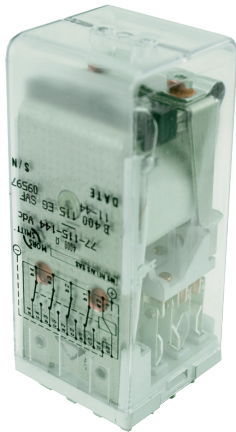


/// Plug-in railway relay with 4 C/O contacts

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

B 400

Safety critical



Description

The B 400 safety critical and heavy duty relay has 4 double make / double break C/O contacts (form Z). Weld no transfer 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.

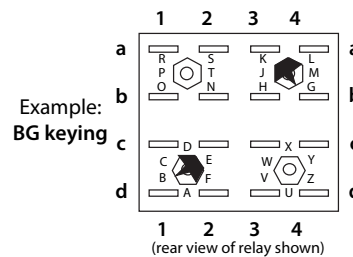
Application

The B 400 relay is designed for ultra reliable heavy duty and safety critical applications such as door control, emergency brake failure, interlocking between traction and breaking around the world in countless railcars.

Features

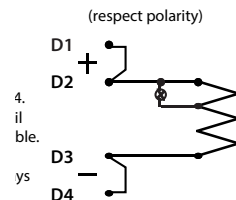
- Instantaneous & safety critical relay
- Plug-in design with secure locking feature for maximum ease of maintenance
- 4 double make / double break C/O contacts (form Z), 12 A
- Weld no transfer contacts standard
- Contact life (mechanical) of 100 million cycles
- -40 °C...+80 °C operating temperature

Relay pin correspondence

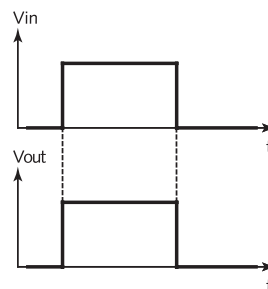


N.B.1 :
On 500VDC and 700VDC relays, coil is connected only to D1 and D4. D2 and D3 are not wired and transil or diode protections are not available.

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



Timing diagram

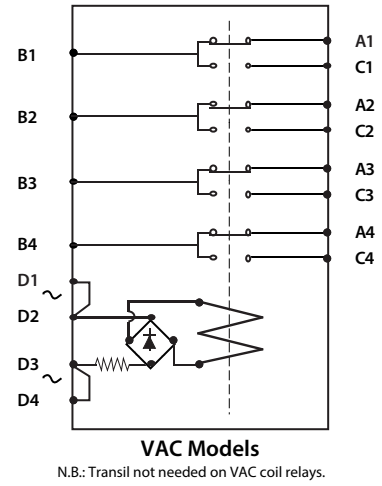
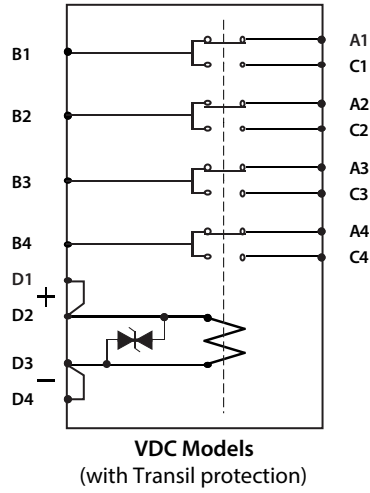
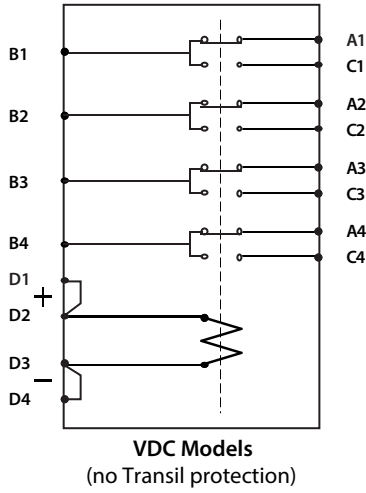


Railway compliancy

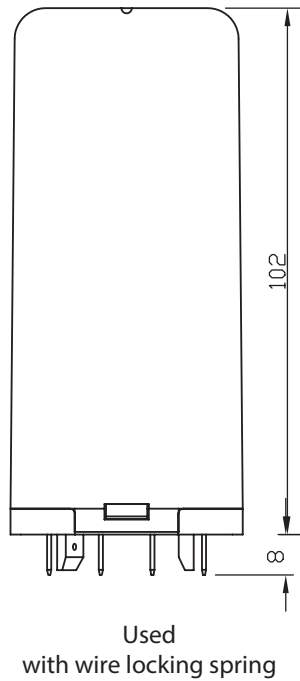
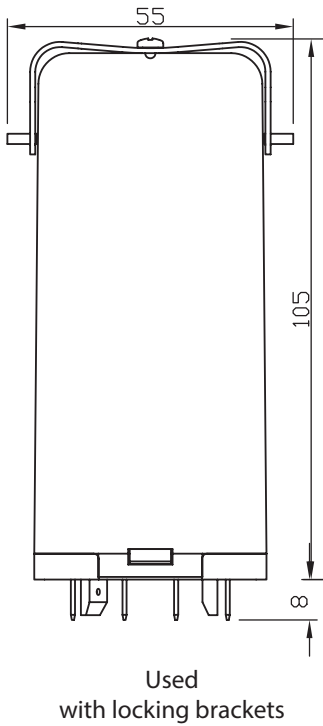
NF F 62-002 EN 45545-2, HL3 (R22)
NF F16-101/102

Safety critical relay
B 400

Connection diagram



Dimensions (mm)



Technical specifications

Safety critical relay B 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 - standard version (Ag contacts)

Nominal current	12 A resistive		
Nominal breaking capacity and life	3 A at 72 VDC 1 A at 72 VDC 3 A at 220 VAC 50 Hz cosØ=1 Lamp filament circuit: 200 W at 72 VDC	L/R : 0 ms L/R: 30 ms	Electrical life: 5 x 10 ⁶ op. Electrical life: 2.5 x 10 ⁶ op. Electrical life: 2.5 x 10 ⁶ op. Electrical life: 5 x 10 ⁵ op.
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 24 VDC		
Number of contacts	4 double make / double break contacts (form Z)		
Contact material	Hard silver overlay laminated to copper		
Contact resistance	initial end of life	10 mΩ max at 5 A 40 mΩ max at 5 A	

Contact design



Safety critical relay B 400

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
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) ASTM E162 and ASTM E662, and have been approved to be used on the English/French train channel shuttle.

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
EN 45545-2, HL3 (R22)	Fire protection on railway vehicles

Safety critical relay

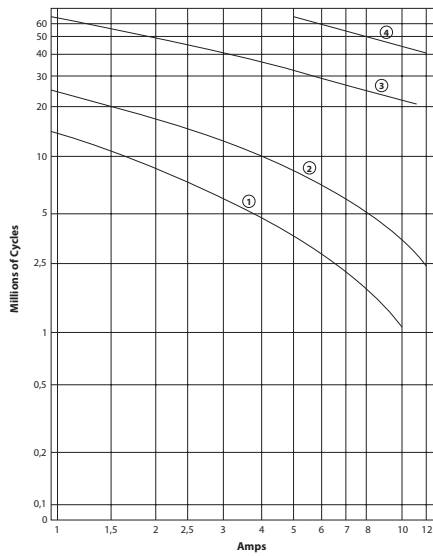
B 400

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 load (Power Factor = 1).

Curve	1	2	3	4
VAC	220	125	48	24



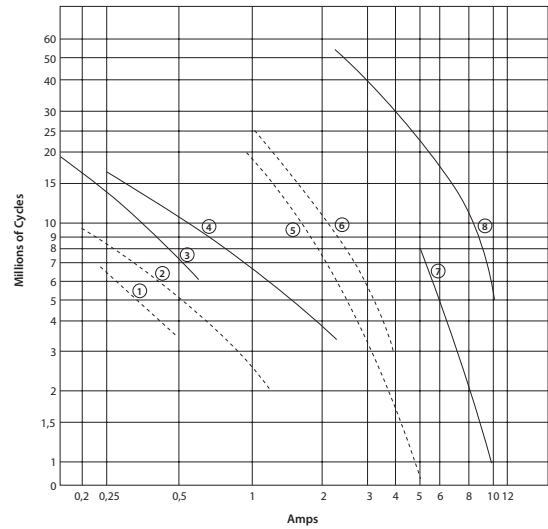
Dynamic relay selection curve #2

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
VDC	220	125	48	24

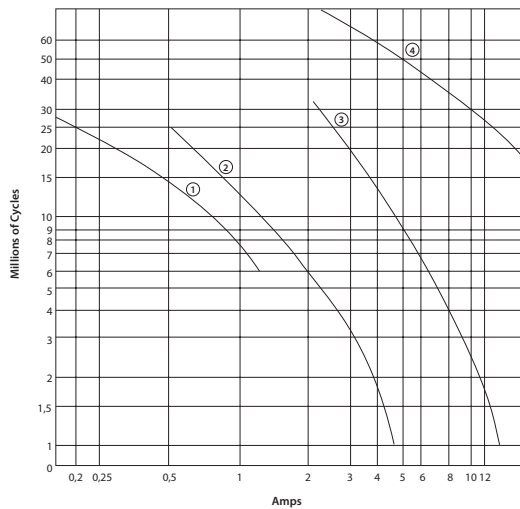


Dynamic relay selection curve #3

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 %

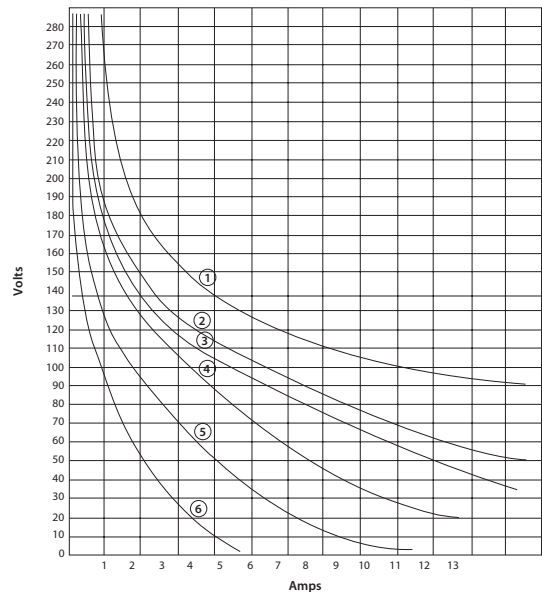
Curve	1	2	3	4
VDC	220	125	48	24



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: 2 Millions of Cycles

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



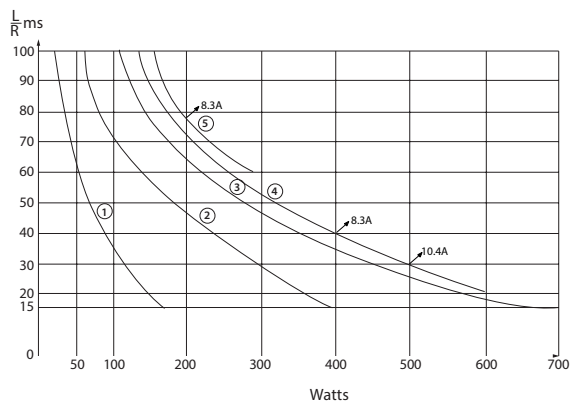
Safety critical relay

B 400

Dynamic relay selection curve #5

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

Curve	1	2	3	4	5
VDC	220	125	72	48	24



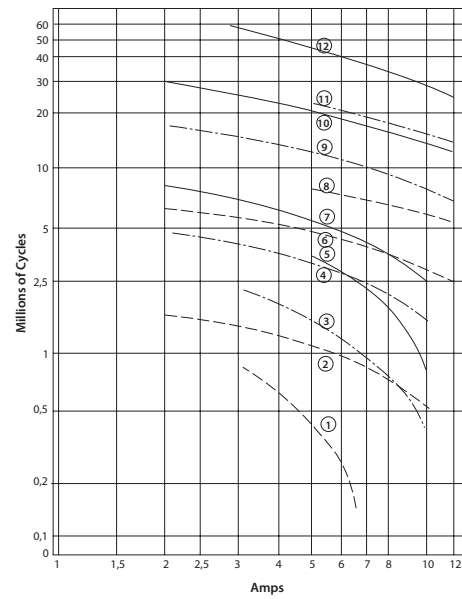
Dynamic relay selection curve #6

AC Current breaking capacity versus life expectancy in millions of cycles.
Rate of contacts opening and closing = 1200 operations per hour.

Values shown for inductive loads -

- $\cos \phi = 0.7$
- - $\cos \phi = 0.5$
- - - $\cos \phi = 0.3$

Curves	1,3 & 5	2,4 & 7	6,9 & 10	8,11 & 12
VAC	220	125	48	24



Safety critical relay B 400

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



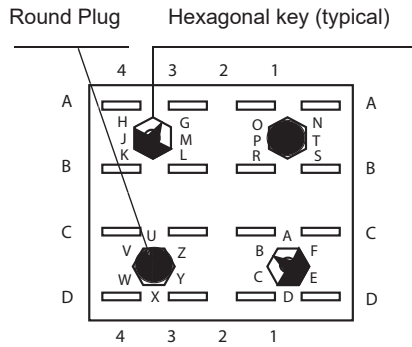
Article no.	Part for	Description
905846	Sockets	Locking bracket
C927210	Sockets	Screw for bracket
P928060	Sockets	Metal strap (2)
P928061	Sockets	Metal strap (4)
431906654	Sockets	Wire locking spring
414928005	Sockets	Round plastic plugs
414905678	Sockets & relays	Hexagonal plastic keys
212903020	Relays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

Safety critical relay

B 400

Keying

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

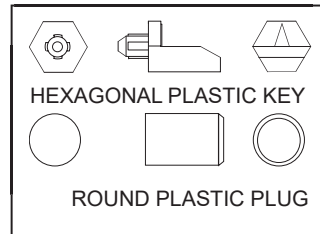


Keying of relay to socket is accomplished by pressing 2 hexagonal keys and 2 round plugs into molded-in recesses on the socket.

Relay keying done in factory.

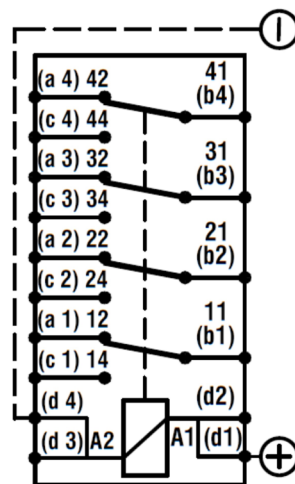
Insert keys so that arrows point to the correct keying letters on socket - see example shown.

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)

Cover printing - DIN marking



Safety critical relay B 400

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.

Safety critical relay

B 400

Ordering scheme

B 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							127 VAC
	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
Terminal identification (see page 9)					-			No marking
					X8			DIN marking

Example: B 400 24 AG S C V F

Description: B 400, Unom: 24 VDC, keying AG, transil coil protection, LED indicator, relay cover for wire locking spring

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

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