RATING

1.Coil data

- Operating characteristics such as 'Operate voltage' and 'Release voltage' are influenced by mounting conditions, ambient temperature, etc.
  Therefore, please use the relay within ± 5% of rated coil voltage.
- 'Initial' means the condition of products at the time of delivery.

Nominal coil voltage	Pick-up voltage (at 20°C 68°F)	Drop-out voltage (at 20°C 68°F)	Nominal operating current [±10%] (at 20°C 68°F)	Coil resistance [±10%] (at 20°C 68°F)	Nominal operating power	Max. applied voltage (at 20°C 68°F)
5V DC	80%V or less of nominal voltage (Initial)	10%V or more of nominal voltage (Initial)	50 mA	100Ω	250mW	6.5V DC
9V DC			27.8mA	324Ω		11.7V DC
12V DC			20.8mA	576Ω		15.6V DC
24V DC			10.4mA	2,304Ω		31.2V DC

2. Specifications

| Characteristics	Item		Specifications	
			TV-5 type	TV-8 type
Contact	Arrangement		1 Form A	
	Contact resistance (Initial)		Max. 100mΩ (By voltage drop 6 V DC 1A)	
	Contact material		AgSnO$_2$ type	
Rating	Nominal switching capacity (resistive load)		5A 277V AC	8A 277V AC
	Max. switching power (resistive load)		1,385VA	2,216VA
	Max. switching voltage		277V AC	
	Max. switching current		5A (AC)	8A (AC)
	Min. switching capacity (reference value)*1		100mA, 5V DC	
Electrical characteristics	Insulation resistance (Initial)		Min. 1,000MΩ (at 500V DC) Measurement at same location as "Breakdown voltage" section.	
	Breakdown voltage (Initial)	Between open contacts	1,000 Vrms for 1 min. (Detection current: 10 mA)	
		Between contact and coil	4,000 Vrms for 1 min. (Detection current: 10 mA)	
	Surge breakdown voltage*2 (Between contact and coil) (Initial)		10,000 V	
	Operate time (at nominal voltage) (at 20°C 68°F) (Initial)		Max. 15 ms (excluding contact bounce time.)	
	Release time (at nominal voltage) (at 20°C 68°F) (Initial)		Max. 5 ms (excluding contact bounce time) (Without diode)	
Mechanical characteristics	Shock resistance	Functional	200 m/s^2 (Half-wave pulse of sine wave: 11 ms; detection time: 10μs.)	
		Destructive	1,000 m/s^2 (Half-wave pulse of sine wave: 6 ms.)	
	Vibration resistance	Functional	10 to 55 Hz at double amplitude of 1.5 mm (Detection time: 10μs.)	
		Destructive	10 to 55 Hz at double amplitude of 1.5 mm	
Expected life	Mechanical (at 180 times/min.)		Min. 10^6	
	Electrical		Min. 10^5 (ON: 1.5s, OFF: 1.5s, at nominal switching capacity)	Min. 5×10^4 (ON: 1.5s, OFF: 1.5s, at nominal switching capacity)
Conditions	Conditions for operation, transport and storage*3		Ambient temperature: –40°C to +70°C –40°F to +158°F, Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature), Air pressure: 86 to 106kPa	
	Max. operating speed		20 times/min. (at nominal switching capacity)	
Unit weight			Approx. 12 g .42 oz	

Notes: *1. This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.
   *2. Wave is standard shock voltage of ±1.2×50μs according to JEC-212-1981
   *3. The upper limit of the ambient temperature is the maximum temperature that can satisfy the coil temperature rise value. Refer to Usage, transport and storage conditions in NOTES.
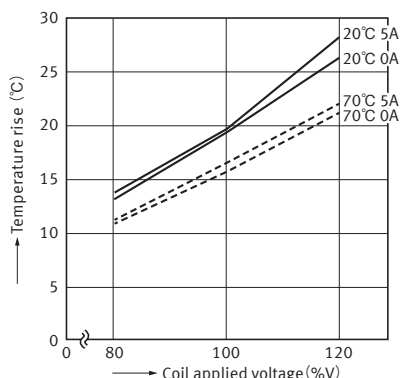
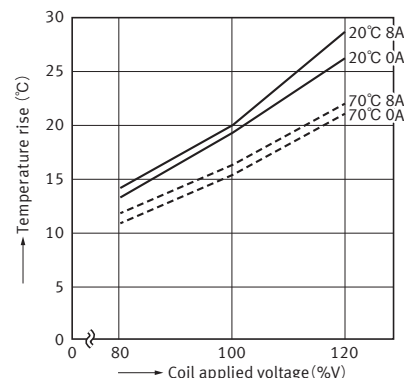# REFERENCE DATA

1. Max. switching power (AC resistive load)
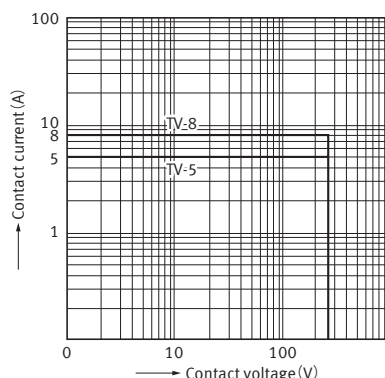
2-(1). Coil temperature rise (TV-5 type)

Tested sample：LKQ1aF-12V-TV5, 6 pcs.
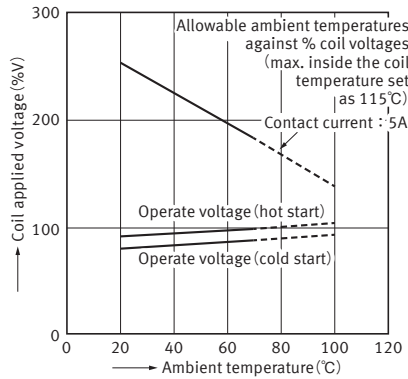Measured portion：Coil inside
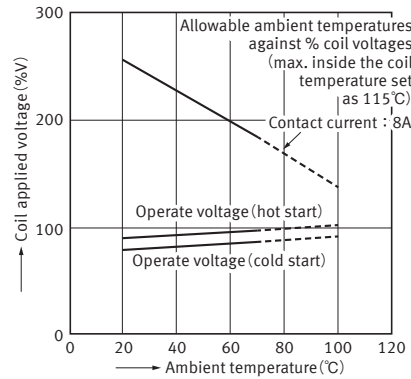Contact current：0A, 5A

2-(2). Coil temperature rise (TV-8 type)

Tested sample：LKQ1aF-12V-TV8, 6 pcs.
Measured portion：Coil inside
Contact current：0A, 8A

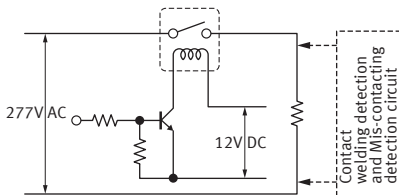## 3-(1). Ambient temperature characteristics and coil applied voltage (TV-5 type)

Allowable ambient temperatures against % coil voltages (max. inside the coil temperature set as 115℃)
Contact current : 5A
Operate voltage (hot start)
Operate voltage (cold start)

Coil applied voltage (%V) vs Ambient temperature (℃)

3-(2). Ambient temperature characteristics and coil applied voltage (TV-8 type)

Allowable ambient temperatures against % coil voltages (max. inside the coil temperature set as 115℃)
Contact current : 8A
Operate voltage (hot start)
Operate voltage (cold start)

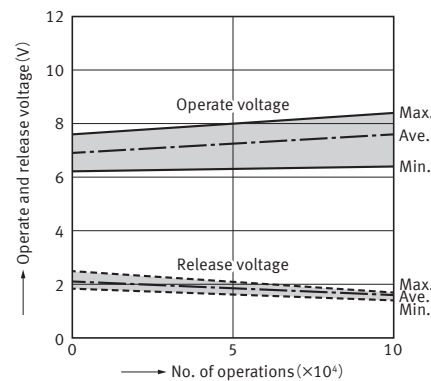Coil applied voltage (%V) vs Ambient temperature (℃)

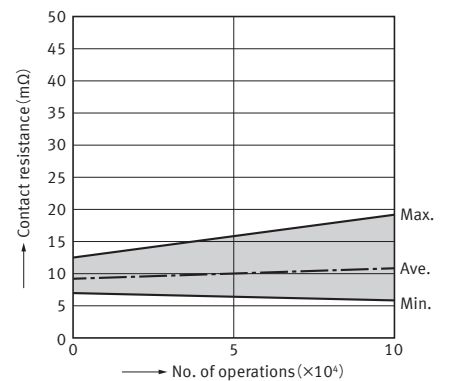## 4-(1). Electrical life test (TV-5 type)
(5A 277V AC, resistive load)

Tested sample : LKQ1aF-12V-TV5, 6 pcs.
Operation frequency : 20 times/min.
(ON : OFF=1.5s : 1.5s)
Ambient temperature : 20℃
Circuit :

277V AC, 12V DC, Contact welding detection and Mis-contacting detection circuit

Change of operate and release voltage

Operate voltage — Max. Ave. Min.
Release voltage — Max. Ave. Min.
Operate and release voltage (V) vs No. of operations (×10⁴)

Change of contact resistance
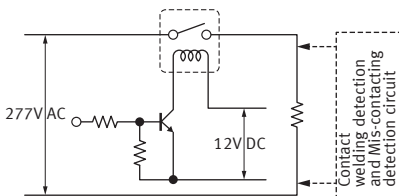

Max. Ave. Min.
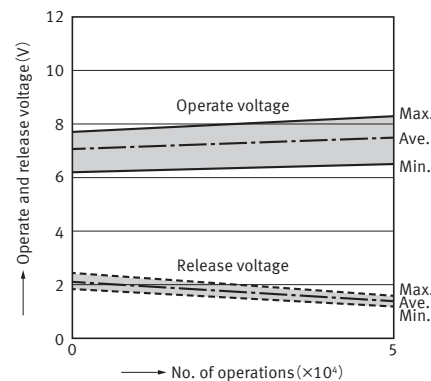Contact resistance (mΩ) vs No. of operations (×10⁴)

4-(2). Electrical life test (TV-8 type)
(8A 277V AC, resistive load)
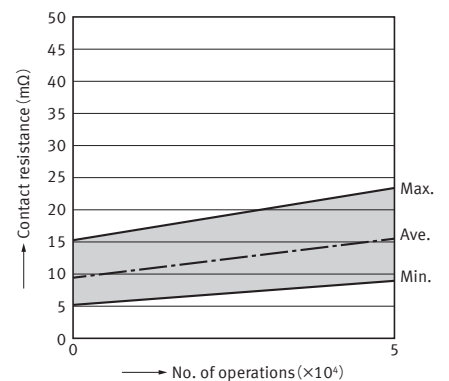
Tested sample : LKQ1aF-12V-TV8, 6 pcs.
Operation frequency : 20 times/min.
(ON : OFF=1.5s : 1.5s)
Ambient temperature : 20℃
Circuit :

277V AC, 12V DC, Contact welding detection and Mis-contacting detection circuit

Change of operate and release voltage

Operate voltage — Max. Ave. Min.
Release voltage — Max. Ave. Min.
Operate and release voltage (V) vs No. of operations (×10⁴)

Change of contact resistance
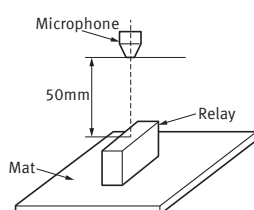

Max. Ave. Min.
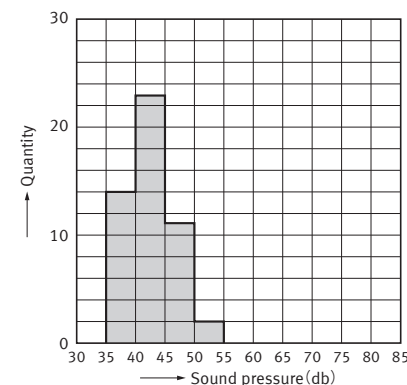Contact resistance (mΩ) vs No. of operations (×10⁴)

5-(1). Operation noise distribution
Measuring conditions

Measuring conditions
Tested sample : LKQ1aF-12V-TV5, 50 pcs.
Background noise : approx. 20dB
Coil voltage : 12V DC
Equipment setting : "A" weighted
Single part (refer to figure below)
With diode

Microphone
50mm
Relay
Mat

When operate (At contact making)

Quantity vs Sound pressure (db)

When release (At contact breaking)

Quantity vs Sound pressure (db)
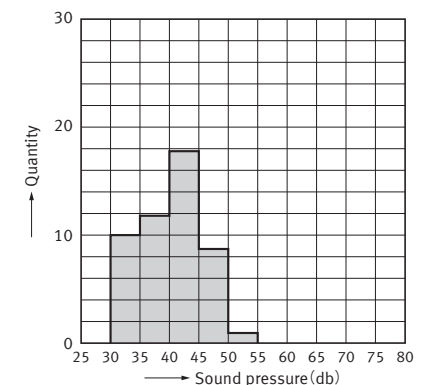
5-(2). Operation noise distribution
(refer to comparison)

Measuring conditions
Tested sample : LKQ1aF-12V, 50 pcs.
Background noise : approx. 20dB
Coil voltage : 12V DC
Equipment setting : "A" weighted
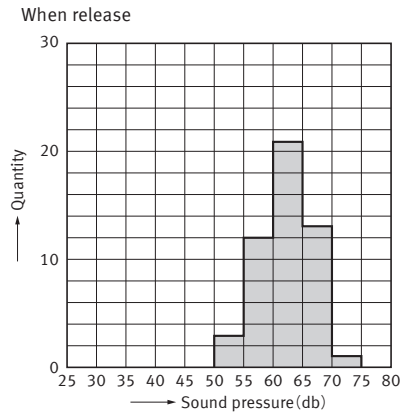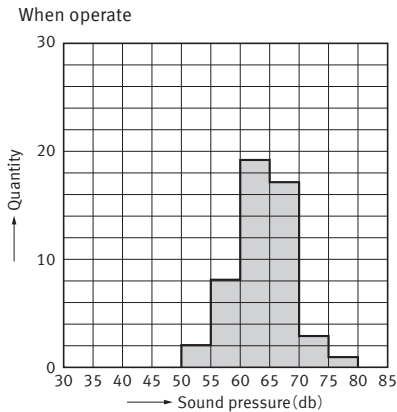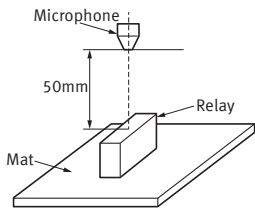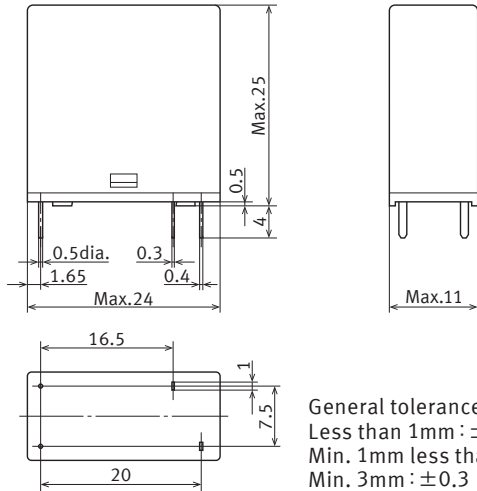Single part (refer to figure below)
With diode

Microphone

50mm

Relay

Mat

When operate

Quantity / Sound pressure (db)

When release

Quantity / Sound pressure (db)

DIMENSIONS (mm)

CAD The CAD data of the products with a "CAD" mark can be downloaded from our Website.

CAD

External dimensions

Max.25

0.5

4

0.5dia. 0.3
1.65 0.4
Max.24

Max.11

16.5

1

7.5

20

PC board pattern (Bottom view)

16.5

2−0.9dia. 2−1.3dia.

7.5

20
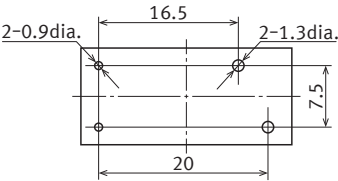
Tolerance ±0.1

Schematic (Bottom view)

General tolerance
Less than 1mm : ±0.1
Min. 1mm less than 3mm : ±0.2
Min. 3mm : ±0.3

SAFETY STANDARDS

Item	UL/C-UL (Recognized)			TÜV (Certified)			SEMKO (Certified)		TV rating (UL/C-UL)	
	File No.	Contact rating	Cycles	File No.	Contact rating	Cycles	File No.	Contact rating	File No.	Contact rating
TV-5 type	E43149	10A 277V AC General use	5×10^4	B 12 09 13461 333	5A 250V AC (cosφ =1.0)	10^5	1408509	3A/100A 250V AC	E43149	TV-5
		5A 277V AC General use	10^5							
		5A 30V DC Resistive	10^5							
TV-8 type	E43149	10A 277V AC General use	5×10^4	B 12 09 13461 333	8A 250V AC (cosφ =1.0)	2×10^4	1408509	3/100A 250V AC	E43149	TV-8
		8A 277V AC General use	5×10^4							
		5A 277V AC General use	10^5							
		5A 30V DC Resistive	10^5							

* CSA standard: Certified by C-UL

NOTES
1. For cautions for use, please read "GENERAL APPLICATION GUIDELINES".

Please refer to **"the latest product specifications"**
when designing your product.
 • Requests to customers :
  https://industrial.panasonic.com/ac/e/salespolicies/

■ **For cautions for use, please read "GUIDELINES FOR RELAY USAGE".**
https://industrial.panasonic.com/ac/e/control/relay/cautions_use/index.jsp

Precautions for Coil Input

■ **Long term current carrying**
A circuit that will be carrying a current continuously for long periods without relay switching operation. (circuits for emergency lamps, alarm devices and error inspection that, for example, revert only during malfunction and output warnings with form B contacts) Continuous, long-term current to the coil will facilitate deterioration of coil insulation and characteristics due to heating of the coil itself. For circuits such as these, please use a magnetic-hold type latching relay. If you need to use a single stable relay, use a sealed type relay that is not easily affected by ambient conditions and make a failsafe circuit design that considers the possibility of contact failure or disconnection.

■ **DC Coil operating power**
Steady state DC current should be applied to the coil. The wave form should be rectangular. If it includes ripple, the ripple factor should be less than 5%.
However, please check with the actual circuit since the electrical characteristics may vary. The rated coil voltage should be applied to the coil and the set/reset pulse time of latching type relay differs for each relays, please refer to the relay's individual specifications.

■ **Coil connection**
When connecting coils of polarized relays, please check coil polarity (+,-) at the internal connection diagram (Schematic). If any wrong connection is made, it may cause unexpected malfunction, like abnormal heat, fire and so on, and circuit do not work. Avoid impressing voltages to the set coil and reset coil at the same time.

■ **Maximum allowable voltage and temperature rise**
Proper usage requires that the rated coil voltage be impressed on the coil. Note, however, that if a voltage greater than or equal to the maximum continuous voltage is impressed on the coil, the coil may burn or its layers short due to the temperature rise. Furthermore, do not exceed the usable ambient temperature range listed in the catalog.

■ **Operate voltage change due to coil temperature rise**
In DC relays, after continuous passage of current in the coil, if the current is turned OFF, then immediately turned ON again, due to the temperature rise in the coil, the pick-up voltage will become somewhat higher. Also, it will be the same as using it in a higher temperature atmosphere. The resistance/temperature relationship for copper wire is about 0.4% for 1°C, and with this ratio the coil resistance increases. That is, in order to operate of the relay, it is necessary that the voltage be higher than the pick-up voltage and the pick-up voltage rises in accordance with the increase in the resistance value. However, for some polarized relays, this rate of change is considerably smaller.

Ambient Environment

■ **Usage, Transport, and Storage Conditions**
During usage, storage, or transportation, avoid locations subjected to direct sunlight and maintain normal temperature, humidity and pressure conditions.

● **Temperature/Humidity/Pressure**
When transporting or storing relays while they are tube packaged, there are cases the temperature may differ from the allowable range. In this case be sure to check the individual specifications. Also allowable humidity level is influenced by temperature, please check charts shown below and use relays within mentioned conditions. (Allowable temperature values differ for each relays, please refer to the relay's individual specifications.)

1) Temperature:
   The tolerance temperature range differs for each relays, please refer to the relay's individual specifications
2) Humidity: 5 to 85 % RH
3) Pressure: 86 to 106 kPa
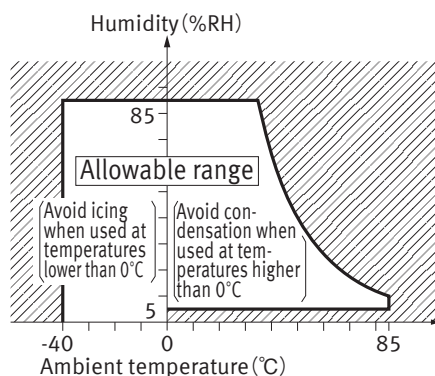
● **Dew condensation**
Condensation occurs when the ambient temperature drops suddenly from a high temperature and humidity, or the relay is suddenly transferred from a low ambient temperature to a high temperature and humidity. Condensation causes the failures like insulation deterioration, wire disconnection and rust etc.
Panasonic Corporation does not guarantee the failures caused by condensation.
The heat conduction by the equipment may accelerate the cooling of device itself, and the condensation may occur.
Please conduct product evaluations in the worst condition of the actual usage. (Special attention should be paid when high temperature heating parts are close to the device. Also please consider the condensation may occur inside of the device.)

● **Icing**
Condensation or other moisture may freeze on relays when the temperature become lower than 0°C. This icing causes the sticking of movable portion, the operation delay and the contact conduction failure etc. Panasonic Corporation does not guarantee the failures caused by the icing.
The heat conduction by the equipment may accelerate the cooling of relay itself and the icing may occur. Please conduct product evaluations in the worst condition of the actual usage.

● **Low temperature and low humidity**
The plastic becomes brittle if the switch is exposed to a low temperature, low humidity environment for long periods of time.

● **High temperature and high humidity**
Storage for extended periods of time (including transportation periods) at high temperature or high humidity levels or in atmospheres with organic gases or sulfide gases may cause a sulfide film or oxide film to form on the surfaces of the contacts and/or it may interfere with the functions. Check out the atmosphere in which the units are to be stored and transported.

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●**Package**

In terms of the packing format used, make every effort to keep the effects of moisture, organic gases and sulfide gases to the absolute minimum.

●**Silicon**

When a source of silicone substances (silicone rubber, silicone oil, silicone coating materials and silicone filling materials etc.) is used around the relay, the silicone gas (low molecular siloxane etc.) may be produced.

This silicone gas may penetrate into the inside of the relay. When the relay is kept and used in this condition, silicone compound may adhere to the relay contacts which may cause the contact failure.

Do not use any sources of silicone gas around the relay (Including plastic seal types).

●**NOx Generation**

When relay is used in an atmosphere high in humidity to switch a load which easily produces an arc, the NOx created by the arc and the water absorbed from outside the relay combine to produce nitric acid.

This corrodes the internal metal parts and adversely affects operation.

Avoid use at an ambient humidity of 85%RH or higher (at 20°C). If use at high humidity is unavoidable, please contact our sales representative.

Others

■**Cleaning**

• Although the environmentally sealed type relay (plastic sealed type, etc.) can be cleaned, avoid immersing the relay into cold liquid (such as cleaning solvent) immediately after soldering. Doing so may deteriorate the sealing performance.

• Cleaning with the boiling method is recommended(The temperature of cleaning liquid should be 40°C or lower).

Avoid ultrasonic cleaning on relays. Use of ultrasonic cleaning may cause breaks in the coil or slight sticking of the contacts due to ultrasonic energy.

Please refer to **"the latest product specifications"** when designing your product.

•Requests to customers:
https://industrial.panasonic.com/ac/e/salespolicies/

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