	141±2	AC	250	2.0	125	200	●	●	○	●	●	●
				AC	125	3.0	115		---	●	○	●	●	●
				DC	50	4.5	100		---	●	○	●	●	●

UL,C-UL:E60271, CSA:67163, VDE:481106-1171-0004, BEAB:C1067, CCC:2002010205004245 ●:Approved ○:Under Application

Dimension (mm)



Construction



Rated Functioning Temperature (Tf)

The temperature at which causes a Thermal-links changing its state of conductivity with loading detective current only. (Tolerance: PSE:±7℃, UL, CSA, VDE, BEAB, CCC:+0,-10℃)

Holding Temperature (Th)

The maximum temperature at which a Thermal-links will not change its state of conductivity for 168 hours under the condition of the rated current loaded.

Maximum Temperature limit (Tm)

The maximum temperature up to which mechanical and electrical properties of opened Thermal-links will not be impaired for 10 minutes.

Note: This catalog shows the ratings of just only a component. For quality assurance, exchange the specification with us. Before adoption, be sure to evaluate and verify the Thermal-links mounted on your products.

Thermal-Links (Thermal Cutoffs) Pb-free &Cd-free

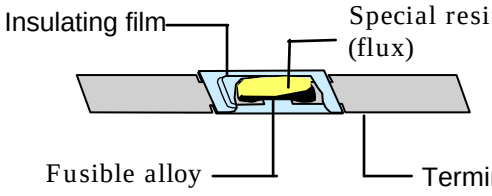
ML Sereis MU Sereis

Part Number	Type Number	Tf (℃)	Functioning Temperature (℃)	Electrical Ratings AC/DC	Voltage (V)	Current (A)	Th (℃)	Tm (℃)	DCR avg (mΩ)	Approved UL	VDE	CCC
EYP2ML092U	ML092	92	89 +3 -4	DC	50	2	60	135	7.5	●	●	●
EYP2ML092U□												
EYP2ML098U	ML098	98	94 +3 -2.5	DC	50	2	65	135	7.5	●	●	●
EYP2ML098U□												
EYP4MU092XU	MU092X	92	89 +3 -4	DC	50	4	55	150	5.0	●	●	○
EYP4MU092XU□												

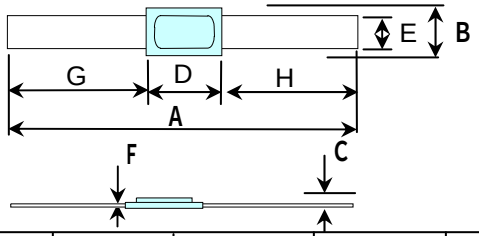
UL:E60271, ML Series VDE:481106-1171-0011, CCC:2003010205034615
MU Series 481106-1171-0009 2003010205034614

●:Approved ○:Under Application

Construction



Dimension (mm)



	A	B	C	D	E	F	G	H
EYP2ML***U	25.0±0.5	3.2±0.2	0.65±0.15	4.5±0.5	3.0 ±0.2	0.10±0.02	10.25±0.5	(10.25)
EYP2ML***US	29.0±0.5	3.2±0.2	0.65±0.15	4.5±0.5	3.0±0.2	0.10±0.02	9.2±0.5	(15.3)
EYP2ML***UH	23.0±0.5	3.2±0.2	0.65±0.15	4.5±0.5	3.0±0.2	0.10±0.02	12.0±0.5	(6.5)
EYP2ML***UK	13.35±0.2	3.2±0.2	0.65±0.15	4.5±0.5	3.0±0.2	0.10±0.02	3.7 ±0.5	(5.15)
EYP4MU092XU	26.5±0.5	4.5±0.4	1.0±0.15	11.0 +0.6 -0.4	3.0 ±0.2	0.15±0.02	7.7±0.5	(7.7)

Rated Functioning Temperature (Tf)
The temperature at which causes a Thermal-links changing its state of conductivity with loading detective current only. (Tolerance: PSE:±7℃, UL, CSA, VDE, BEAB, CCC:+0,-10℃)

Holding Temperature (Th)
The maximum temperature at which a Thermal-links will not change its state of conductivity for 168 hours under the condition of the rated current loaded.

Maximum Temperature limit (Tm)
The maximum temperature up to which mechanical and electrical properties of opened Thermal-links will not be impaired for 10 minutes.

Note: This catalog shows the ratings of just only a component. For quality assurance, exchange the specification with us. Before adoption, be sure to evaluate and verify the Thermal-links mounted on your products.

PRECAUTIONS IN HANDLING
(Application instructions)

1. Precautions in design

1) Use the Thermal-Links within their specified temperature and electrical ratings.

①Use the Thermal-Links under an ambient temperature of not more than the maximum operating temperature specified in the individual specification. Using the Thermal-Links under a higher temperature than the maximum operating temperature may cause premature opening or opening delay.

* When Thermal-Links is continuously used at the temperature close to the functioning temperature, the Thermal-Links may operate while being used.
* When the Thermal-Links is continuously used at the temperature higher than the maximum operation temperature, the Thermal-Links may be degraded and may not operate normally at the specified temperature.

②The holding temperature (Th) is defined as the highest temperature at which the Thermal-Links is activated continuously at the rated current for 168 hours. The Thermal-Links can not be used over 168 hours exceeding the holding temperature.

③Equipment shall be so designed that its overshoot does not exceed the maximum temperature limit(Tm) after the Thermal-Links operates.

④If the Thermal-Links is activated by voltage higher than the rated voltage or current higher than the rated current, the Thermal-Links produces excessive heat, resulting in premature operating. The arc generated at this condition of operation will result in an abnormality of appearance (fracture of insulating case, blowing out of lead or sealant, and et al) and insufficient insulation.

* When Thermal-Links is operated at abnormal status of mode while the rated voltage and/or the rated current being exceeded, it may not cut off the circuit.

⑤Thermal element may be transformed and Thermal-Links may open when it is used in the environment from which an excessive temperature change (such as outdoor) is repeated. Investigate the environment where Thermal-Links is used.

⑥In case that transient overload might be applied, repeat the tests under the worst conditions assumed for decision before determining whether or not Thermal-Links is used.

⑦The Thermal-Links cannot be used as a current sensitive fuse

2) To bring out fully the performances of Thermal-Links, a suitable Thermal-Links for equipment must be selected. Verification tests to select shall be made yourself every model.

①Tests should be repeated for the finished equipment to confirm that the Thermal-Links does operate as expected.

②To maximize the thermal response of Thermal-Links, bring both the body and the leads (terminals) as close to the heat source as possible and put into mounting location where the Thermal-Links is evenly heated. If there is large difference between the temperature transferred to the body and the temperature transferred to the leads (terminals), Thermal-Links might operate faulty and cause in arcing and insulation deterioration.

3) Thermal-Links body and leads (terminals) must be properly fixed when the Thermal-Links is mounted in the equipment. It may cause breaking of thermal element and/or leads (terminals) , or damages of the Thermal-Links body, or other failure when the body or leads (terminals) is not properly connected. Avoid a transport under the condition with a connection only a single side of lead (terminal) and the equipment as it might cause breaking of thermal element and/or leads (terminals) , or damages of the Thermal-Links body, or other failure due to the vibration or mechanical stress on the transportation.

4) When Thermal-Links is mounted in the equipment, leads (terminals) must be aligned with the body. If Thermal-Links body and leads (terminals) are mutually mounted askew, it might cause breaking of thermal element and/or leads (terminals) . Also after assembling Thermal-Links in the equipment, avoid pulling, bending, pushing stress and twisting stress in the Thermal-Links body and leads (terminals) in order not to cause breaking of thermal element and/or leads (terminals) , or damages of the Thermal-Links body.

5) Avoid vibration or other stress in the finished equipment. They may cause breaking of thermal element and/or leads and damage of Thermal-Links body by the vibration or some stress even if the Thermal-Links in the equipment is kept at temperatures below its Maximum operating temperature.

6) When sealing the Thermal-Links with resin, select the resin that does not corrode the body and/or leads (terminals) . When sealing the overall Thermal-Links with resin, test repeatedly on the finished equipment in order to confirm if Thermal-Links is damaged by the expansion and shrinkage of the resin itself, by the curing temperature, and if the sealed Thermal-Links operate normally.

7) When immersing equipment on which the Thermal-Links is mounted in varnish or solvent and drying it, repeat the test to check whether or not the varnish or solvent used dissolves the coating of the Thermal-Links or causes damage, such as cracks, before performing the treatment

8) Thermal-Links does not take the use under the following special environments into consideration.
Do not use under the following environments.
①In liquids such as water, oil, chemical and/or organic solvent.
②Under direct sunlight, and/or outdoor and/or dusty atmospheres.
③In place where water condensation occurs.
* Use in the following environments may affect the performance of the Thermal-Links; Verify performance and reliability etc. before production use.
a. In places full of corrosive gases such as sea breeze, Cl_2, H_2S, NH_3, SO_2 and/or NO_2.
b. In environment with high static electricity and/or strong electromagnetic waves.
* Do not use Thermal-Links in aerospace equipment, atomic energy equipment, military weapon, life saving equipment, etc.

2. PRECAUTIONS IN HANDLING
1)Forming and cutting
① Leads (terminals) are to be bent or cut at least 3 mm away from the Thermal-Links body to avoid damaging the Thermal-Links (axial/radial type) or body (thin type) . Shall not be grasped with any tools or holders. Terminals of thin type Thermal-Links are to be grasped before they are bent. (See Fig.1, and this way is one of requirements by UL). If you have to form the lead at a position of a shorter length than 3 mm away from the sealant, you should take care not to damage to the sealant and the fusible alloy and closely check Thermal-Links if the forming affects it.
②It is recommended that experimental assembly be made by production personnel to verify that manufacturing procedures does not exceed neither a pulling forces of 20N nor a pushing forces of 5N on the leads (pulling forces of 5N and pushing forces of of 5N in case of thin type), and that manufacturing procedures does not induce excessive twisting between both leads (terminals) or between lead (terminal) and body.
③The leads (terminals) shall not be nicked, fractured or burned. The body must not be damaged, burned or overheated.

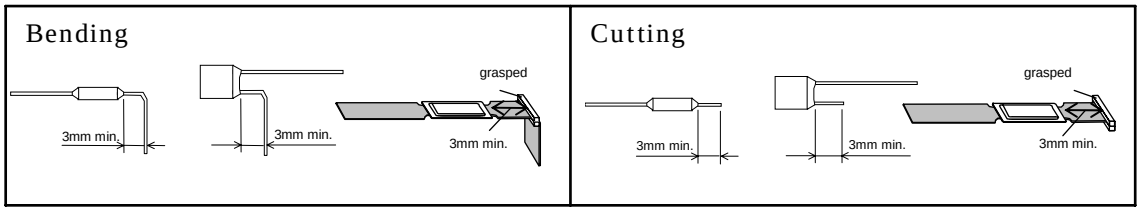
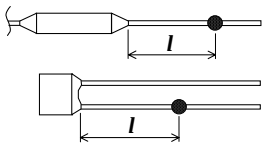


Fig. 1

2)Soldering, welding and calking
①Lead wires are to be soldered with the standard conditions shown in Table 1. Excessive soldering heat and soldering time may cause damage to Thermal-Links. In higher temperature, longer time or shorter lead length exists rather than the conditions of Table 1, it is recommended to run tests for finding the soldering conditions that do not damaged the Thermal-Links. Also use of tools such as pliers is recommended to dissipate soldering heat by grasping lead wires between the Thermal-Links body and soldering point.
②Avoid preheating and gradual cooling as much as possible. However if preheating and gradual cooling is done, set the process conditions after confirming that Thermal-Links is not affected by these procedures.
③Do not use any reflow soldering.
④Thin type (ML, MS, MU series) is not to be soldered.
⑤ If water or solvent is used for cleaning flux after soldering, check and confirm closely performance and reliability of Thermal-Links.
⑥When required to connect Thermal-Links by welding or calking, it is necessary to connect securely at a position of at least 3mm away from the sealant of Thermal-Links so that it may be not applied excessive stresses. Improper connections may result in premature opening due to excessive heating from a high contact resistance.
⑦Set the conditions for welding or calking only after checking the contact resistance and the connection strength.
⑧When re-soldering or re-welding, cool off Thermal-Links in the room temperature.
⑨While Thermal-Links is heated by soldering or welding, be careful not to pull, push or twist the lead. Because their stresses result in breaking out of lead or sealant.
⑩It is recommended that the preliminary test to determine proper welding conditions is made in order not to make the heat of welding influence Thermal-Links, for example, function the Thermal-Links or narrow the fusible alloy, etc, and in order that the welding method, like a resistance welding, laser welding, ultrasonic welding and so on, does not damage to Thermal-Links.

Table 1. Soldering conditions

Soldering temperature: 300 ° C, Time: 3 seconds					● Soldering point 
Lead length (*l*)	Type No.				
30mm				H101	
25mm	E115 ,E134, E138	F101	N082 N099	H115, H134	
20mm	E145	F115, F134, F138, F145	N109, N110	H138,H145	
15mm			N127,N134 N143		

3)The sufficiently flexible, appropriate free length and proper size wire shall be used for splice connection with lead of Thermal-Links. Connection including connectors for splicing shall be of the low resistance type, and they shall be made mechanically secure.
4)In case that lead of Thermal-Links is fixed to other component or unit by some materials such as a string, the fixed point of the lead shall be placed over 10mm away from sealant of Thermal-Links.
5)Do not repair Thermal-Links. For replacement, install the same part number of Thermal-Links in the same way exactly.

3. Recommendations for quality control
1)Measuring resistance and checking the internal status by X-rays equipment are effective means to confirm the Thermal-Links delivered and assembled in your product.
2)It is necessary to confirm normal operation of Thermal-Links with the trial pieces and the equipment of the initial production lot set at normal condition and at abnormal condition.

4. Storage method
1)Store Thermal-Links in packing cases or in polyethylene bags within the temperature of -10℃ to +40℃ and relative humidity of 30% to 75%. Store them at the location where no rapid change of temperature or humidity, or no direct sunlight is applied. The location must also be free from vibration or shock or the like.
2)Avoid the storage in places containing corrosive gases such as sea breeze, Cl2, H2S, NH3, SO2 and/or NO2.
3)The period of guarantee for performance such as solderability / weldability is for one year after our delivery; and this condition applies only in the case where the storage method specified in above has been followed.

5. Law and Regulations
1)No ozone-depleting substances subjected to regulations under the Montreal Protocol are used in our manufacturing processes, including in the manufacture of this product.
2)All the materials used in this product exist in chemical substances recognized under “Lows on examination of chemical substances and regulations of manufacturing and others.”
3)None of the materials used in this product contain the designated incombustible bromic substances, PBBOs or PBBs.
4)Please contact us to obtain a notice as to whether this product has passed inspection under review criteria primarily based on Foreign Exchange and Foreign Trade Control Law and appended table in the Export Control Law.

6. Notice
1)Please return to us a sheet of the specifications signed on the cover page if you agree with description.
Unless you return it to us beyond three months from the date of issue, we should consider that you accept it.
2)In time to modify this specification, when we receive your acceptance under mutual confirmation based on your review, we understand that you accept the revised specification and consider the former specifications to be not effective