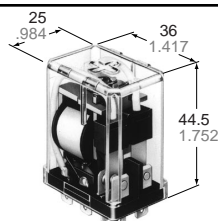


**NAIS****10 AMP POWER RELAY****HP-RELAYS**

mm inch

**UL File No.: E43028****CSA File No.: LR26550**

- Interchangeable with existing models
- Long life and high reliability
- High contact capacity up to 10 A 250 V AC
- Available with plug-in/solder and quick-connect terminals

**SPECIFICATIONS (at 20°C 68°F)****Contacts**

Arrangement	2 Form C	3 Form C	4 Form C
Initial contact resistance, max. (By voltage drop 6 V DC 1 A)	15 mΩ		
Contact material	Silver		Silver alloy
Rating	Nominal switching capacity		
	10 A 250 V AC (resistive)		
	UL/CSA rating		
	10 A, 1/3 HP 125, 250 V AC		
VDE rating			10 A (7.5 A) 250 V AC (HP2) 10 A 250 V AC (HP3)

**Remarks**

- \*1 Measurement at same location as "initial breakdown voltage" section  
 \*2 Detection current; 10 mA  
 \*3 Excluding contact bounce time  
 \*4 Half-wave pulse of sine wave: 11ms; detection time: 10μs  
 \*5 Half-wave pulse of sine wave: 6ms  
 \*6 Detection time: 10μs  
 \*7 Refer to 5. Conditions for operation, transport and storage mentioned in AMBIENT ENVIRONMENT (Page 49)

**Characteristics (at 60 Hz, 20°C 68°F)**

	2 Form C	3 Form C	4 Form C
Maximum operating speed	20 cpm		
Initial insulation resistance*1	more than 100 MΩ at 500 V DC		
Break-down voltage*2	Between open contacts	1,000 Vrms	2,000 Vrms
	Between contact sets	1,500 Vrms	2,000 Vrms
	Between contact and coil	1,500 Vrms	2,000 Vrms
Operate time*3 (at nominal voltage)	Approx. 15 ms	Approx. 25 ms	
Release time(without diode)*3 (at nominal voltage)	Approx. 15 ms	Approx. 25 ms	
Temperature rise	Max. 65°C		
Shock resistance	Functional*4	98 m/s <sup>2</sup> {10 G}	
	Destructive*5	980 m/s <sup>2</sup> {100 G}	
Vibration resistance	Functional*6	58.8 m/s <sup>2</sup> {6 G}, 10 to 55 Hz at 1 mm double amplitude	
	Destructive	117.6 m/s <sup>2</sup> {12 G}, 10 to 55 Hz at 2 mm double amplitude	
Conditions for operation, transport and storage*7 (Not freezing and condensing at low temperature)	Ambient temp.	-50°C to +40°C -58°F to +104°F	
	Humidity	5 to 85% R.H.	
Unit weight	Approx. 60g	Approx. 100g	Approx. 125g
	2.12 oz	3.53 oz	4.41 oz

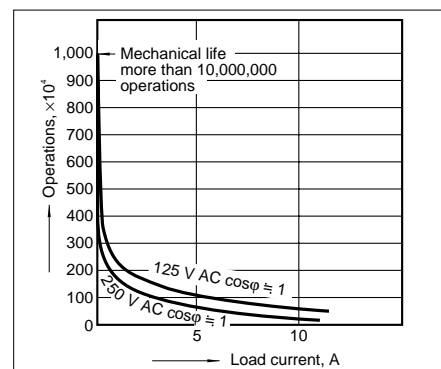
**LIFE DATA****Contact rating and expected life For AC load type**

	Voltage	125 V AC		250 V AC		Expected life (min. operations)
		Resistive (cosφ ≅ 1)	Inductive (cosφ ≅ 0.4)	Resistive (cosφ ≅ 1)	Inductive (cosφ ≅ 0.4)	
Electrical life	Load	—	—	10 A	7.5 A	2×10 <sup>5</sup>
		10 A	7.5 A	7.5 A	5 A	5×10 <sup>5</sup>
	Current	5 A	3 A	3 A	2 A	1×10 <sup>6</sup>
		1A	0.7 A	0.6 A	0.4 A	2×10 <sup>6</sup>
Mechanical life						1×10 <sup>7</sup>

Note: When the electromagnet or exciting coil (Solenoid, etc.) is the load, the value of motor or lamp load is applicable.

**Contact rating and expected life For DC load type**

	Voltage	24 V DC		125 V DC		Expected life (min. operations)
		Resistive (cosφ ≅ 1)	Inductive (cosφ ≅ 0.4)	Resistive (cosφ ≅ 1)	Inductive (cosφ ≅ 0.4)	
Electrical life	Load	—	7 A	—	—	2×10 <sup>5</sup>
		7.5 A	5 A	0.5 A	0.4 A	5×10 <sup>5</sup>
	Current	5 A	3 A	0.3 A	0.2 A	1×10 <sup>6</sup>
		1 A	0.6 A	0.1 A	0.06 A	2×10 <sup>6</sup>
Mechanical life						1×10 <sup>7</sup>

**Life curve****Notes:**

1. For DC inductive loads, use an arc suppressing circuit.
2. When used under a DC load operating at high repetition rate with considerable arcing, corrosion of the contacts and/or the contact blades is likely to occur. When using the relay under conditions of high temperature, humidity or high repetition rate, it is suggested that the relay cover be removed to facilitate extended operation.

## ORDERING INFORMATION

Ex. HP 3 — M — AC240V

Contact arrangement	Terminal	Coil voltage
2: 2 Form C 3: 3 Form C 4: 4 Form C	Nil: Standard plug-in terminal M: Direct mounting (3 Form C only) TM: Top mounting (2 Form C only) L: Lamp wired, standard plug-in terminal	AC 6, 12, 24, 48, 115, 220, 240 V DC 6, 12, 24, 48, 110 V

(Notes) 1. For UL/CSA or VDE recognized types, add suffix UL/CSA or VDE (HP2-TM type VDE application under way)  
2. Standard packing Carton: 50 pcs. Case: 200 pcs.

## TYPICAL APPLICATIONS

HP relays enjoy wide use in various applications, particularly in automation controls and remote controls.

Applications include:  
Industrial machinery

Machine tool  
Food processing packing machines  
Office equipment  
Coin operate devices  
Home appliances

Transportation  
Communication and measuring devices  
Amusement devices

## TYPES AND COIL DATA

### 1. Standard plug-in terminal type (without lamp wired)

#### DC TYPES at 20°C 68°F

Type	Part No.	Nominal coil voltage, V DC	Pick-up voltage, V DC (max.)	Drop-out voltage, V DC (min.)	Max. allowable voltage, V DC	Coil resistance, $\Omega$ ( $\pm 10\%$ )	Nominal coil current, mA	Nominal operating power, W
2 Form C	HP2-DC6V	6	4.8	0.9	6.6	25	240	1.5
	HP2-DC12V	12	9.6	1.8	13.2	110	109	1.3
	HP2-DC24V	24	19.2	3.6	26.4	440	54.5	1.3
	HP2-DC48V	48	38.4	7.2	52.8	1,800	26.7	1.3
	HP2-DC110V	110	88	16.5	121	7,300	15.0	1.7
3 Form C	HP3-DC6V	6	4.8	0.9	6.6	24	250	1.5
	HP3-DC12V	12	9.6	1.8	13.2	100	120	1.4
	HP3-DC24V	24	19.2	3.6	26.4	400	60	1.4
	HP3-DC48V	48	38.4	7.2	52.8	1,560	31	1.5
	HP3-DC110V	110	88	16.5	121	7,450	14.9	1.6
4 Form C	HP4-DC6V	6	4.8	0.9	6.6	22	273	1.6
	HP4-DC12V	12	9.6	1.8	13.2	95	127	1.5
	HP4-DC24V	24	19.2	3.6	26.4	380	63	1.5
	HP4-DC48V	48	38.4	7.2	52.8	1,500	32	1.5
	HP4-DC110V	110	88	16.5	121	7,000	15.7	1.7

#### AC TYPE (50/60 Hz) at 60 Hz, 20°C 68°F

Type	Part No.	Nominal coil voltage, V AC	Pick-up voltage, V AC (max.)	Drop-out voltage, V AC (min.)	Max. allowable voltage, V AC	Inductance, H	Nominal coil current, mA	Nominal operating power, VA
2 Form C	HP2-AC6V	6	4.8	1.8	6.6	0.049	310	1.9
	HP2-AC12V	12	9.6	3.6	13.2	0.190	160	1.9
	HP2-AC24V	24	19.2	7.2	26.4	0.776	78	1.9
	HP2-AC48V	48	38.4	14.4	52.8	3.106	39	1.9
	HP2-AC115V	115	92	34.5	126.5	15.83	18	2.1
	HP2-AC220V	220	176	66	242	57.90	9.5	2.1
3 Form C	HP3-AC6V	6	4.8	1.8	6.6	0.030	520	3.1
	HP3-AC12V	12	9.6	3.6	13.2	0.119	260	3.1
	HP3-AC24V	24	19.2	7.2	26.4	0.475	130	3.1
	HP3-AC48V	48	38.4	14.4	52.8	1.899	65	3.1
	HP3-AC115V	115	92	34.5	126.5	10.36	28.5	3.3
	HP3-AC220V	220	176	66	242	39.32	14.2	3.1
4 Form C	HP4-AC6V	6	4.8	1.8	6.6	0.019	800	4.8
	HP4-AC12V	12	9.6	3.6	13.2	0.077	400	4.8
	HP4-AC24V	24	19.2	7.2	26.4	0.309	200	4.8
	HP4-AC48V	48	38.4	14.4	52.8	1.292	95	4.6
	HP4-AC115V	115	92	34.5	126.5	6.953	42	4.8
	HP4-AC220V	220	176	66	242	26.57	21	4.6
	HP4-AC240V	240	192	72	264	29.75	20.5	4.9

## NOTES

- The range of coil current for AC relays is  $\pm 15\%$  (60 Hz). For DC relays it is  $\pm 10\%$  at 20°C, 68°F.
- The HP relay will operate in a range from 80% to 110% of the nominal coil voltage. It is, however, recommended that the relay be used in the range of 85% to 110% of the nominal coil voltage, with the temporary voltage variation taken into consideration.
- When the operating voltage of AC relays drops below 80% of the nominal coil voltage, the relay will generate a considerable amount of heat which is not recommended for maximum efficiency.
- The coil resistance of DC types is the measured value of the coil at a temperature of 20°C 68°F. If the coil temperature changes by  $\pm 1^\circ\text{C}$ , the measured value of the coil resistance should be increased or decreased by 0.4%.
- For applications from 220 V to 240 V DC, connect a resistor in series with the relay coil. See chart for resistor values.

Voltage	2 Form C	3 Form C	4 Form C
220 V DC	7.3 k $\Omega$ (5 W)	7.45 k $\Omega$ (5 W)	7 k $\Omega$ (5 W)
240 V DC	8.7 k $\Omega$ (5 W)	8.8 k $\Omega$ (5 W)	8.3 k $\Omega$ (5 W)

**2. Standard plug-in terminal type (with Lamp wired)****DC TYPES** at 20°C 68°F

Type	Part No.	Nominal coil voltage, V DC	Pick-up voltage, V DC (max.)	Drop-out voltage, V DC (min.)	Max. allowable voltage, V DC	Coil resistance, $\Omega$ ( $\pm 10\%$ )	Nominal coil current, mA	Nominal operating power, W	
2 Form C	LED	HP2-L-DC6V	6	4.8	0.9	6.6	25	240	1.5
		HP2-L-DC12V	12	9.6	1.8	13.2	110	109	1.3
		HP2-L-DC24V	24	19.2	3.6	26.4	440	54.5	1.3
		HP2-L-DC48V	48	38.4	7.2	52.8	1,800	26.7	1.3
	Neon lamp	HP2-L-DC110V	110	88	16.5	121	7,300	15.0	1.7
3 Form C	LED	HP3-L-DC6V	6	4.8	0.9	6.6	24	250	1.5
		HP3-L-DC12V	12	9.6	1.8	13.2	100	120	1.4
		HP3-L-DC24V	24	19.2	3.6	26.4	400	60	1.4
		HP3-L-DC48V	48	38.4	7.2	52.8	1,560	31	1.5
	Neon lamp	HP3-L-DC110V	110	88	16.5	121	7,450	14.9	1.6
4 Form C	LED	HP4-L-DC6V	6	4.8	0.9	6.6	22	273	1.6
		HP4-L-DC12V	12	9.6	1.8	13.2	95	127	1.5
		HP4-L-DC24V	24	19.2	3.6	26.4	380	63	1.5
		HP4-L-DC48V	48	38.4	7.2	52.8	1,500	32	1.5
	Neon lamp	HP4-L-DC110V	110	88	16.5	121	7,000	15.7	1.7

**AC TYPE (50/60 Hz)** at 60 Hz, 20°C 68°F

Type	Part No.	Nominal coil voltage, V AC	Pick-up voltage, V AC (max.)	Drop-out voltage, V AC (min.)	Max. allowable voltage, V AC	Inductance, H	Nominal coil current, mA	Nominal operating power, VA	
2 Form C	LED	HP2-L-AC6V	6	4.8	1.8	6.6	0.049	310	1.9
		HP2-L-AC12V	12	9.6	3.6	13.2	0.190	160	1.9
		HP2-L-AC24V	24	19.2	7.2	26.4	0.776	78	1.9
	Neon lamp	HP2-L-AC115V	115	92	34.5	126.5	15.83	18	2.1
		HP2-L-AC220V	220	176	66	242	57.90	9.5	2.1
3 Form C	LED	HP3-L-AC6V	6	4.8	1.8	6.6	0.030	520	3.1
		HP3-L-AC12V	12	9.6	3.6	13.2	0.119	260	3.1
		HP3-L-AC24V	24	19.2	7.2	26.4	0.475	130	3.1
	Neon lamp	HP3-L-AC115V	115	92	34.5	126.5	10.36	28.5	3.3
		HP3-L-AC220V	220	176	66	242	39.32	14.2	3.1
		HP3-L-AC240V	240	192	72	264	44.05	13.9	3.3
		4 Form C	LED	HP4-L-AC6V	6	4.8	1.8	6.6	0.019
HP4-L-AC12V	12			9.6	3.6	13.2	0.077	400	4.8
HP4-L-AC24V	24			19.2	7.2	26.4	0.309	200	4.8
Neon lamp	HP4-L-AC115V		115	92	34.5	126.5	6.953	42	4.8
	HP4-L-AC220V		220	176	66	242	26.57	21	4.6
		HP4-L-AC240V	240	192	72	264	29.75	20.5	4.9

**3. Top Mounting (TM) and direct mounting (M) type****DC TYPES** at 20°C 68°F

Type	Part No.	Nominal coil voltage, V DC	Pick-up voltage, V DC (max.)	Drop-out voltage, V DC (min.)	Max. allowable voltage, V DC	Coil resistance, $\Omega$ ( $\pm 10\%$ )	Nominal coil current, mA	Nominal operating power, W	
2 Form C Top Mounting Type (TM)	HP2-TM-DC6V	6	4.8	0.9	6.6	25	240	1.5	
	HP2-TM-DC12V	12	9.6	1.8	13.2	110	109	1.3	
	HP2-TM-DC24V	24	19.2	3.6	26.4	440	54.5	1.3	
	HP2-TM-DC48V	48	38.4	7.2	52.8	1,800	26.7	1.3	
	HP2-TM-DC110V	110	88	16.5	121	7,300	15.0	1.7	
3 Form C Direct Mounting Type (M)	HP3-M-DC6V	6	4.8	0.9	6.6	24	250	1.5	
	HP3-M-DC12V	12	9.6	1.8	13.2	100	120	1.4	
	HP3-M-DC24V	24	19.2	3.6	26.4	400	60	1.4	
	HP3-M-DC48V	48	38.4	7.2	52.8	1,560	31	1.5	
		HP3-M-DC110V	110	88	16.5	121	7,450	14.9	1.6

## AC TYPE (50/60 Hz) at 60 Hz, 20°C 68°F

Type	Part No.	Nominal coil voltage, V AC	Pick-up voltage, V AC (max.)	Drop-out voltage, V AC (min.)	Max. allowable voltage, V AC	Inductance, H	Nominal coil current, mA	Nominal operating power, VA
2 Form C Top Mounting Type (TM)	HP2-TM-AC6V	6	4.8	1.8	6.6	0.049	310	1.9
	HP2-TM-AC12V	12	9.6	3.6	13.2	0.190	160	1.9
	HP2-TM-AC24V	24	19.2	7.2	26.4	0.776	78	1.9
	HP2-TM-AC48V	48	38.4	14.4	52.8	3.106	39	1.9
	HP2-TM-AC115V	115	92	34.5	126.5	15.83	18	2.1
	HP2-TM-AC220V	220	176	66	242	57.90	9.5	2.1
	HP2-TM-AC240V	240	192	72	264	66.26	9.0	2.2
3 Form C Direct Mounting Type (M)	HP3-M-AC6V	6	4.8	1.8	6.6	0.030	520	3.1
	HP3-M-AC12V	12	9.6	3.6	13.2	0.119	260	3.1
	HP3-M-AC24V	24	19.2	7.2	26.4	0.475	130	3.1
	HP3-M-AC48V	48	38.4	14.4	52.8	1.899	65	3.1
	HP3-M-AC115V	115	92	34.5	126.5	10.36	28.5	3.3
	HP3-M-AC220V	220	176	66	242	39.32	14.2	3.1
	HP3-M-AC240V	240	192	72	264	44.05	13.9	3.3

## 4. Direct mounting (with Lamp wired) type DC TYPES

Type	Part No.	Nominal coil voltage, V DC	Pick-up voltage, V DC (max.)	Drop-out voltage, V DC (min.)	Max. allowable voltage, V DC	Coil resistance, $\Omega$ ( $\pm 10\%$ )	Nominal coil current, mA	Nominal operating power, W
3 Form C Neon lamp	HP3-ML-DC110V	110	88	16.5	121	7,450	14.9	1.6

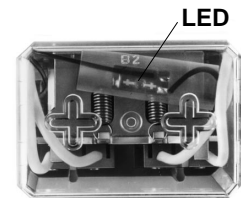
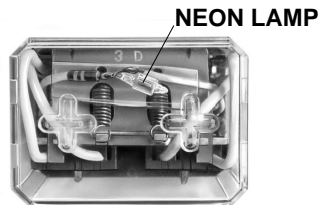
## AC TYPE (50/60 Hz) at 60 Hz, 20°C 68°F

Type	Part No.	Nominal coil voltage, V AC	Pick-up voltage, V AC (max.)	Drop-out voltage, V AC (min.)	Max. allowable voltage, V AC	Inductance, H	Nominal coil current, mA	Nominal operating power, VA
3 Form C Neon lamp	HP3-ML-AC115V	115 V	92	34.5	126.5	10.36	28.5	3.3
	HP3-ML-AC220V	220 V	176	66	242	39.32	14.2	3.1
	HP3-ML-AC240V	240 V	192	72	264	44.05	13.9	3.3

## LAMP-WIRED RELAYS

### Specifications

Life of neon lamp ... continuous : more than 25,000 hours (more than 3 years)  
 on/off = 1 : more than 6 years  
 Life of LED ..... continuous : more than 50,000 hours (more than 5.5 years)  
 on/off = 1 : more than 100,000 hours (more than 11 years)



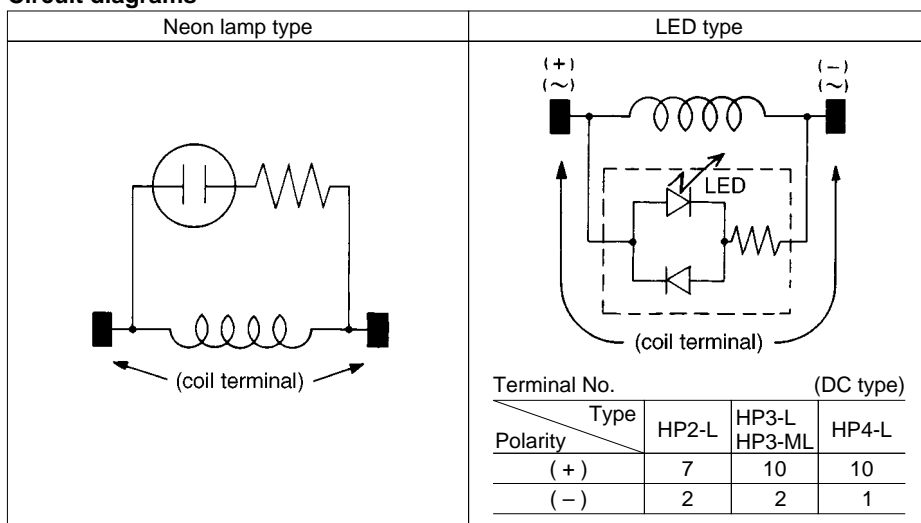
### Variation

Type	Coil Voltage		
	AC	DC	
HP2-L HP3-L	6 V	6 V	LED (Light emitting diode)
	12 V	12 V	
	24 V	24 V	
	–	48 V	
HP3-ML HP4-L	115 V	110 V	Neon lamp
	220 V	–	
	240 V	–	

### Notes:

1. AC 48 V type is not available for lamp wiring.

**Circuit diagrams**



**Notes:**

1. Pay attention to the polarity of coil  
See circuit diagram (LED type only).

**Operating current of LED**












Coil Voltage		Operating current of LED	
DC	6V	DC	6.4 mA
	12V		5.7 mA
	24V		4.7 mA
	48V		4.5 mA
AC	6V	AC	10.5 mA
	12V		9.0 mA
	24V		7.7 mA

**Notes:**

1. Operating current of relays should be increased by the value of LED operating current. Please refer the table. Operating current of neon lamp is approx. 0.3 mA to 0.4 mA.
2. To use the HP relay in the inductive load circuit, the contact protection circuit is recommended.

**ACCESSORIES**

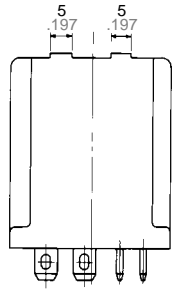
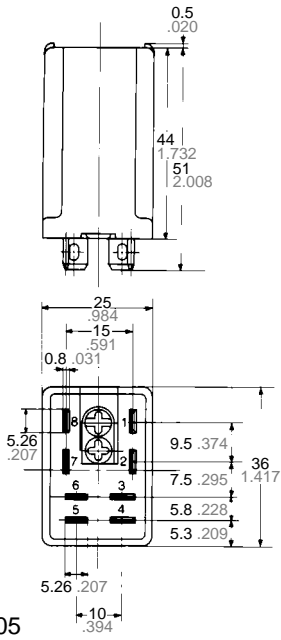
Please refer to "MOUNTING METHODS" for further information.  
UL, CSA recognized except BRACKET and INSERTING PLATE.

HP	Relay		Solder terminal socket for rectangular hold boring (with hold-down clip)	Screw terminal socket for front wiring (with hold-down clip)	For HP2, HP4
HP2			HP2-SRS  (UL, CSA, VDE)	HP2-SRS  (UL, CSA)	HP-BRACKET for direct mounting 
HP3			HP3-SRS  (UL, CSA, VDE)	HP3-SF  (UL, CSA, VDE)	HP INSERTION PLATE for P/C board mounting 
HP4			HP4-SRS  (UL, CSA)	HP4-SF  (UL, CSA)	

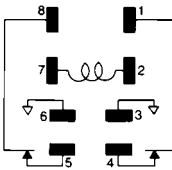
Note: Mounting screw is included in HP2-SF, HP3-SF and HP4-SF.

**DIMENSIONS AND WIRING DIAGRAM**

**HP2 (2 Form C) Plug-in terminal types**



Circuit diagram

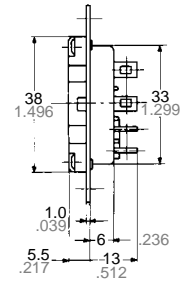
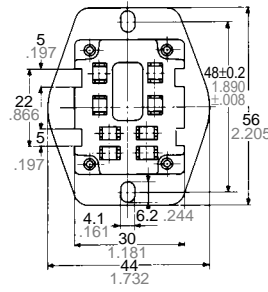


Accepts  
Faston 205

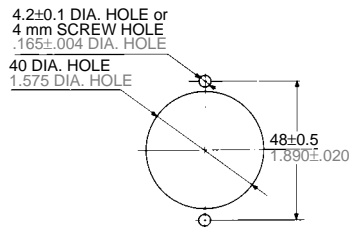
**HP2-SRR (with hold-down clip)**

Easy mounting, round panel cut-out

mm inch



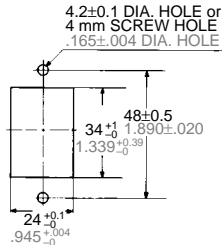
Mounting dimensions



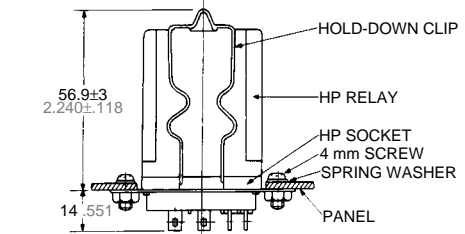
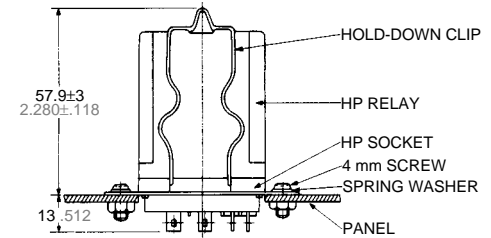
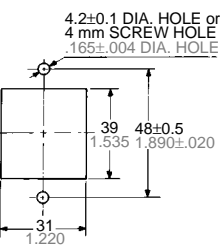
**HP2-SRS (with hold-down clip)**

Optimum space-saving panel cut-out.  
Can be mounted from either the front  
or the rear of the panel.

Front surface-mounting



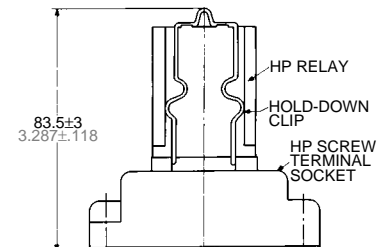
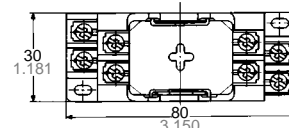
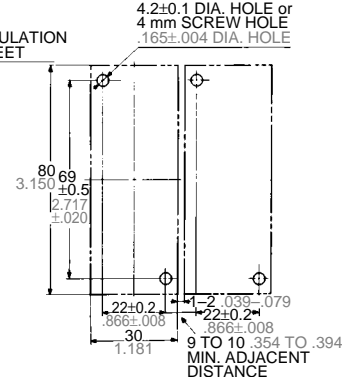
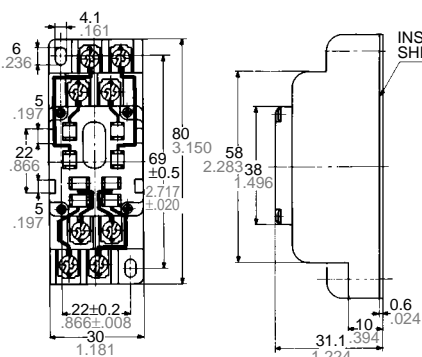
Rear surface-mounting



**HP2-SF (with hold-down clip, mounting screw)**

Front wiring in restricted space

Mounting dimensions



General tolerance: ±0.5 ±.020



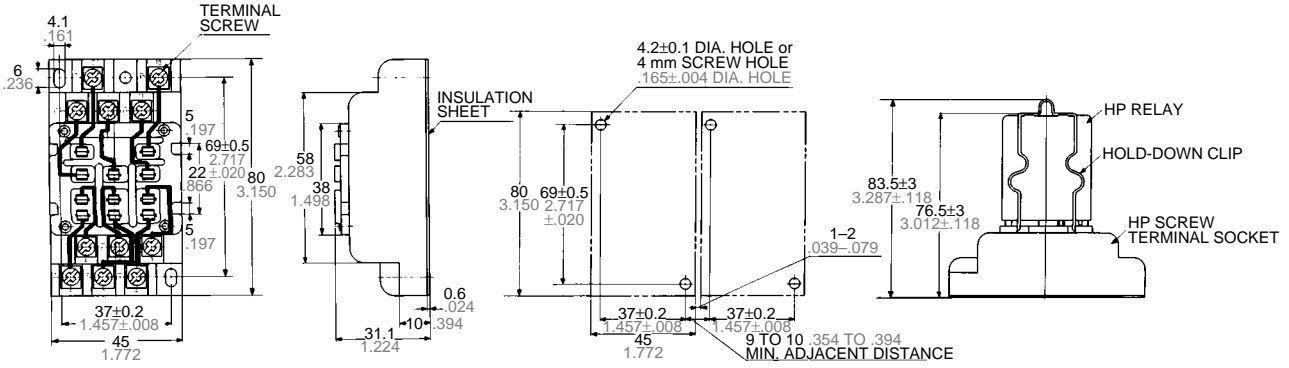
# HP

## HP3-SF (with hold-down clip, mounting screw)

mm inch

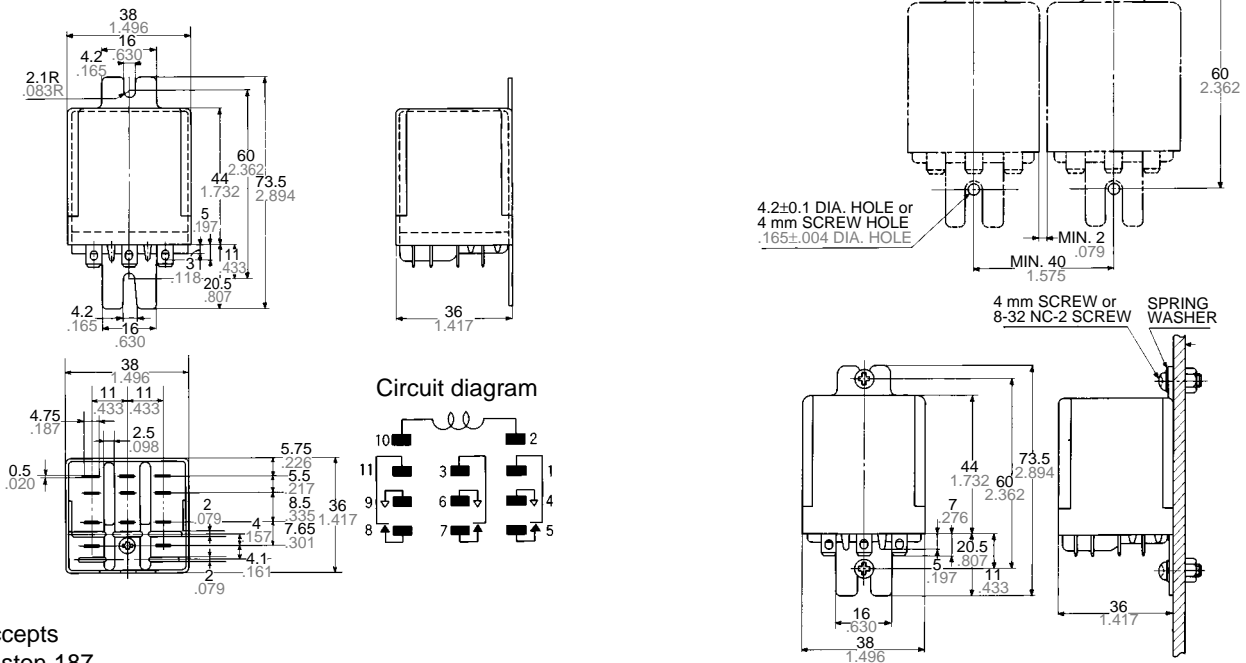
Front wiring in restricted space

Mounting dimensions



## HP3-M (3 Form C) Direct mounting types

Mounting dimension

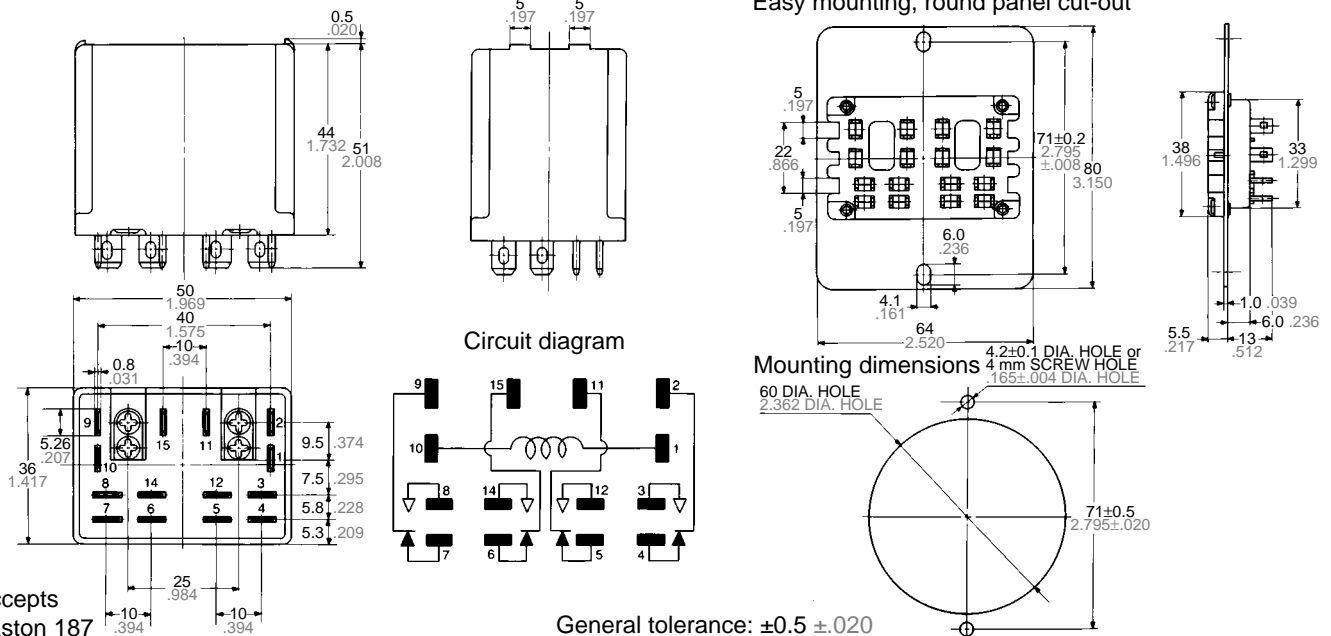


Accepts Faston 187

## HP4 (4 Form C) Plug-in terminal types

## HP4-SRR (with hold-down clip)

Easy mounting, round panel cut-out



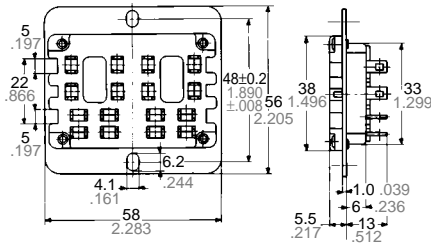
Accepts Faston 187

General tolerance: ±0.5 ±.020

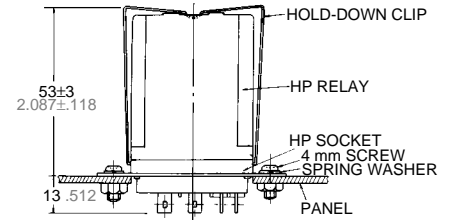
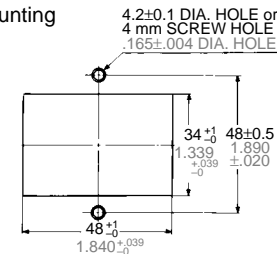


**HP4-SRS (with hold-down clip)**

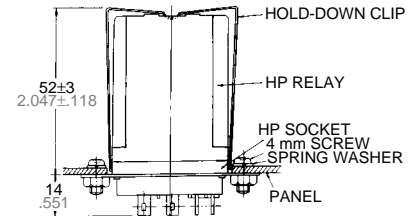
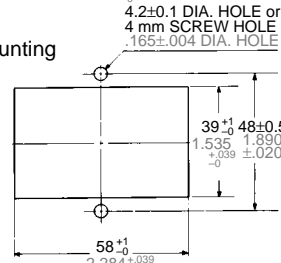
Optimum space-saving panel cut-out.  
Can be mounted from either the front or the rear of the panel.



**Front surface-mounting**



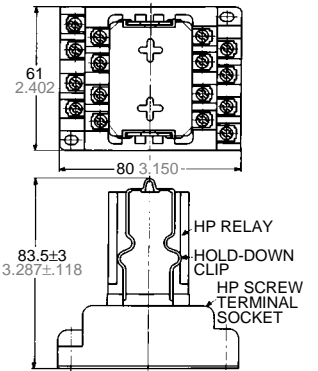
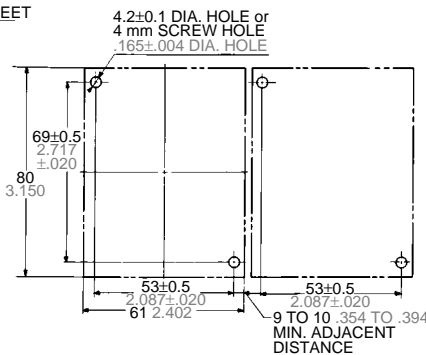
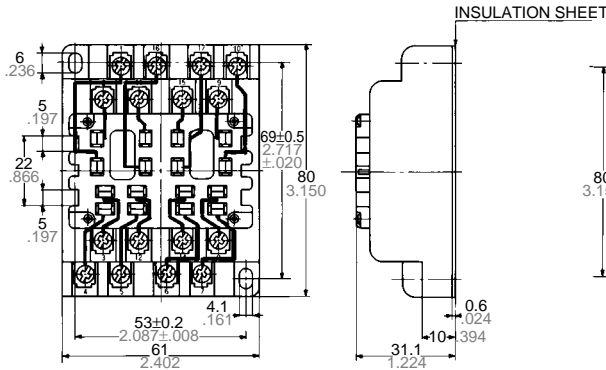
**Rear surface-mounting**



**HP4-SF (with hold-down clip, mounting screw)**

Front wiring in restricted space.  
Two HP2 relays can be mounted in one socket.

**Mounting dimensions**



General tolerance:  $\pm 0.5 \pm .020$

**ACCESSORIES for HP2 and HP4 types**

**HP Bracket (with 2 screws, 2 washers)**

The HP Bracket is used for mounting HP2 relays and HP4 relays directly to the panel. It facilitates soldering or quick connections with Faston 205 tab 0.8 mm.

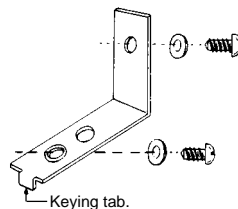
**Mounting methods**

(a) Remove the M3 × 7 screw (red colored) fixed to the relay, and place the bracket on the relay with the attaching M3 × 7 screw (blue colored) and the spring washer.

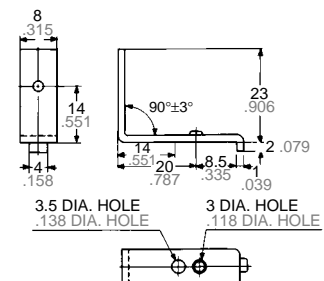
(b) Use the additional M3 × 7 screw and washer for attaching the bracket to the panel.

**Note:**

1. This bracket is unavailable for UL, CSA and VDE applications.
2. When using the special bracket, it is recommended to use the screws and washers called out in the chart in the next page in order to eliminate any possible damage to the relay coil.

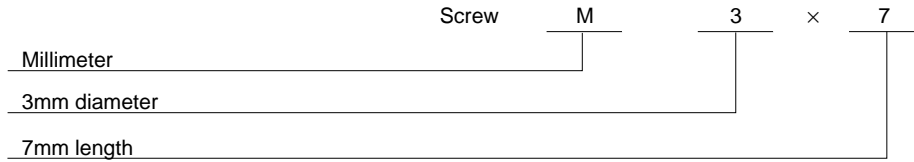


For the HP4 type relay two brackets are used.



# HP

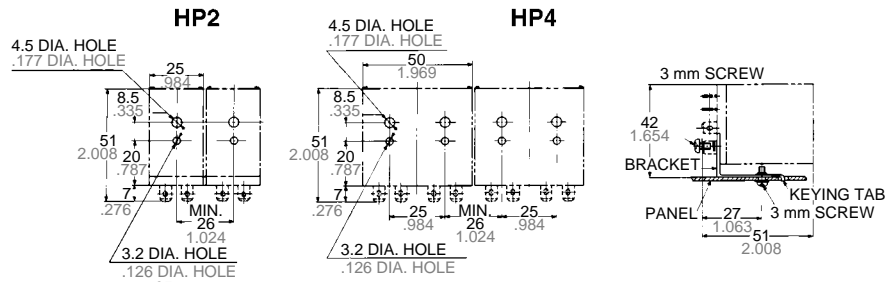
Thickness of a special bracket	1.0 mm (.039 inch)	1.6 mm (.063 inch)	2.0 mm (.079 inch)
A suitable screw	M3 × 7-M3 × 8	M3 × 8	M3 × 8-M3 × 10
A suitable washer	for M3	for M3	for M3



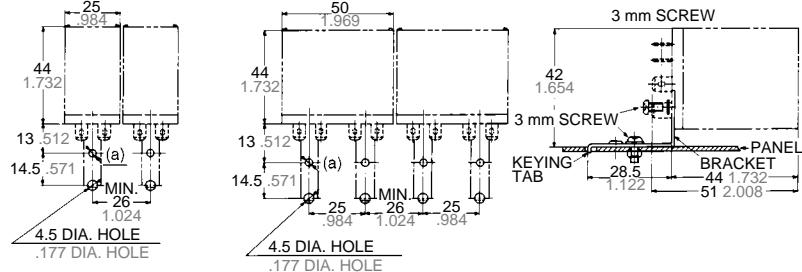
## Dimensions and mounting methods

mm inch

### 1. Rear-surface mounting



### 2. Front-surface mounting



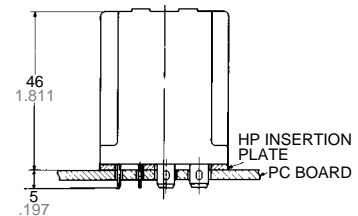
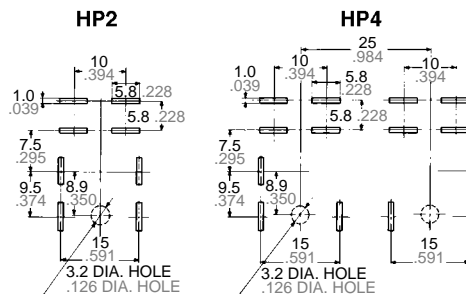
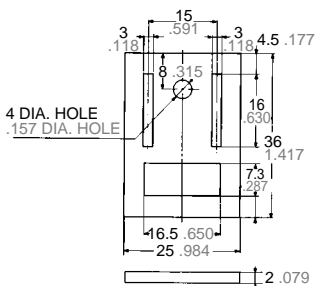
## HP Inserting Plate for HP2 and HP4 types

- HP inserting plate is used for mounting HP2 and HP4 relays on a printed board to adjust the length of the terminals.
- If adjustment by soldering is not suitable, bore 1/8" diameter hole on the printed circuit board and mount the

- relay with a M3 × 10 screw. The chart to the right suggests the proper screws for different printed circuit boards.
- Two plates are used for the HP4 type relay.

Thickness of P/C board	Suitable screw
1.0 mm (.039 inch)	M3 × 10
1.2 mm (.047 inch)	M3 × 10

## PC board pattern



Please refer to the above second instruction.

Tolerance: ±0.1 ±.004