

/// Plug-in railway relay with 4 C/O contacts

Rugged plug-in relays for extreme reliability, within long endurance applications and harsh environments

BK 400

Safety critical



Description

The BK 400 safety critical, heavy duty and weld resistant relay has 4 double make / double break C/O contacts (form Z). Weld no transfer and silver tin oxide safety contacts are standard.

The plug-in design offers secure locking feature for maximum ease of maintenance (no wires need to be disconnected or other hardware removed for relay inspection or replacement).

The resistance to impact and vibration is conforming the standards for Railway Transported Equipment. Positive mechanical keying of relay to socket is built into relay and socket during manufacture and terminal identifications are clearly marked on identification plate that is permanently attached to the relay.

The BK 400 is pluggable in the following sockets: EA 102 B, EA 102 BF, EA 103 BF, EA 104 B, EA 104 BF, EA 105 BF, EA 112 BF.

Application

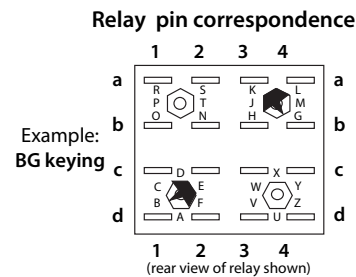
The BK relay is designed for safety critical applications where a high degree of resistance to welding is required. Stationary contacts are silver tin oxide.

Mobile contacts are hard silver laminated to copper. In a power interruption situation relay armature will assure a "safe" position. This is due to the strength of the 2 compressed springs which pushes the armature back into the rest position.

Features

- Instantaneous & safety critical relay
- Plug-in design with secure locking feature for maximum ease of maintenance
- 4 double make / double break C/O contacts (form Z), 12 A
- Weld resistant
- Weld no transfer contacts standard
- Contact life (mechanical) of 100 million cycles
- -40 °C...+80 °C operating temperature

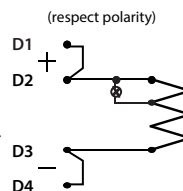
Relay pin correspondence



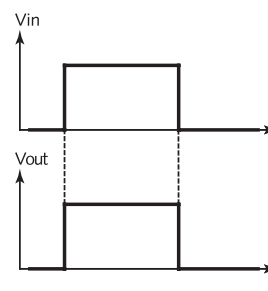
N.B.1 :
On 500VDC and 700VDC relays, coil is connected only to D1 and D4. D2 and D3 are not wired and transil or diode protections are not available.

N.B.2 :
Transil not needed on VAC coil relays

Led (V) option



Timing diagram

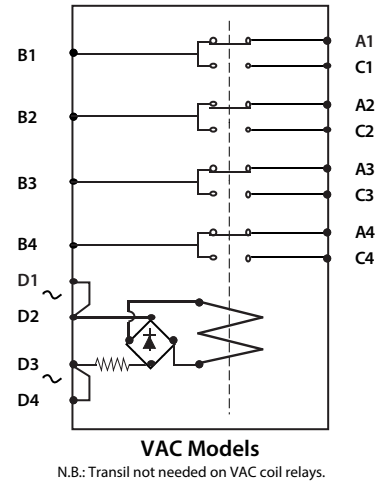
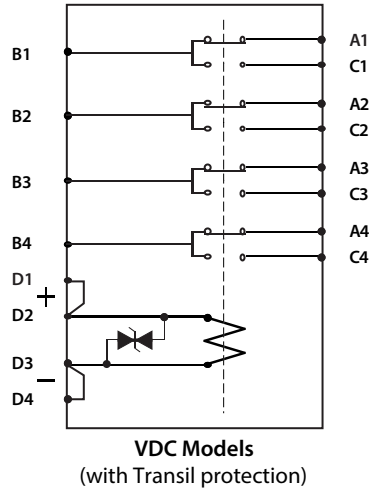
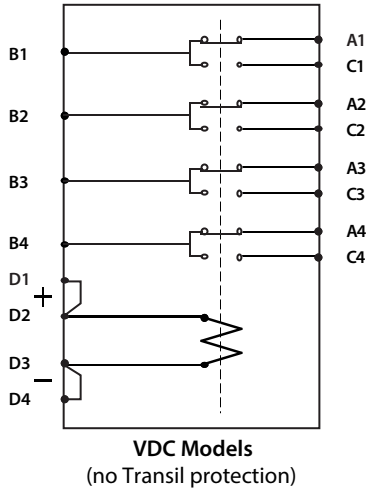


Railway compliancy

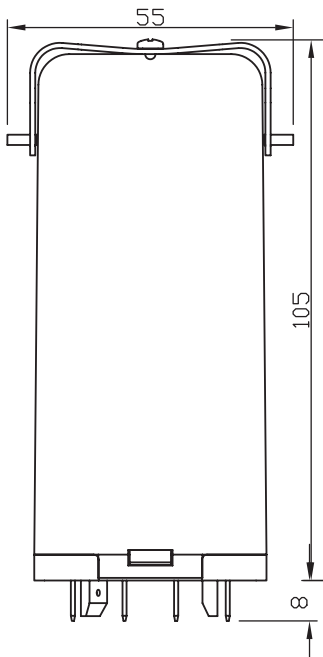
NF F 62-002 NF F 70-031 section 7.1.2. & 7.1.3
NF F16-101/102 EN 45545-2, HL3 (R22)

Safety critical relay BK 400

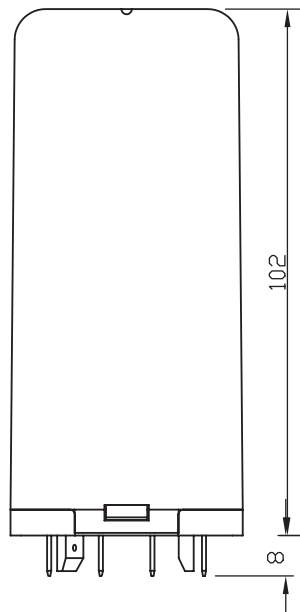
Connection diagram



Dimensions (mm)



Used
with locking brackets



Used
with wire locking spring

Technical specifications

Safety critical relay BK 400

Coil characteristics - DC versions

Type	U _{nom} (VDC)	U _{operating} (VDC)	P _{nom} (W)	U _{hold} (VDC)	U _{drop-out} (VDC)	R _{coil} (Ω) ¹	L/R (ms) ²
ME	12	8/16	3.5	6.25	1.25	40	40
AG	24	16/33	3.5	13.5	2.5	170	40
FL	36	25/45	3.5	21	3.5	390	40
DG	48	33/60	3.5	28.5	4.5	625	40
BG	72	48/90	3.5	40.5	6.5	1600	40
US	96	65/120	3.8	50	9.0	2400	40
EG	115	77/144	3.5	60	11.5	4000	40
FG	550	440/660	4.0	300	50	75500	40
UT	700	450/900	4.2	380	60	115000	40

¹ Coil resistance tol.: ± 8% at 20 °C

² Valid for closed relay

Coil characteristics - AC versions

Type	U _{nom} (VAC)	U _{operating} (VAC)	P _{nom} (VA)	U _{hold} (VAC)	U _{drop-out} (VAC)	R _{coil} (Ω) ¹	L/R (ms) ²
EM	127	88/143	4	71.5	12	4000	40
CG	220	176/242	3	129	21	14350	30

¹ Coil resistance tol.: ± 8% at 20 °C

² Valid for closed relay

Contact characteristics - AgSnO₂ contacts)

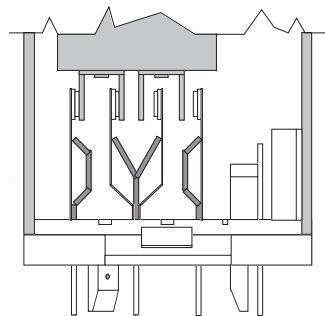
Nominal current	12 A resistive, 10 A resistive according to CF 62-002	
Nominal breaking capacity and life	Please refer to derating curves	
Contact overload withstand	At 24 VDC: 200 A at L/R = 0 for 10 ms (10 operations at the rate of 1 operation per minute)	
Contact closure time	Pick-up time N/O < 55 ms Drop-out* time N/C < 25 ms	
Contact opening time	Pick-up time N/C < 50 ms Drop-out* time N/O < 15 ms	
Minimum contact continuity	20 mA at 110 VDC & 100 mA at 24 VDC	
Number of contacts	4 double make / double break contacts (form Z)	
Contact material	Silver tin oxide (10%) mobile contacts /hard silver overlay laminated to copper fixed contacts	
Contact resistance	initial end of life	30 mΩ max at 5 A 60 mΩ max at 5 A

* With P option less than 95 ms

Contact design

Weld no transfer function:

If one N/O contact welds, no N/C contact can close (and vice versa) and cause an overlapping of functions. A type test is realized to insure the relays meet this important safety requirement. 150% of max. operating voltage is applied to the relay while holding 1 N/C contact closed by mechanical means. Under these conditions, it is verified that no N/O contact makes.



Double break contacts

Extend the contact life on highly inductive DC currents.

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Electrical characteristics

Dielectric strength	2000 VAC, 1 min between contacts 2600 VAC, 1 min between contacts, coil and frame
Insulation resistance	≥ 1000 MΩ at 500 VDC

Mechanical characteristics

Mechanical life	> 100 x 10 ⁶ operations
Weight	450 g

Environmental characteristics

Vibration	NF F 62-002 The tests are conducted in the X, Y , Z planes at frequency between 10 & 150 cycles (sinusoidal) at 2 g.
Shock	NF F 62-002 Tests are applied in both directions in the X, Y & Z planes. Then successive shocks are administered consisting of the positive component of sinusoidal with a value of 30 g, 18 ms. Other vibration and shock tests can be performed on request.
Operating temperature	-40 °C...+80 °C
Humidity	93% RH, 40 °C for 4 days
Salt mist	5% NaCl, 35 °C for 4 days
Protection	IP40
Fire & smoke	Materials: Polycarbonate (cover) / polyester melamine (base) Note: These materials have been tested for fire propagation and smoke emission according standards NF F 16-101, NF F 16-102, EN 45545-2, HL3 (R22) and have been approved to be used on the English/French train channel shuttle.
Protection level	IP40 (relay on socket)

Railway compliancy

NF F 62-002	Railway rolling stock - On-off contact relays and fixed connections
NF F16-101/102	Railway rolling stock - Fire behavior
NF F 70-031 section 7.1.2. and 7.1.3	Weld resistant contacts
EN 45545-2, HL3 (R22)	Fire protection on railway vehicles

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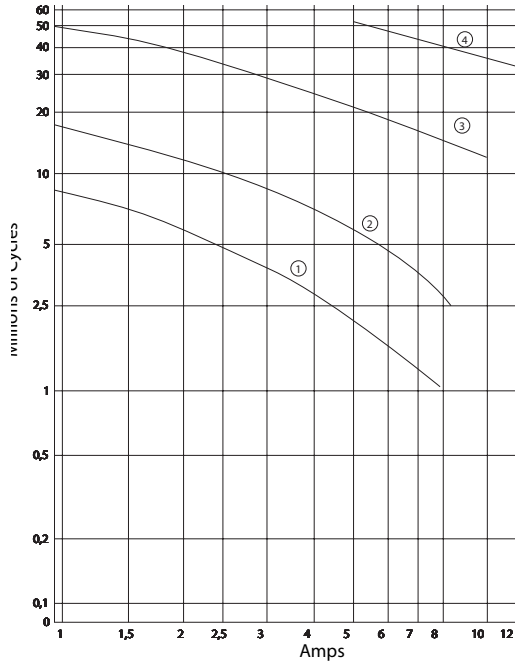
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Electrical life expectancy

Dynamic relay selection curve #1

AC Current breaking capacity versus life expectancy in millions of cycles. Rate of contacts opening and closing = 1200 operations per hour. Curves shown for resistive (Power factor = 1)

Curves	1	2	3	4
VAC	220	125	48	24



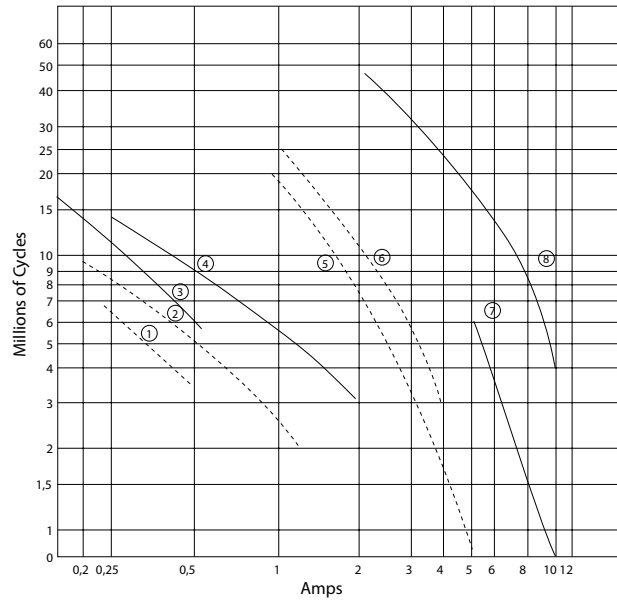
Dynamic relay selection curve #2

DC Current breaking capacity versus life expectancy in millions of cycles. Rate of contacts opening and closing = 1200 operations per hour. Curves shown for inductive load -

- L/R = 20 ms continuous current
- L/R = 40 ms continuous current

* By connecting 2 contacts in series, DC current breaking capacity increases by 50%

Curves	1-3	2-4	5-7	6-8
VAC	220	125	48	24

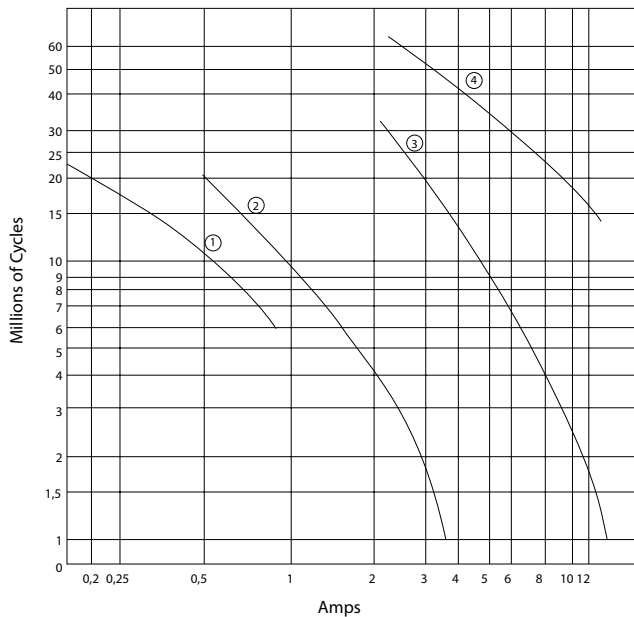


Dynamic relay selection curve #3

DC Current breaking capacity versus life expectancy in millions of cycles. Rate of contacts opening and closing = 1200 operations per hour. Curves shown for resistive load (L/R = 0). Continuous current.

* By connecting 2 contacts in series, DC current breaking capacity increases by 50%

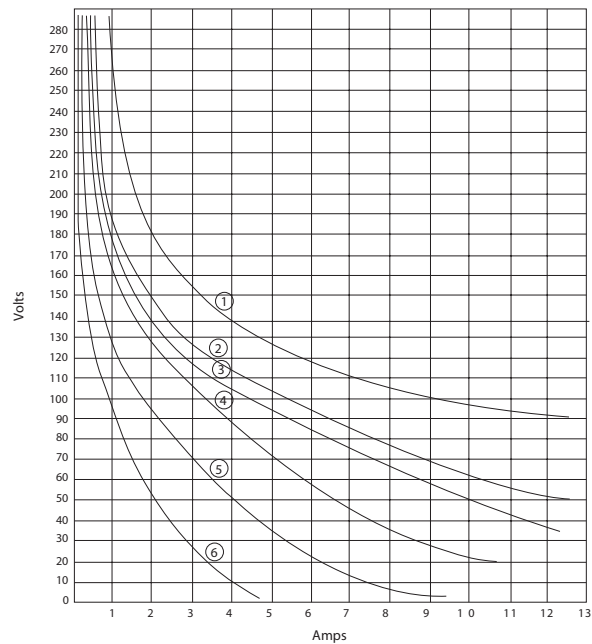
Curves	1	2	3	4
VAC	220	125	48	24



Dynamic relay selection curve #4

Maximum contact breaking capacity versus voltage for a given L/R. Rate of contacts opening and closing = 600 operations per hour. Curves shown for resistive load (L/R = 0) and inductive loads. Continuous current. Life expectancy 800,000 cycles

Curves	1	2	3	4	5	6
L/R	0 ms	15 ms	20 ms	40 ms	60 ms	100 ms

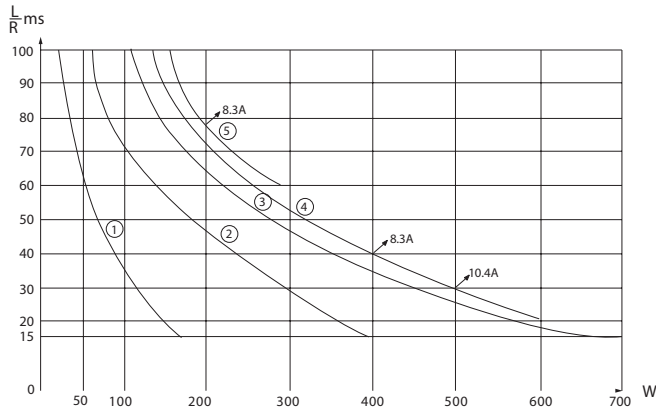


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Dynamic relay selection curve #5

Maximum power interruption versus load time constant (L/R) for a given voltage
Curves shown for resistive load $I = P/V$

Curves	1	2	3	4	5
VAC	220	125	72	48	24



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Mounting possibilities/sockets



Panel/flush mounting

EA 102 B	Locking bracket (905843), rear connection, double Faston 5 mm.
EA 102 BF	Wire locking spring (926853), rear connection, single Faston 5 mm.
EA 104 B	Locking bracket (905843), rear connection, single Faston 5 x 0.8 mm.
EA 104 BF	Wire locking spring (926853), rear connection, single Faston 5 x 0.8 mm
EA 112 BF	Wire locking spring (926853), rear connection, crimp contact

Surface/wall mounting

A 103 BF*	Wire locking spring (926853), front connection, M3 screw 6.5 mm. ring terminals (2.5 mm ²)
A 105 BF*	Wire locking spring (926853), front connection, single Faston 5 mm

* Mounting possibility on 35 mm rail EN 50022 by adding suffix D to the part number (see socket datasheet)

Note: Keying of relay to socket can be specified by adding the keying letters in the part number. See all details in the related socket datasheet.

Ordering codes

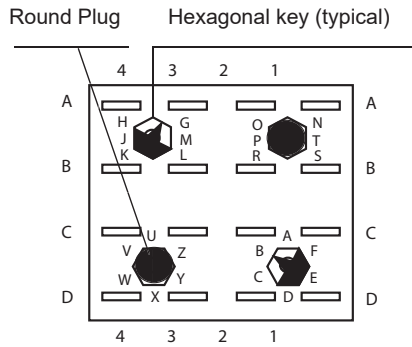


Article no.	Part for	Description
905846	Sockets	Locking bracket
C927210	Sockets	Screw for bracket
P928060	Sockets	Metal strap (2)
P928061	Sockets	Metal strap (4)
431906654	Sockets	Wire locking spring
414928005	Sockets	Round plastic plugs
414905678	Sockets & relays	Hexagonal plastic keys
212903020	Relays	Lock pins assy, 2 screws

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Keying

Socket (top view) set for BG (72V DC)

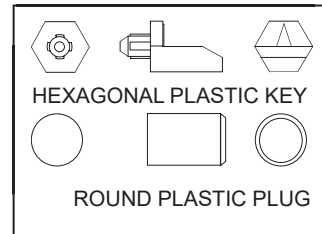


Keying of relay to socket is accomplished by pressing 2 hexagonal keys and 2 round plugs into molded-in recesses on the socket.

Relay keying done in factory.

Insert keys so that arrows point to the correct keying letters on socket - see example shown.

Faston socket EA 104 shown. Screw type socket EA 103, front single faston EA 105 and double Faston EA 102 are keyed similarly.



(empty molded re-cesses are filled up by pressing 2 round plastic plugs)

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Instructions for use

Installation

Install socket and connect wiring correctly according identification to terminals. Plug relay into socket. Reverse installation into socket is not possible due to mechanical blocking by snap-lock. Don't reverse polarity of coil connection. Relays can be mounted (tightly) next to each other and in any attitude. B400 relay can be mounted in any position. Warning! Never use silicon near relays.

Operation

Before operating always apply voltage to coil to check correct operation. Long term storage may corrode the silver on the relay pins. Just by plugging the relay into the socket, the female bifurcated receivers will automatically clean the corrosion on the pins and guarantee a good connection. Do not use the relay in places with flammable gas as the arc generated from switching could ignite gasses.

Maintenance

Correct operation of relay can easily be checked as transparent cover gives good visibility on the moving contacts. When the relay doesn't seem to operate correctly, please check presence of coil voltage. Use a multimeter. If LED is used, coil presence should be indicated. If coil voltage is present, but the relay doesn't work, a short circuit of suppression diode is possible (The coil connection was reversed). If relay doesn't work after inspection, please replace relay unit by a similar model. Send defective relay back to manufacturer. Normal wear and tear excluded.

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Ordering scheme

BK 400							
Nominal voltage & keying	ME						12 VDC
	AG						24 VDC
	FL						36 VDC
	DG						48 VDC
	BG						72 VDC
	US						96 VDC
	EG						115 VDC
	FG						550 VDC
	UT						700 VDC
		EM					
	CG						220 VAC
Coil overvoltage protection		-					No coil protection
		P					Avalanche diode coil protection
	Note: no protection for AC coil versions	S					Transil coil protection
LED coil voltage indicator			-				No LED
			V				LED voltage indicator
Relay cover type				-			Relay cover with lock pins
				F			Relay cover for wire locking spring

Example: BK 400 72 BG S V

Description: B 400 relay, Unom: 72 VDC, keying BG, transil coil protection, LED indicator, relay cover with lock pins

 Over 10 million Mors Smitt relays in use in rail transport applications worldwide!

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