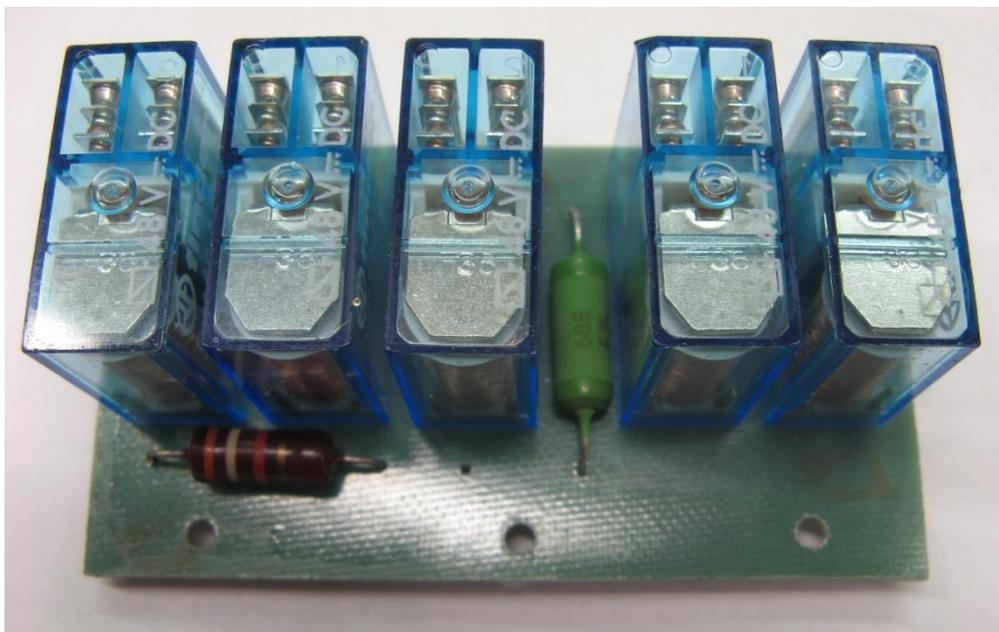


# Modification of the Relays in Collins KWM-2/2A

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By IV3UVW – Mauro – CCAIE# 202



Modifica Relé' per il Collins KWM-2/2A - [www.ccae.info](http://www.ccae.info)

# Modification of the Relays in Collins KWM-2/2A

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by Mauro Ruzzante IV3UVW

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After doing all the modifications from service manual, AGC, modulator, revision on PTO and so ALL and ALL, I discovered with disappointment that my Collins KWM-2A 1960 n° 149 had his K2 coil cuted. (Naturally on the inside, needless to say, cry)

After seen the price of kits that seem to me too expensive, I wondered to use modern relay with a dedicated circuit board. Yes !!! I do it !! even if it is a quasi profanation for the purists. But with a wiring done properly it is also a good job and especially the modern relay with their contacts 8A offer reliability circuit proof, certainly much better even than the relay closed " new type ".

( Also because invest another € 200 in addition to those already spent on a KWM2A that could well be 100% perfect as long as you want, but sure not to sell more than 1000 Euros if all goes well, I would say that is not really the case of overdoing in subtleties)

In original circuit K2 relay coil is driven directly by V4B 6AZ8 triode, while K4 relay coil and K3 antenna relay coil are together paralleled and driven both directly by K2-7 contact grounded in TX mode thanks to K2-6 contact.

R163 6Kohm 5W ceramic resistor located on E50 turret limits voltage to 110Vcc required for K3 and K4 coils.

I have used finder relays 4052S 48Vcc series SENSITIVE SENSIBLE (coil 48V 4800 ohm 10mA). BE CAREFUL that normal series 4052S finder relays IS NOT WORKING because his coil is 48V 3500 ohm 14mA (see finder relays series data sheet).

Thanks to 5 coils series 48Vcc coils i can obtain a 240V 24 Kohm 10 mA equivalent relay. (Sure much better than 14Kohm provided by original collins K2 telephone open type relay!!!)

Because V4B saturation voltage is about 60 70 Vcc, 5 coils relay series can be driven DIRECTLY by 6AZ8 triode without any load resistor.



Switching is hard and strong, and single relay voltage coil is a real nice 40 44 Vcc each .

V4B 6AZ8 triode current is even less than 10mA nominal required by relays and this sure makes our tube happy!

On printed board circuit, in the series of the five coils of the relays an additional 3K9 1W resistor is provided, to be used only when you realize a complete and future solid state switch system, such as a mosfet or a transistor.

In this application 3K9 resistor must be deleted

Taking as reference the schematic diagram numbering standard is taken by convention that the new relay type and is shown with marks in red.

The black lettering instead refer to the kind old numbering relay opened The sketch, it corresponds verbatim to what exists in the real situation by looking at the relay from the back side open- welding wires.

Watching the old position and new position on the printed circuit board and it is not possible to do a mistake.

Number after number, take just little care.

Even the numbering of the printed circuit board is referred to the new numbering scheme of relay closed as Rockwell 1975

The color of the wires is shown in the «cabling printed board". The attached photos will help, but one at a time by pulling the wires from the old relay and connecting them as the new plate to the same numbers, and beating, or by checking the color of the wires as hand, you cannot go wrong even wanting. (to me it worked the first time around ) .

New contact number 7 EX K2 relay, now will drive ONLY original K3 antenna relay coil. (Original old K4 is just removed)

R163 6 Kohm 5W ceramic resistor turret E50 located MUST be replaced with a new 15Kohm 3W resistor, if you do not K3 coil will die soon!!!

C254 4,7  $\mu$ F electrolytic capacitor turret E50 located must be deleted , this because in RX mode C254 is able to charge to +285Vcc, while in TX mode, the same voltage discharges directly to K3 110Vcc antenna really coil, yes, just the time to discharge a little, of course, but this current peak every time you switch to tx is to ask too much to his old coil!!! Better do not Risk.



All original cabling wire jumpers, crosses, ground wires, +TR275 feed and any kind of cabling, are now directly printed board provided.  
If you respect provided numbering and all positions, all will work fine at first time.

Only R170 100K resistor must be soldered directly on rear solder side printed board in EX K2-15 K2-14 positions. (see pictures)  
Compared to original schematic, i have only done one mod: disconnected K4-11 K4-12 K4-13 from J13-6 J13-7 power connector. (J13-6 J13-7 are now no more used)  
K4-11 K4-12 K4-13 , (now free) are paralleled with K4-17 K4-18 K4-19 to obtain a +T275//+R275 switching bombproof!!!

Maybe a paranoid mind, i understand, because a 8A contact relay is definitely not worried by a few mA anodic current, but with two paralleled contacts is also better, so they sure not fire, don't worry!! hi hi !!!

For those who want to leave J13-6 and J13-7 live, have only to cut PCB tracks : 19 to 13 18 to 12 and 17 to 11 then you can use 17, 18, 19 now free positions for J13-6 J13-7 original purposes.

An aluminum support as describe with pictures will do the support for the printed circuit.

The dimension of printed circuit is 48 mm x 84,4 mm.  
For those who want to have fun I can supply the printed board circuit file with pleasure. (email [ruzzante.mauro@yahoo.it](mailto:ruzzante.mauro@yahoo.it))

The distance from screw holes of aluminium support for the relays is the same of the screw holes distance of old open type relay aluminium shield.

Adjust the support and drill a hole for accessing to the load tuning.

Allora buon divertimento!!!

73

Mauro IV3UVW





Modifica Relé' per il Collins KWM-2/2A - [www.ccae.info](http://www.ccae.info)

NEW K4 TERMINAL	NUMBER OF WIRES	WIRE COLOR CODES
4	None	
1	None	
14	1	White-orange-green AF2
15	1	White-orange-green-blue + METER
5	1	White-orange-blue AC2
16	1	White-red-blue AF2
6	1	White-black-blue - METER
7	1	White-black-red-orange AD2
17	1	White-orange + R275
18	1	Bus (see step 21)
8	1	A43 TO CR11 AVC
19	2	White-red + T275
9	1	White-blue AX6 TO V7
10	2	White-black-red AL6
20	1	Coax, 75-ohm Y2 VFO SIGNAL →
21	1	Coax, 50-ohm R6174 22 TO V17A RX MIXER
11	None	TO 17
22	2	Bus, strap to grd,
12	None	TO 18
13	None	TO 19

NEW K2 TERMINAL	NUMBER OF WIRES	WIRE IDENTIFICATION
4	1	White-red shield J7 X14-8
1	2	White-red-orange + TR275
11	2	White-brown-orange AG3
12	1	ground
5	2	White-black TDT6
13	1	Bus to 14 WHITE RED GREEN BLU V8 V6 V5 CONTRA
6	1	Bus to K2 ground lug
8	1	1 Coax
16	1	Bus from pin 11
9	2	2-coax RECANT
10	4	ground coax shields
15	1	-70V WHITE GREEN BROWN
14	1	Bus from pin 13
7	1	WHITE BLACK RED GREEN TO K3-2

- (A) WHITE GREEN BLUE (2 WIRES) : ISOLATE FROM EX K4 PIN 8 AND SOLDER TOGETHER. SEE ALSO SB8
- (B) WHITE BROWN AND GREEN : 2 PAIR WIRES FROM EX K4 PIN 4 : SOLDER TOGETHER



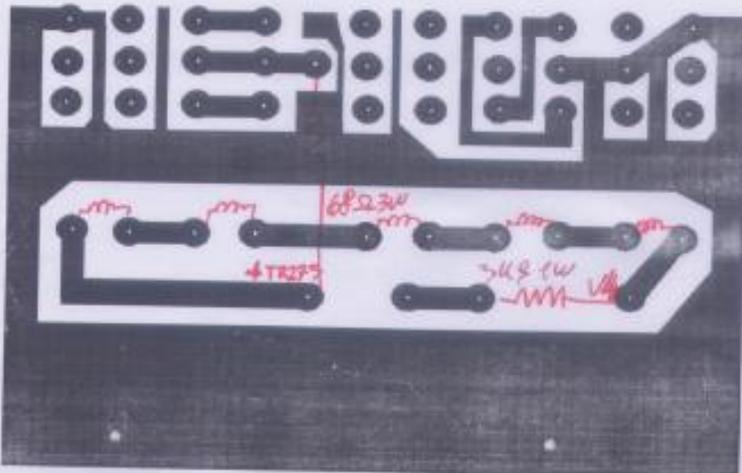


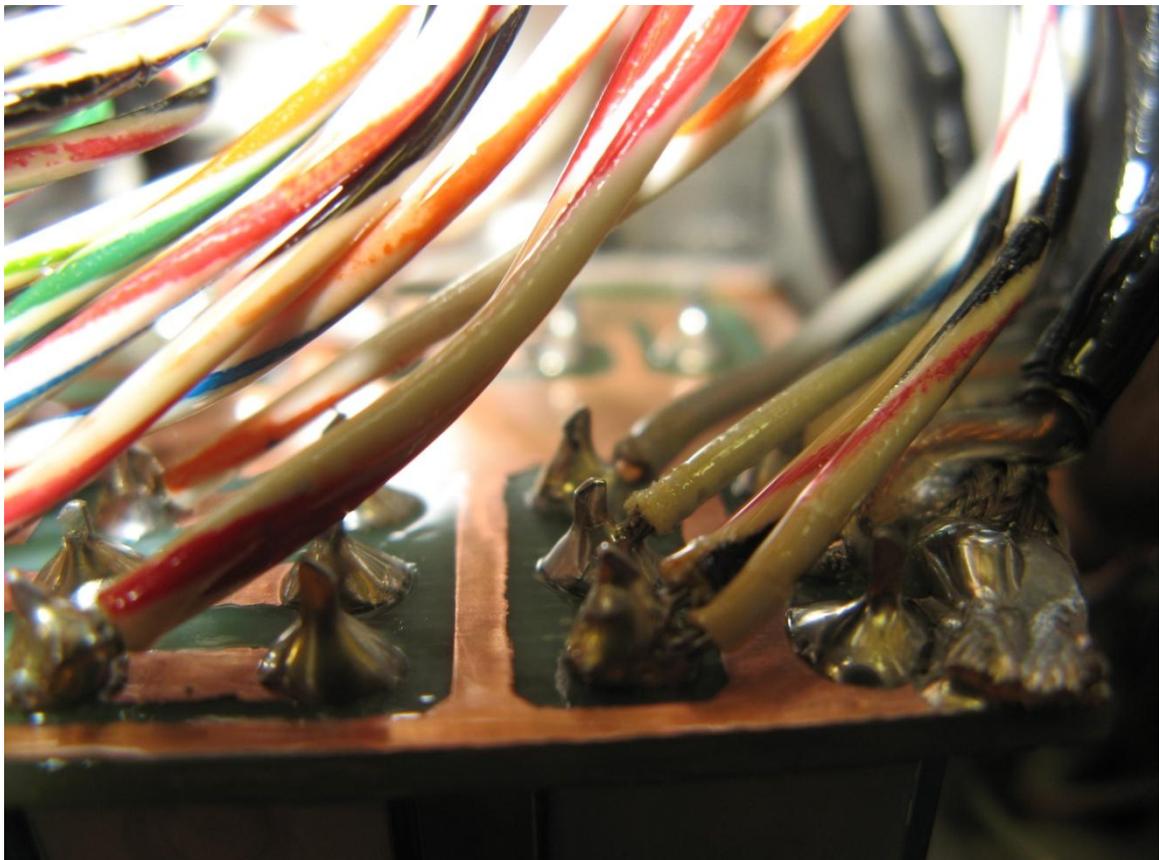
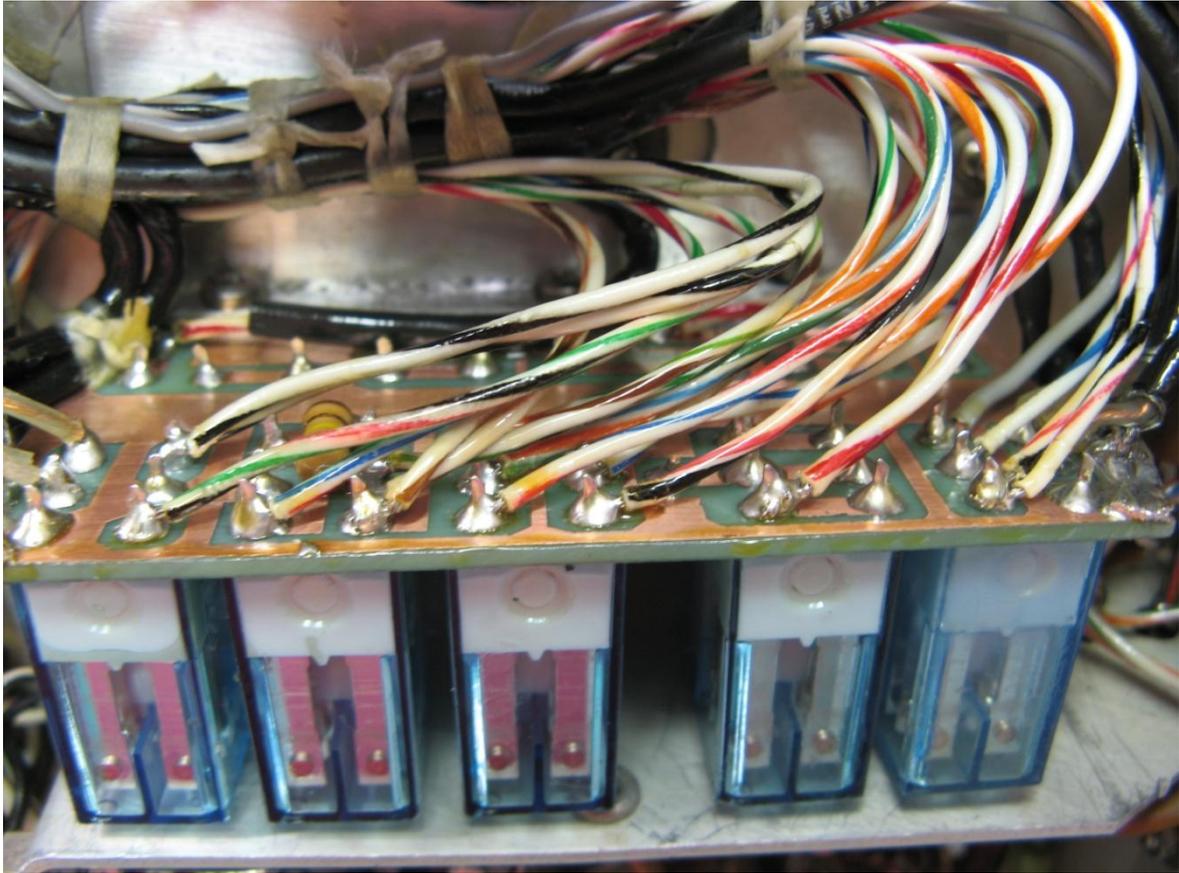
NUMERATION REFERRED  
TO NEW TYPE CLOSED  
RELAYS

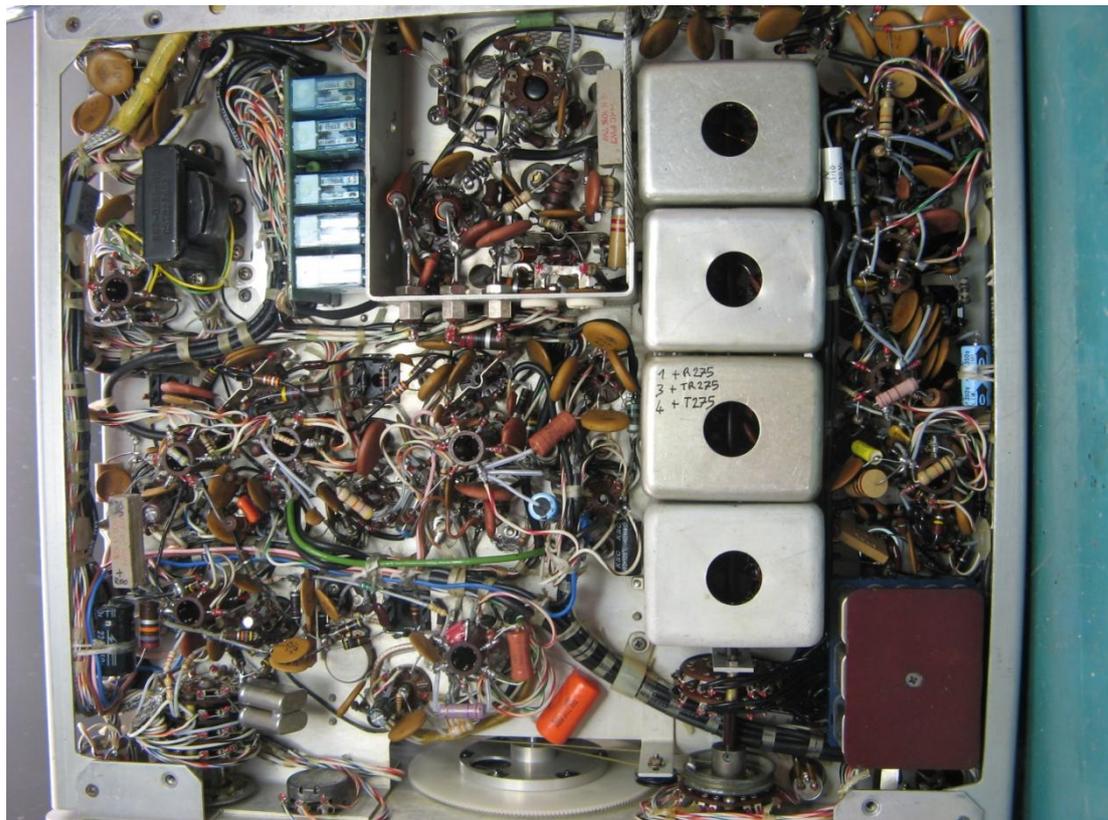
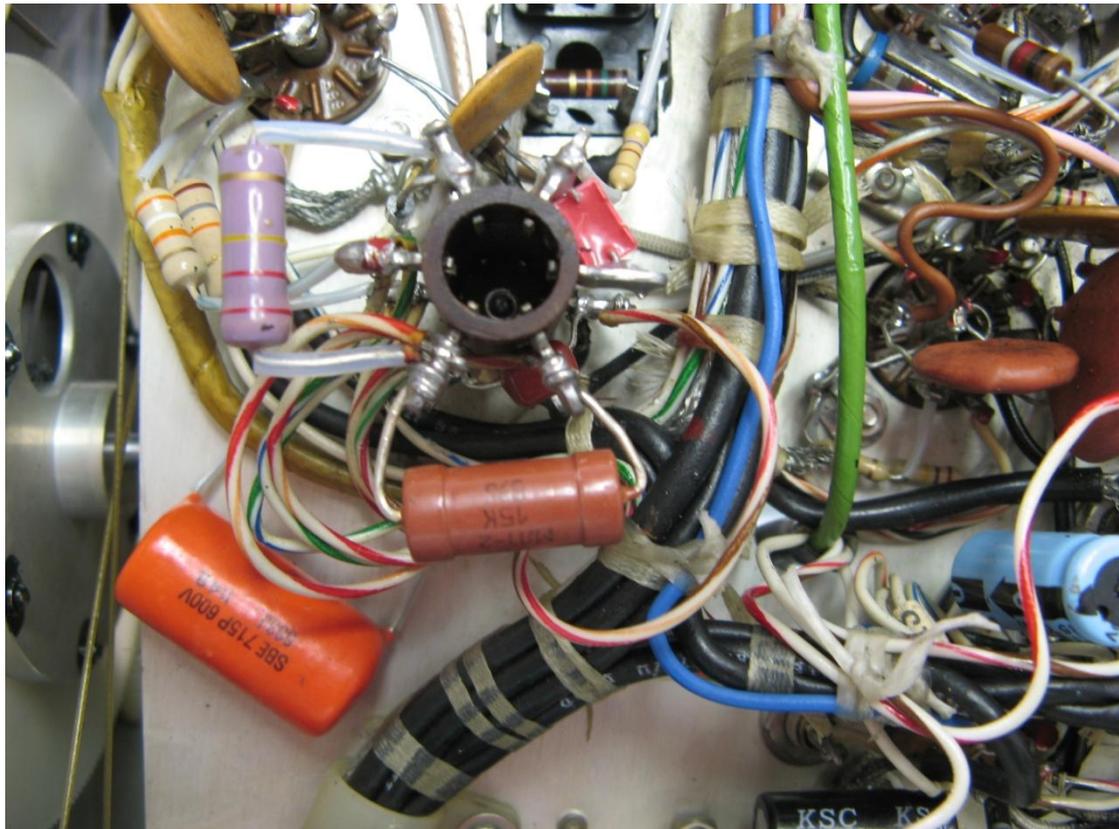
EX K4

EX K2

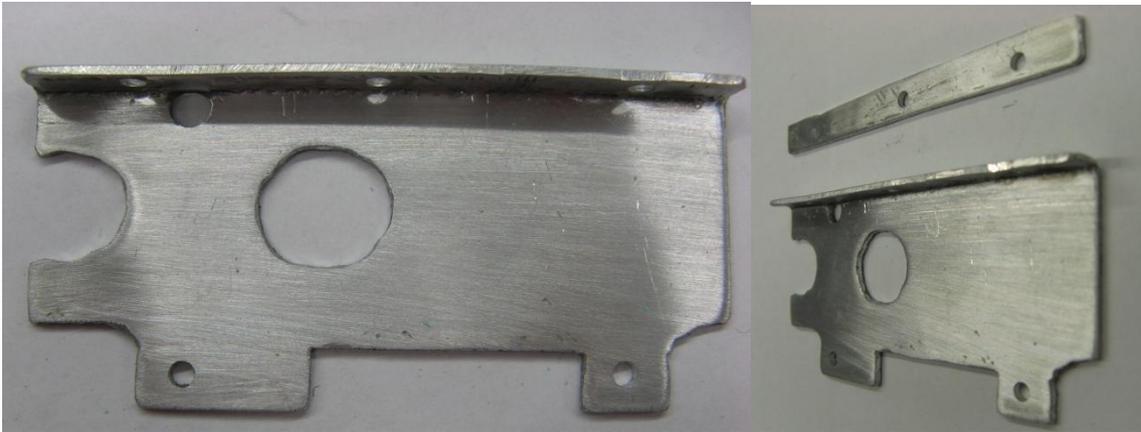
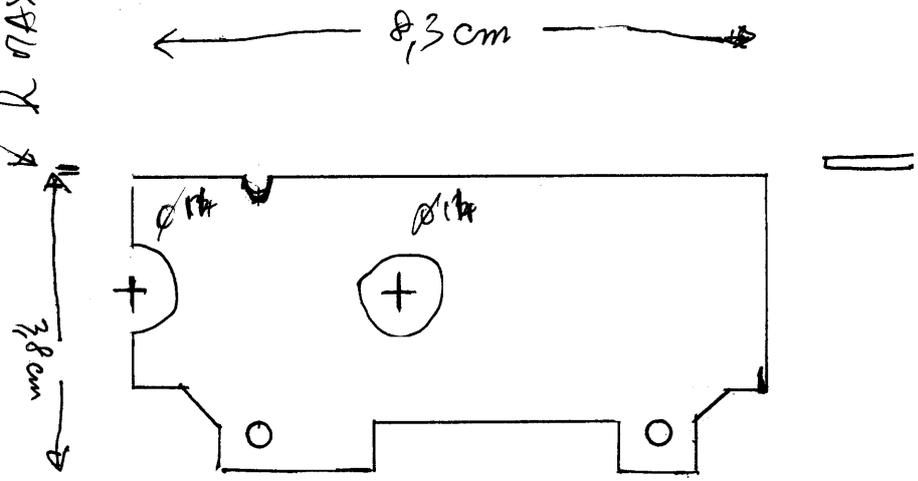
22	10	15	13	7	16	16	13	7	10
21	9	18	12	6	15	15	12	6	9
20	8	17	11	5	14	14	11	5	8

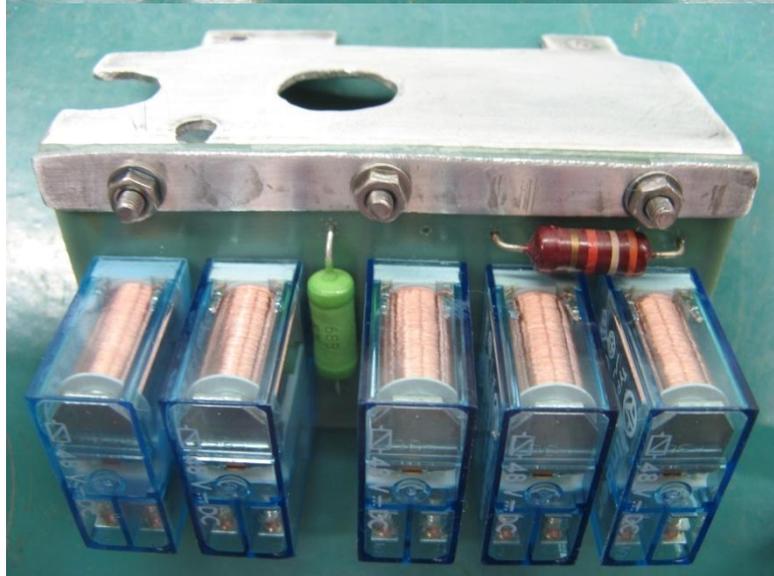
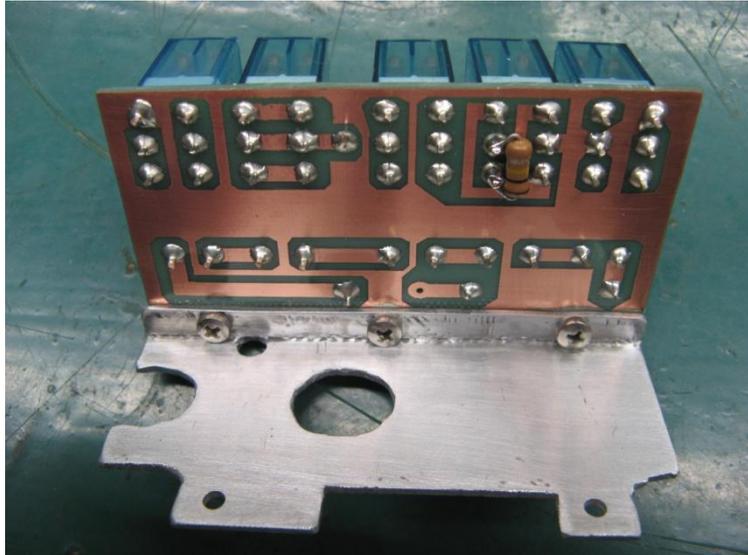


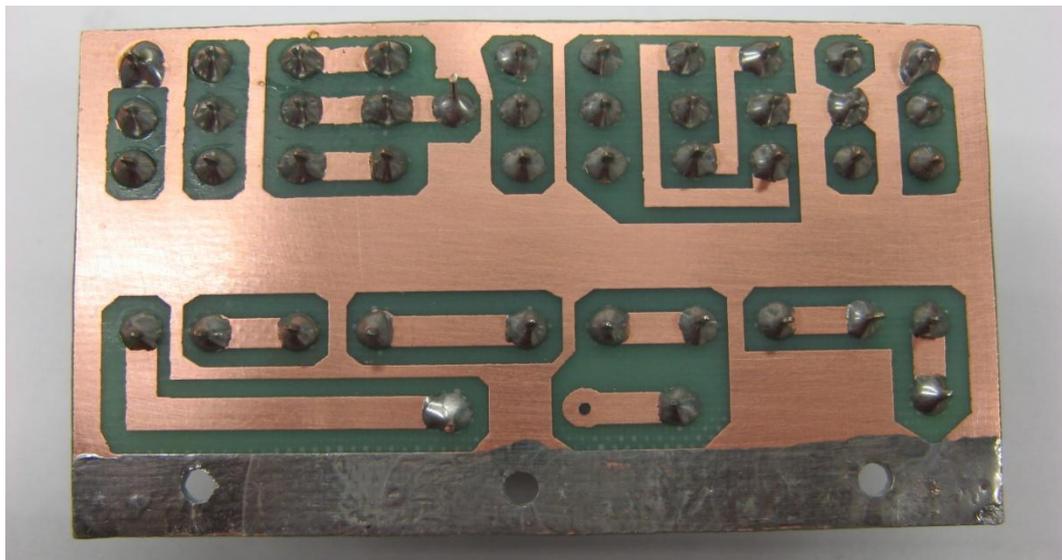
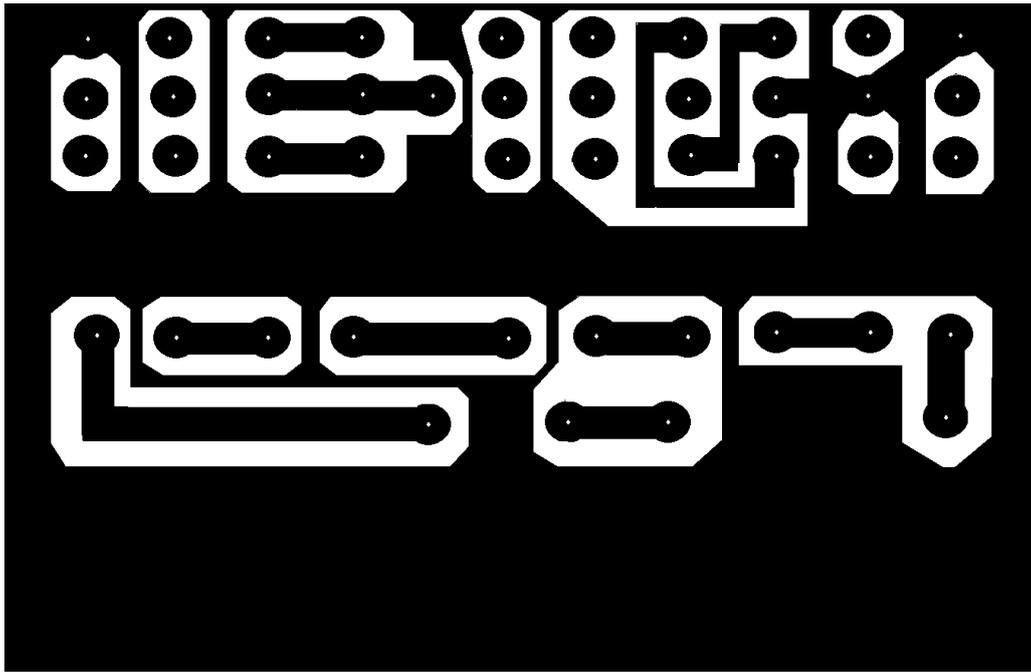




SPESORE DI FOLIA  
R MAX PIEGATURA: 6mm.







### Caratteristiche

- Relè con 1 o 2 contatti  
 40.31 - 1 contatto 10 A (passo 3.5 mm)  
 40.51 - 1 contatto 10 A (passo 5 mm)  
 40.52 - 2 contatti 8 A (passo 5 mm)

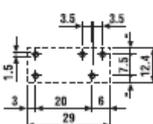
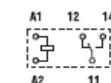
**Montaggio su circuito stampato**

- diretto o su zoccolo da circuito stampato
- Montaggio su barra 35 mm (EN 60715)
- su zoccoli con morsetti a bussola o a molla

- Bobina DC (standard o sensibile) e bobina AC
- Contatti senza Cadmio
- 8 mm, 6 kV (1.2/50 µs) isolamento tra bobina e contatti
- UL Listing (combinazione relè/zoccolo)
- A prova di fessante: RT II standard, (disponibile versione RT III)
- Zoccoli serie 95
- Moduli di segnalazione e protezione EMC
- Moduli temporizzatori serie 86



- Passo 3.5 mm
- 1 contatto 10 A
- Montaggio su circuito stampato o zoccoli serie 95

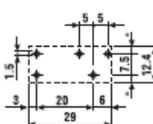
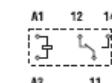


Vista lato rame

Lunghezza pin 5.3 mm per zoccolo o montaggio su circuito stampato



- Passo 5 mm
- 1 contatto 10 A
- Montaggio su circuito stampato o zoccoli serie 95



Vista lato rame

Lunghezza pin 5.3 mm per zoccolo o montaggio su circuito stampato



- Passo 5 mm
- 2 contatti 8 A
- Montaggio su circuito stampato o zoccoli serie 95



Vista lato rame

Lunghezza pin 5.3 mm per zoccolo o montaggio su circuito stampato

PER PORTATE MOTORI E "PILOT DUTY" OMOLOGATE UL  
 VEDERE "Informazioni Tecniche" pagina V

Per i disegni d'ingombro vedere pagina 10

Caratteristiche dei contatti				
Configurazione contatti		1 scambio	1 scambio	2 scambi
Corrente nominale/Max corrente istantanea A		10/20	10/20	8/15
Tensione nominale/Max tensione commutabile V AC		250/400	250/400	250/400
Carico nominale in AC1 VA		2500	2500	2000
Carico nominale in AC15 (230 V AC) VA		500	500	400
Portata motore monofase (230 V AC) kW		0.37	0.37	0.3
Potere di rottura in DC1: 30/110/220 V A		10/0.3/0.12	10/0.3/0.12	8/0.3/0.12
Carico minimo commutabile mW (V/mA)		300 (5/5)	300 (5/5)	300 (5/5)
Materiale contatti standard		AgNi	AgNi	AgNi
Caratteristiche della bobina				
Tensione di alimentazione V AC (50/60 Hz)		6 - 12 - 24 - 48 - 60 - 110 - 120 - 230 - 240		
nominale (U <sub>N</sub> ) V DC		5 - 6 - 7 - 9 - 12 - 14 - 18 - 21 - 24 - 28 - 36 - 48 - 60 - 90 - 110 - 125		
Potenza nominale AC/DC/DC sens. VA (50 Hz)/W/W		1.2/0.65/0.5	1.2/0.65/0.5	1.2/0.65/0.5
Campo di funzionamento AC		(0.8...1.1)U <sub>N</sub>	(0.8...1.1)U <sub>N</sub>	(0.8...1.1)U <sub>N</sub>
DC/DC sensibile		(0.73...1.5)U <sub>N</sub> /(0.73...1.5)U <sub>N</sub>	(0.73...1.5)U <sub>N</sub> /(0.73...1.5)U <sub>N</sub>	(0.73...1.5)U <sub>N</sub> /(0.73...1.5)U <sub>N</sub>
Tensione di mantenimento AC/DC		0.8 U <sub>N</sub> /0.4 U <sub>N</sub>	0.8 U <sub>N</sub> /0.4 U <sub>N</sub>	0.8 U <sub>N</sub> /0.4 U <sub>N</sub>
Tensione di rilascio AC/DC		0.2 U <sub>N</sub> /0.1 U <sub>N</sub>	0.2 U <sub>N</sub> /0.1 U <sub>N</sub>	0.2 U <sub>N</sub> /0.1 U <sub>N</sub>
Caratteristiche generali				
Durata meccanica cicli		10 · 10 <sup>6</sup>	10 · 10 <sup>6</sup>	10 · 10 <sup>6</sup>
Durata elettrica a carico nominale in AC1 cicli		200 · 10 <sup>3</sup>	200 · 10 <sup>3</sup>	100 · 10 <sup>3</sup>
Tempo di intervento: eccitazione/diseccitazione ms		7/3 - (12/4 sensibile)	7/3 - (12/4 sensibile)	7/3 - (12/4 sensibile)
Isolamento tra bobina e contatti (1.2/50 µs) kV		6 (8 mm)	6 (8 mm)	6 (8 mm)
Rigidità dielettrica tra contatti aperti V AC		1000	1000	1000
Temperatura ambiente °C		-40...+85	-40...+85	-40...+85
Categoria di protezione		RT II**	RT II**	RT II**
Omologazioni (a seconda dei tipi)				

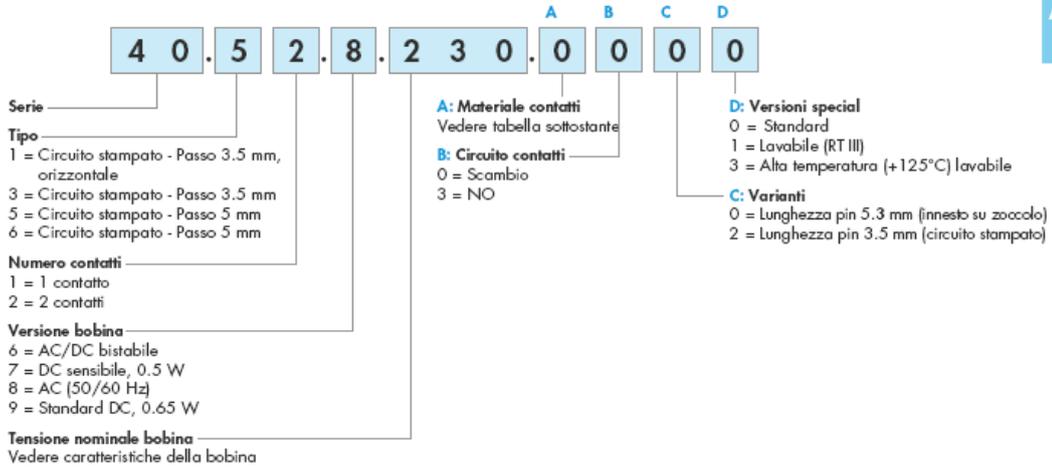
V12015 - www.finder.it

\*\* Vedere informazioni tecniche "Cenni sulle procedure di saldatura automatica" pagina II.



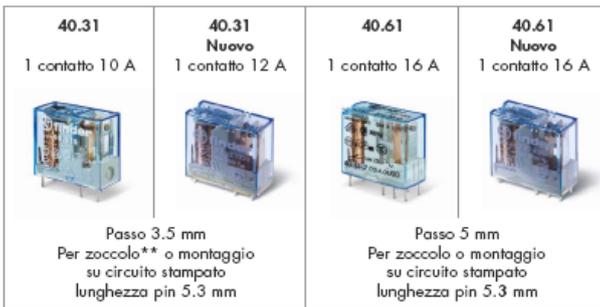
### Codificazione

Esempio: serie 40, relè per circuito stampato, 2 scambi, tensione bobina 230 V AC.



Versioni disponibili: solo le combinazioni indicate sulla stessa riga. In grassetto le versioni preferenziali (alta disponibilità).

Terminali	Tipo	Versione bobina	A	B	C	D
Circuito stampato, lunghezza pin 3.5 mm	40.11	DC sensibile	<b>2</b> (AgCdO) - 4 (AgSnO <sub>2</sub> )	<b>0</b>	<b>0</b>	<b>0</b>
	40.31 *	Standard DC/DC sensibile	<b>1</b> (AgNi)	<b>0 - 3</b>	<b>2</b>	<b>0 - 1</b>
	40.61 *	Standard DC/DC sensibile	1 (AgNi) - <b>2</b> (AgCdO)	<b>0 - 3</b>	<b>2</b>	<b>0 - 1</b>
Circuito stampato/ innesto su zoccolo, lunghezza pin 5.3 mm	40.31 */51	AC/DC sensibile	<b>0</b> (AgNi) - 2 (AgCdO) - 5 (AgNi+Au)	<b>0 - 3</b>	<b>0</b>	<b>0 - 1</b>
	40.31 */51	Standard DC	<b>0</b> (AgNi) - 2 (AgCdO) - 5 (AgNi+Au)	<b>0 - 3</b>	<b>0</b>	<b>0 - 1 - 3</b>
	40.52	AC/DC sensibile	<b>0</b> (AgNi) - 2 (AgCdO) - 5 (AgNi+Au)	<b>0 - 3</b>	<b>0</b>	<b>0 - 1</b>
	40.52	Standard DC	<b>0</b> (AgNi) - 2 (AgCdO) - 5 (AgNi+Au)	<b>0 - 3</b>	<b>0</b>	<b>0 - 1 - 3</b>
	40.61 *	AC/DC sensibile	<b>0</b> (AgCdO) - 4 (AgSnO <sub>2</sub> )	<b>0 - 3</b>	<b>0</b>	<b>0 - 1</b>
	40.61 *	Standard DC	<b>0</b> (AgCdO) - 4 (AgSnO <sub>2</sub> )	<b>0 - 3</b>	<b>0</b>	<b>0 - 1 - 3</b>
	40.31/51/52	Bistabile	<b>0</b> (AgNi)	<b>0</b>	<b>0</b>	<b>0</b>
40.61	Bistabile	<b>0</b> (AgCdO)	<b>0</b>	<b>0</b>	<b>0</b>	



\* Grazie alle nuove linee di produzione, il disegno / specifiche delle versioni DC con contatti standard viene modificato per allinearsi con le versioni a relè per circuito stampato 40.x1...20. Per i dati tecnici completi vedere a pagina 3.

\*\* Per il relè tipo 40.31 relè montato su zoccolo, la corrente nominale massima deve essere limitata a 10 A.

### Caratteristiche generali

A

Isolamento secondo EN 61810-1		1 contatto		2 contatti	
Tensione nominale del sistema di alimentazione	V AC	230/400		230/400	
Tensione nominale di isolamento	V AC	250	400	250	400
Grado d'inquinamento		3	2	3	2
<b>Isolamento tra bobina e contatti</b>					
Tipo di isolamento		Rinforzato (8 mm)		Rinforzato (8 mm)	
Categoria di sovratensione		III		III	
Tensione di tenuta ad impulso	kV (1.2/50 µs)	6		6	
Rigidità dielettrica	V AC	4000		4000	
<b>Isolamento tra contatti adiacenti</b>					
Tipo di isolamento		—		Principale	
Categoria di sovratensione		—		II	
Tensione di tenuta ad impulso	kV (1.2/50 µs)	—		2.5	
Rigidità dielettrica	V AC	—		2000	
<b>Isolamento tra contatti aperti</b>					
Tipo di sconnessione		Microconnessione		Microconnessione	
Rigidità dielettrica	V AC/kV (1.2/50 µs)	1000/1.5		1000/1.5	
<b>Immunità ai disturbi condotti</b>					
Burst (5...50)ns, 5 kHz, su A1 - A2		EN 61000-4-4		livello 4 (4 kV)	
Surge (1.2/50 µs) su A1 - A2 (modo differenziale)		EN 61000-4-5		livello 3 (2 kV)	
<b>Altri dati</b>					
Tempo di rimbalzo: NO/NC	ms	2/5			
Resistenza alle vibrazioni (10...150)Hz: NO/NC	g	20/5 (1 scambio)		14/2 (2 scambi)	
Resistenza all'urto NO/NC	g	20/13 (1 scambio)		20/12 (2 scambi)	
Potenza dissipata nell'ambiente	a vuoto	W 0.65			
	a carico nominale	W 1.2 (40.11/31/51)		2 (40.61/52)	
Distanza di montaggio tra relè su circuito stampato	mm	≥ 5			