

CAM SWITCHES



01

CR series

CA series

CQ series

Cam switches

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Range

The range of Bremas Cam Switches includes 3 top performance series in line with the highest market standards.

Their characteristics make them the ideal choice for any industrial application.

■ CR Series

- Rated current: from 12A up to 40A
- Rated insulation voltage: 690V
- Terminal protection degree: IP20

**■ CA Series**

- Rated current: from 12A up to 630A
- Rated insulation voltage: 690V
- Terminal protection degree: IP00

**■ CQ Series**

- Rated current: from 16A up to 40A
- Rated insulation voltage: 690V
- Terminal protection degree: IP20
- Simplified wiring



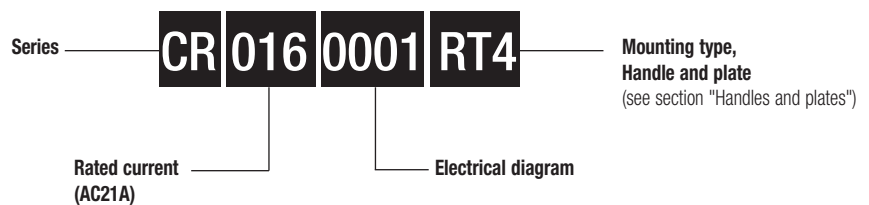
CR Series

- Terminal protection degree: IP20
- Class V2 self-extinguishing housing
- Metal shaft
- Metal rods
- Terminal with self raising plate and captive screws
- Rear mounting and Base mounting



Size	Rated current I_e (A)	Rated insulation voltage U_i (V)	Type
S1	12	690	CR012
	16	690	CR016
	20	690	CR020
	25	690	CR026
	32	690	CR033
S2	25	690	CR025
	32	690	CR032
	40	690	CR040

Code structure



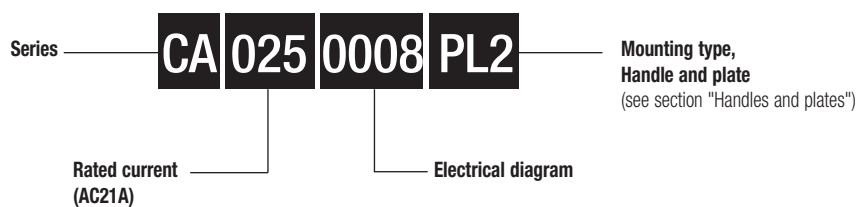
CA Series

- Terminal protection degree: IP00
- Class V2 self-extinguishing housing
- Metal shaft
- Metal rods
- Terminal with self raising plate and captive screws
- Rear mounting and Base mounting



Size	Rated current Ie (A)	Rated insulation voltage Ui (V)	Type
S1	12	690	CA012
	16	690	CA016
	20	690	CA020
	25	690	CA026
	32	690	CA033
S2	25	690	CA025
	32	690	CA032
	40	690	CA040
S3	50	690	CA050
S4	75	690	CA063
S5	115	690	CA100
S6	200	690	CA200
	400	690	CA400
	630	690	CA630

Code structure



Technical data IEC/EN 60947-3

Rated insulation voltage	Ui	V
Rated operating voltage	Ue	V
Rated impulse withstand voltage	Uimp	kV
Rated thermal current for open switch	Ith	A
Rated thermal current for enclosed switch	Ithe	A
Rated operation frequency		Hz
Power dissipation for each pole		W
Rated operating current		
AC-21A Switching resistive loads, including moderate overloads	Ie	A
AC-22A Switching of mixed resistive and inductive loads, including moderate overloads	Ie	A
AC-20A Connecting and disconnecting under no loads conditions		
Rated operating power		
AC-23A Switching of motor loads or other highly inductive loads 3 phase - 3 pole	230V	Kw (A)
	400V	Kw (A)
	500V	Kw (A)
	690V	Kw (A)
AC-23A Switching of motor loads or other highly inductive loads 1 phase - 2 pole	110V	Kw (A)
	230V	Kw (A)
AC-3 Squirrel cage motors: starting, switching off motors during running 3 phase - 3 pole	230V	Kw (A)
	400V	Kw (A)
	500V	Kw (A)
	690V	Kw (A)
AC-3 Squirrel cage motors: starting, switching off motors during running 1 phase - 2 pole	110V	Kw (A)
	230V	Kw (A)
	400V	Kw (A)
AC-4 Squirrel cage motors: Direct-on-line starting, reversing, plugging and inching 3 phase - 3 pole	230V	Kw (A)
	400V	Kw (A)
AC-15 Control of a.c electromagnetic loads	230V	A
	400V	A
Rated breaking capability in AC-23A (cos φ=0,45)	230V	A
	400V	A
Short circuit protection		
Rated short time withstand current	Icw	A
Rated short-circuit make capacity	Icm	A
Rated conditional short-circuit current	-	kA
With fuses class gG	500V	A

Technical data UL/CSA

Rated operating voltage	Ue	UL/CSA V
General use current	Ie	UL/CSA A
Short circuit rating @600Vac		Arms
Fuse size (Class RK5, 600Vac, 200kA A.I.C.)		A
Rated operating power		
1 phase - 2 pole	120V	Hp (A)
	240V	Hp (A)
3 phase - 3 pole	200V	Hp (A)
	240V	Hp (A)
	480V	Hp (A)
	600V	Hp (A)

Mechanical characteristics

Mechanical life		Cycles x 10 ⁶ Cycles/hr
Connection according to IEC 9471-1 and EN 50947-1		
Connecting capability	With flexible wires	Min-Max mm ²
	With solid wires	Min-Max AWG
Connection terminal screw dimensions		Type
Screw tightening torque		Nm
Protection degree IEC 529 EN 60529		
Terminals		IP
Ambient conditions		
Operating ambient temperature		°C
Storage ambient temperature		°C
Withstand to constant humid according to IEC 60068		
Withstand to cyclic humid according to IEC 60068		

SIZE													
		1			2			3	4	5	6	7	8
CA/CR 012	CA/CR 016	CA/CR 020	CA/CR 026	CA/CR 033	CA/CR 025	CA/CR 032	CA/CR 040	CA 050	CA 063	CA 100	CA200	CA400	CA630
690	690	690	690	690	690	690	690	690	690	690	690	690	690
690	690	690	690	690	690	690	690	690	690	690	690	690	690
6	6	6	6	6	6	6	6	6	6	6	6	6	6
16	20	25	32	32	32	40	50	63	80	115	200	400	630
16	20	25	25	32	32	40	50	63	80	100	160	-	-
50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50	50
0,27	0,5	0,4	0,5	0,5	1	1	1,3	1,6	2,5	4,7	7	15	30
12	16	20	25	32	25	32	40	50	75	115/110 ⁵	160 ⁵	-	-
12	16	16	20	25	20	25	32	40	63 ⁵	110	160	-	-
-	-	-	-	-	-	-	-	-	-	-	-	400	630
3 (9)	4 (14)	5,5 (17)	7,5 (24)	8,5 (27)	7,5 (24)	8,5 (27)	10 (32)	15 (48)	18,5 (58)	30 (95)	40 (125)	-	-
4 (9)	7,5 (14)	9 (16)	11 (20)	15 (27)	11 (20)	15 (27)	18,5 (30)	25 (45)	30 (54)	45 (85)	59 (106)	-	-
-	-	9 (13)	11 (15)	15 (22)	11 (15)	15 (22)	18,5 (27)	33 (48)	22 (32)	30 (40)	75 (108)	-	-
-	-	9 (9)	11 (11)	15 (16)	11 (11)	15 (16)	18,5 (19)	22 (23)	-	-	-	-	-
0,75 (8,5)	1,1 (12)	1,1 (5)	2,2 (25)	2,2 (25)	2,2 (25)	2,2 (25)	3 (34)	3,7 (42)	5,5 (63)	9 (102)	11 (125)	-	-
1,5 (8,5)	2,2 (14)	3 (17)	3,7 (20)	3,7 (20)	3,7 (20)	3,7 (20)	5,5 (30)	7,5 (40)	10 (32)	15 (82)	22 (120)	-	-
2,2 (7)	3,7 (12)	4 (13)	4,5 (16)	5,5 (17)	5,5 (17)	5,5 (17)	7,5 (24)	11 (35)	15 (47)	22 (70)	30 (95)	-	-
3,5 (7)	5,5 (10)	7,5 (14)	8 (16)	9,5 (16)	9,5 (16)	10 (17)	15 (27)	18 (33)	22 (40)	37 (67)	45 (82)	-	-
-	-	7,5 (11)	8 (12,5)	9,5 (12,5)	9,5 (12,5)	10 (14)	15 (22)	22 (32)	22 (32)	30 (40)	59 (85)	-	-
-	-	7,5 (8)	8,5 (10)	9,5 (10)	8,5 (10)	10 (10)	16 (16)	20 (20)	-	-	-	-	-
0,37 (4)	0,75 (9)	1,1 (13)	1,5 (17)	1,5 (17)	1,5 (17)	1,5 (17)	2,2 (25)	3,7 (42)	4 (45)	7,5 (85)	9 (102)	-	-
1,1 (6)	1,5 (8)	2,2 (12)	3 (17)	3 (17)	3 (17)	3 (17)	4,5 (25)	7,5 (40)	7,5 (40)	11 (60)	15 (82)	-	-
-	-	3,7 (12)	-	-	-	-	-	-	-	-	-	-	-
-	-	1,5 (4,5)	1,7	2	2,2 (17)	2,2 (17)	3 (10)	3,7 (12)	5,5 (17)	7,5 (85)	-	-	-
-	-	2,2 (2,6)	2	2,5	3 (5,5)	3 (5,5)	5,5 (10)	6 (11)	7,5 (14)	11 (20)	-	-	-
4	6	7	8	8	8	8	10	-	-	-	-	-	-
3	4	5	6	6	6	6	8	-	-	-	-	-	-
72	112	136	192	216	192	216	256	384	464	760	1000	-	-
72	112	128	160	216	160	216	240	360	432	680	848	-	-
150	240	240	240	-	400	400	500	600	800	1500	2000	-	-
-	-	1500	1500	-	2000	2000	2000	2000	2500	3000	3000	-	-
4	4	5	5	5	10	10	10	15	15	15	15	-	-
16	20	20	25	32	35	35	50	50	63	125	200	-	-

600/-	600/-	600/300	600/-	600/-	600/600	600/600	600/600	600/600	600/600	600/600	600/600	600/- ⁴	600/- ⁴
12	16	20/16	25/-	30/-	25/25	35/25	40/32	60/40	85/63	125/100	240/-	400/- ³⁴	630/- ³⁴
5000	5000	5000	5000	5000	5000	5000	5000	-	-	-	-	-	-
60	25 (30)	60	25	30	60	60	60	-	-	-	-	-	-
0,5 (9,8)	1 (16)	1,5 (20)/-	2 (24)/-	-	2 (24)/-	2 (24)/-	3 (34)/2,5	5 (56)/-	7,5 (80)/-	10 (100)/5	-	-	-
1,5 (10)	2 (12)	3 (17)/-	3 (17)/-	-	3 (17)/6	5 (17,5)/-	7,5 (25,3)/-	10 (50)/-	10 (50)/-	15 (68)/12	-	-	-
1,5 (6,9)	2 (7,8)	5 (17,5)/-	-	7,5 (25,3)/-	5 (17,5)/-	7,5 (22)/-	10 (28)/9,5	15 (48,3)/-	20 (62,1)/-	20 (62,1)/-	-	-	-
2 (6,8)	3 (9,6)	5 (15,2)/-	7,5 (22)/-	10 (28)/-	7,5 (22)/-	10 (14)/-	15 (21)/20	20 (54)/-	20 (54)/-	25 (68)/24	-	-	-
3 (4,8)	7,5 (11)	10 (14)/-	-	15 (21)/-	10 (14)/-	15 (17)/-	20 (22)/25	30 (40)/-	30 (40)/-	40(52)/50	-	-	-
5 (6,1)	7,5 (9)	10 (11)/-	15 (17)	20 (22)/-	15 (17)/-	15 (17)/17	20 (22)/25	30 (32)/32,5	40 (41)/50	50(52)/65	-	-	-

2	2	2	2	2	1,5	1,5	1,5	1,5	1	0,3	0,1	-	-
120	120	120	120	120	120	120	120	120	120	120	120	-	-
2x1,5-4	2x1,5-4	2x1,5-4	2x1,5-4	2x1,5-4	2x2,5-10	2x2,5-10	2x2,5-10	2x2,5-6	6-16	10-25	50-70 ¹	Terminals designed for cable lugs or copper bars suitable for bolts	
16-10	16-10	16-10	16-10	16-10	16-8	16-8	16-8	14-8	10-6	10-3	1/0-2/0	-	-
2x1,5-6	2x1,5-6	2x1,5-6	2x1,5-6	2x1,5-6	2x2,5-16	2x2,5-16	2x2,5-16	2x4-10	10-25	10-25	16-35	-	-
M3,5	M3,5	M3,5	M3,5	M3,5	M4	M4	M4	M5	2xM5	M8	M10	M12x20	M16x25
1	1	1	1	1	1,2	1,2	1,2	2,8	2,8	2,8	23	40	98
00/20	00/20	00/20	00/20	00/20	00/20	00/20	00/20	00	00	00	00	00	00

-25 ÷ +55

-30 ÷ +70

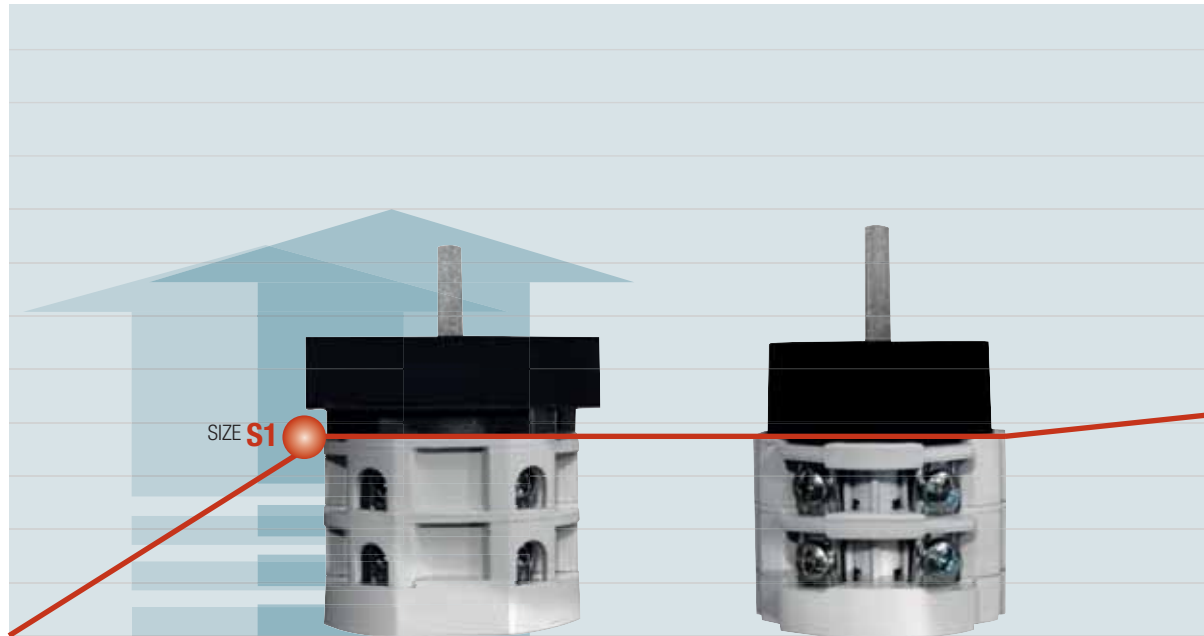
parte 2-78

parte 2-30

New

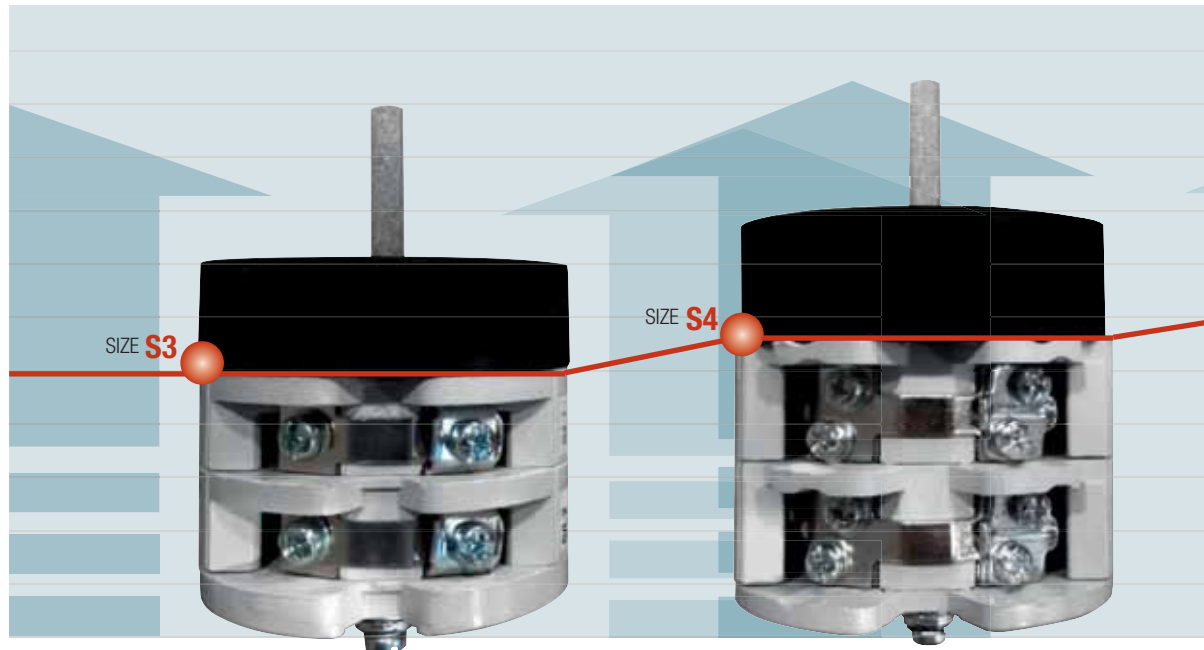
Notes: ¹ = Terminals for M10 bolts ² = CSA at 300V ³ = for use similar to the category AC20 ⁴ = UR approval ⁵ = at 500V

■ CR/CA 012...630 dimensions



■ CR 012/033

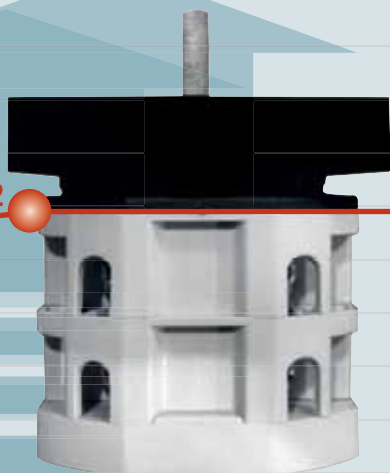
■ CA 012/033



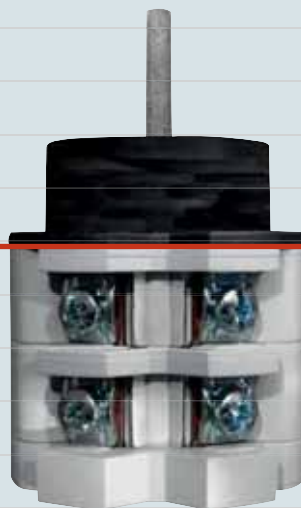
■ CA 050

■ CA 063

SIZE **S2**

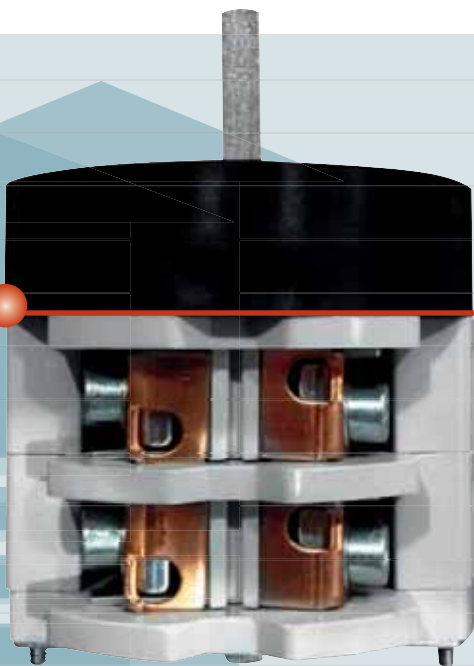


■ CR 025/040



■ CA 025/040

SIZE **S5**



■ CA 100

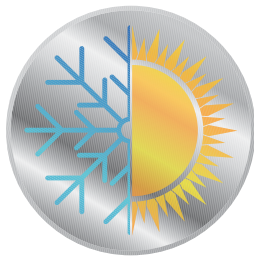
SIZE **S6**



■ CA 200-400-630

Ambient conditions

- Designed to withstand very severe conditions of use
- Operating ambient temperature $-25^{\circ}\text{C} \div +55^{\circ}\text{C}$
- Storage ambient temperature $-30^{\circ}\text{C} \div +70^{\circ}\text{C}$
- Withstand to constant humid
- Withstand to cyclic humid
- According to IEC 60068



Bremas is able to meet any application requirement through the use of special materials, such as stainless steel, metal alloys and plastics even in environments which demands for specific construction requirements (eg. UV resistance, higher self-extinguishing degree, higher mechanical strength etc.).

International standards and approvals

Country	USA / Canada	Canada	China	UK	Germany	Switzerland	Denmark	Norway	Sweden	Finland	Austria	Great Britain	IEC International electrical Commission	Technischer Überwachungs-Verein	Istituto Italiano del Marchio di Qualità
Authority	UL investigated according to CSA	CSA International	China Compulsory Certificate		Verband Deutscher Elektrotechniker	Schweizerischer Elektrotechnischer Verein	Danmarks Elektriske Materielkontrol	Norges Elektriske Materielkontrol	Svenska Elektriske Materielkontroll-anstalten	Sähkötar-kastuskeskus	Österreichischer Verband für Elektrotechnik	British Standards Institution	IEC International electrical Commission	Technischer Überwachungs-Verein	Istituto Italiano del Marchio di Qualità
Mark of standard					VDE 0660							BS EN 60947 ⁽¹⁾	IEC 60947 ⁽²⁾		
CA012	•			•	+	+	+	+	+	+	+	+	+		
CA016	•			•	+	+	+	+	+	+	+	+	+		
CA020	•			•	+	+	+	+	+	+	+	+	+	•	•
CA026	•			•	+	+	+	+	+	+	+	+	+	•	
CA033	•			•											
CA025	•			•	+	+	+	+	+	+	+	+	+		
CA032	•			•	+	+	+	+	+	+	+	+	+		
CA040	•			•	+	+	+	+	+	+	+	+	+		•
CA050	•			•	+	+	+	+	+	+	+	+	+		
CA063	•	•		•	+	+	+	+	+	+	+	+	+		
CA100	•	•		•	+	+	+	+	+	+	+	+	+		
CA200		•		•	+	+	+	+	+	+	+	+	+		
CA400		•		•	+	+	+	+	+	+	+	+	+		
CA630		•		•	+	+	+	+	+	+	+	+	+		
CQ012	•		•	•	+	+	+	+	+	+	+	+	+		
CQ016	•		•	•	+	+	+	+	+	+	+	+	+		
CQ025				•	+	+	+	+	+	+	+	+	+		
CQ032				•	+	+	+	+	+	+	+	+	+		
CR012	•		•	•	+	+	+	+	+	+	+	+	+		
CR016	•		•	•	+	+	+	+	+	+	+	+	+		
CR020	•		•	•	+	+	+	+	+	+	+	+	+	•	•
CR026	•		•	•	+	+	+	+	+	+	+	+	+	•	
CR033	•		•	•											
CR025	•		•	•	+	+	+	+	+	+	+	+	+		
CR032	•		•	•	+	+	+	+	+	+	+	+	+		
CR040	•		•	•	+	+	+	+	+	+	+	+	+		•

• Approved + conforms to requirements * Pending ⁽¹⁾ on request, available in certified version EN 61058


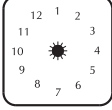
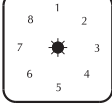
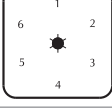
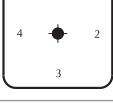
Note:

- 1) UL Approval File E101686
- 2) CSA Approval File 039540-0-000
- 3) It is not required to bear a symbol but switches must conform to requirements.
- 4) IEC does not operate an approval diagram



Switching angles

The range of Bremas solution include more than 10.000 electrical diagrams, characterized by different switching angles, number of positions as well as specific customer requirements:

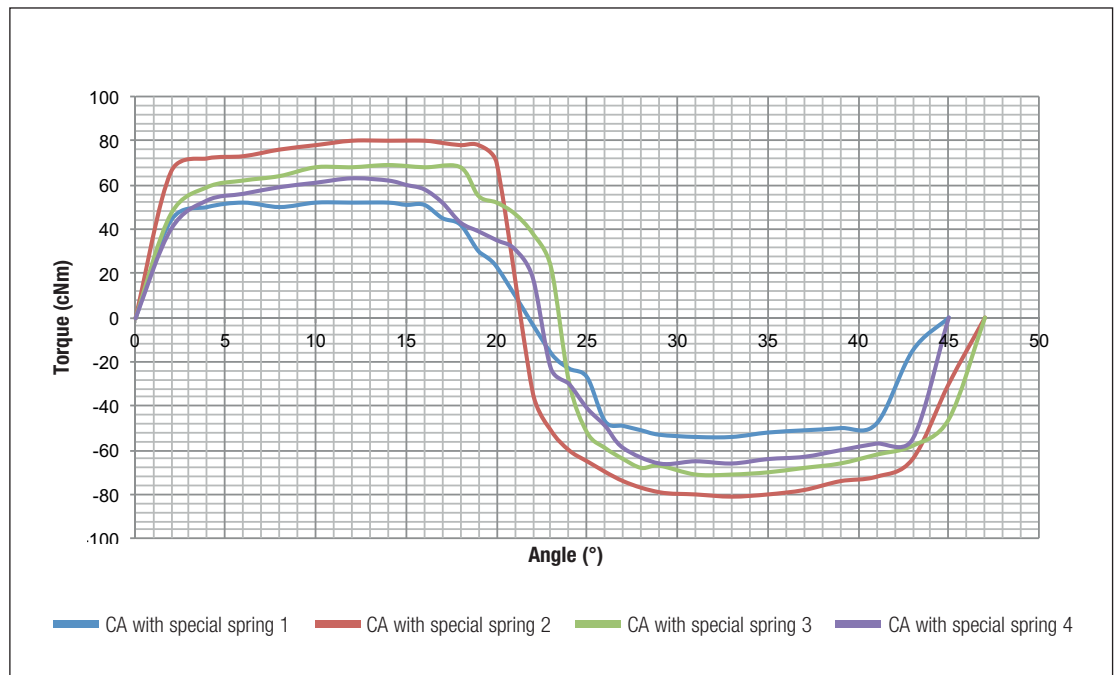
Switching angles	Number of positions	
22,5°	16	
30°	12	
45°	8	
60°	6	
90°	4	

Latching Torque

The Bremas switching system allows the best performances in every application. Its modular design allows to develop customized solution with different latching torques.

Any special requirement can be fulfilled by using different combinations of components such as:

- Springs with different resistances
- Cursors
- Latching mechanism
- Cams
- Shafts



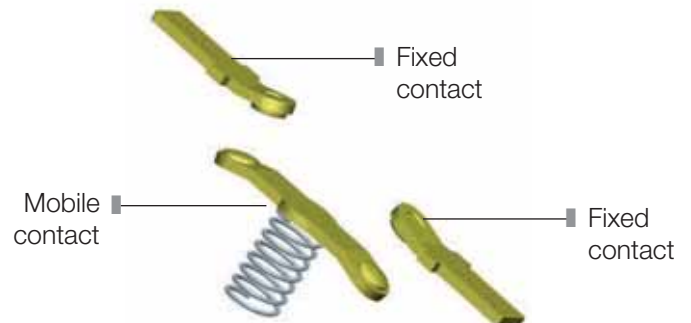
Comparison of latching torques between some switches with special springs.

Contacts

- Copper contacts
- Silver alloy pads
- Double break with positive opening
- Long electrical life (over 1.000.000 electrical cycles)
- Gold contacts for low voltage signals control
- Sliding and self-cleaning contacts for occasional maneuvers

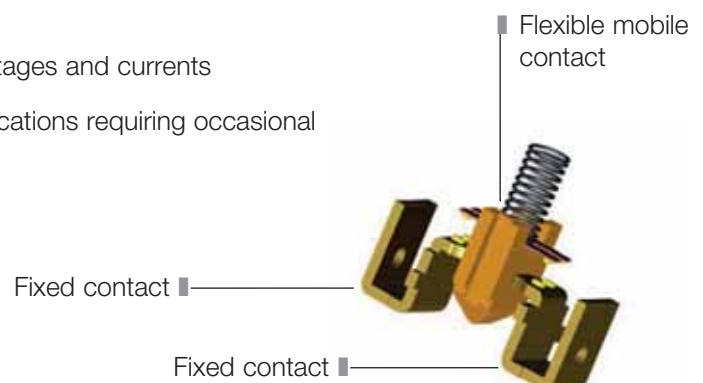
■ Standard contact system (optional gold contacts)

- Consists of fixed contacts, connected to the terminals, and mobile contacts controlled by springs, cursors and cams
- In the standard configuration, there are a spring and a cursor for each mobile contact
- For special configurations, can be used more springs and cursors for each mobile contact



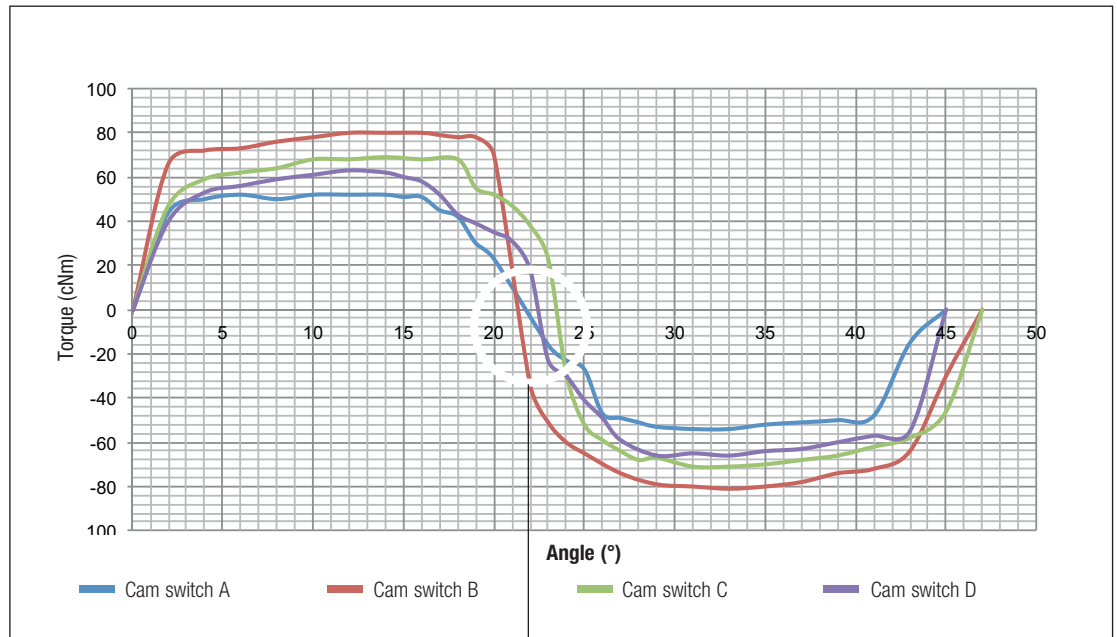
■ Sliding and self-cleaning contacts system (optional gold contacts)

- Consists of fixed contacts, connected to the terminals, and mobile contacts controlled by springs, cursors and cams
- High reliability even at low voltages and currents
- Specifically designed for applications requiring occasional maneuvers

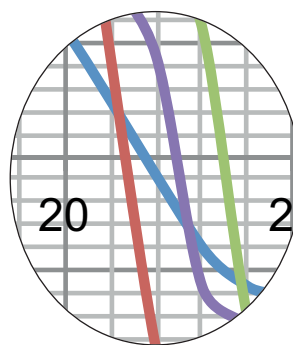


Precision of the latching and the contacts closure

- High precision in the latch: $\pm 3^\circ$
- High precision in the closure of the contacts: $\pm 4^\circ$



Comparison between the latch of some cam switches with switching angle 45°.



Latching precision $\pm 3^\circ$

Terminals for cables connection

■ Different types of terminals for cables connection:



■ Screw connection
Standard Solution



■ Single faston at 90°



■ Double faston at 90°



■ Alternating faston



■ Single faston at 135°

■ Additional features of the terminals for cables connection:



■ **CR series**
Captive plus-minus terminal screws



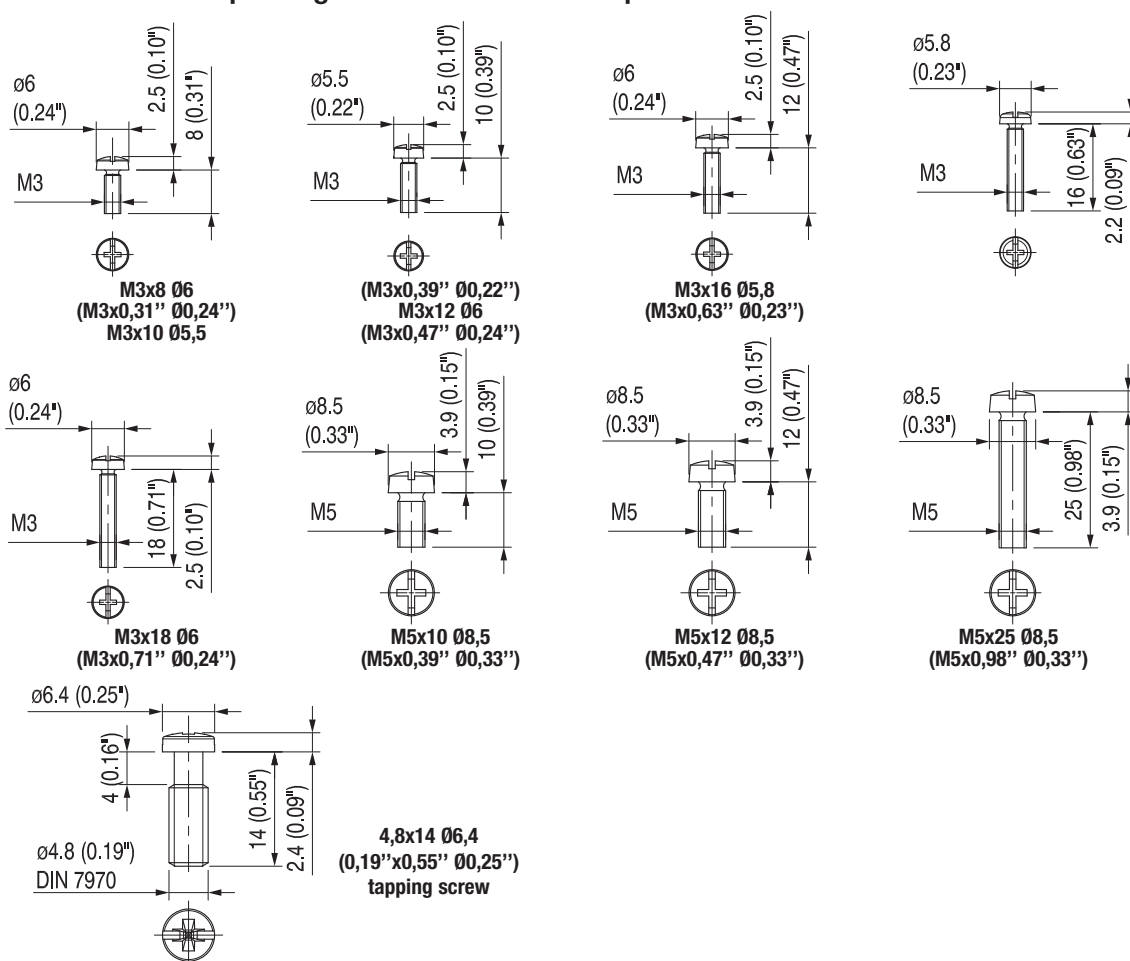
■ **CA series**
Terminal with self raising plate and captive screws

Fixing screws

All Bremas switches are equipped with fixing screws and, upon request, with knobs and/or plates. Different types and sizes of fixing screws can be supplied on request.

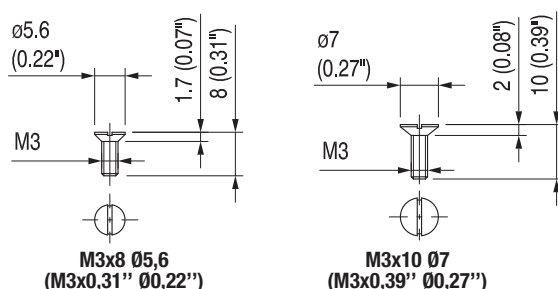
■ Cylinder head (convex):

- Cross head (for Philips and slot screwdrivers)
- Can be used depending on the thickness of the panel where the cam switch will be fixed



■ Countersunk head:

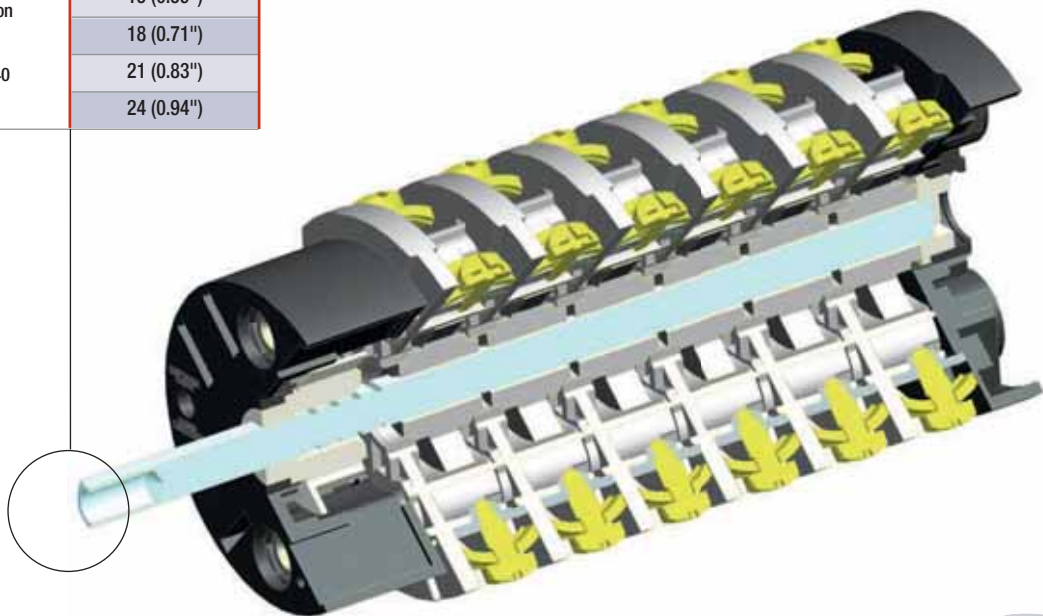
- Single slot (for slot screwdrivers)
- Can be used when is necessary that the screw head does not protrude from the panel where the cam switch will be fixed



Metal control shafts

- Steel made with galvanic treatment;
- Passing through all the contact elements of the switch;
- High quality construction and high resistance to bending and torsion;
- They ensure the simultaneous perfect closing and opening of the contacts;
- Section of the control shaft determined by the size and by the power of the switch.

	mm (in)
Standard protrusion	15 (0.59")
CR/CA	18 (0.71")
012...040	21 (0.83")
	24 (0.94")



Size	Type	Section of the control shaft
S1/S2	CR/CA 012/051	Q5*
S3/S4	CA 050/063	Q7
S5/S6	CA 100/630	Q10

*Q6 on request

Metal rods

- Steel made with galvanic treatment;
- Passing through all the contacts elements of the switch;
- Ensure the solid construction of the cam switch;
- They ensure the simultaneous perfect closing and opening of the contacts;
- Guarantee a high mechanical resistance to the torsion and, consequently, avoid short circuits between the various phases during the transition from one position to another of the switch (especially when there are many contact elements);
- Special rods achievable for specific customer requirements.



Plastic material

- Body of the cam switch made with self-extinguishing plastic, which guarantees safety even in emergency conditions:
- High precision components made of special plastic materials;
- UL approval with characteristics required for:
 - Flammability class
 - HWI (Hot Wire Ignition)
 - HAI (High-Amp Arc Ignition)
 - CTI (Comparative Tracking Index)

The choice of the plastic material type used for the construction of the Bremas cam switches depends on the application and on customer needs.

■ Self-extinguishing class

	V0	V2
Total time of flaming combustion for each group of samples.	< 50 s	< 250 s
Residual combustion time plus persistence time of the incandescence for each sample, after the second application of the flame.	< 30 s	< 60 s
Residual combustion time for each of the samples after the removal of the flame.	< 10 s	< 30s
Ignition of cotton wool by incandescent drops (drip).	NO	NO
Complete burning of the sample.	NO	NO

Stainless steel solutions

Specific applications require products with particular characteristics in terms of **mechanical** and **weathering strength**.

Bremas cam switches can be made with Stainless Steel components:

- Control shaft
- Rods
- Terminal plates
- Shaft brake disk of the control shaft
- Nuts
- Terminal screws for cable connections
- Product fixing screws
- Knob fixing screws

Other
solutions for
special
applications

■ Quick connection terminals (faston connection)

- Faston with angle to customer specification



■ Coaxial cam switches

Obtained by coupling
2 different sizes



■ Key selector switch

Device for mounting on single hole
Ø22mm (0.87") with key



■ With undervoltage release

Security electromagnet that allows, in case of power failure, an automatic return in "0" position of the switch, thus interrupting the circuit power supply.



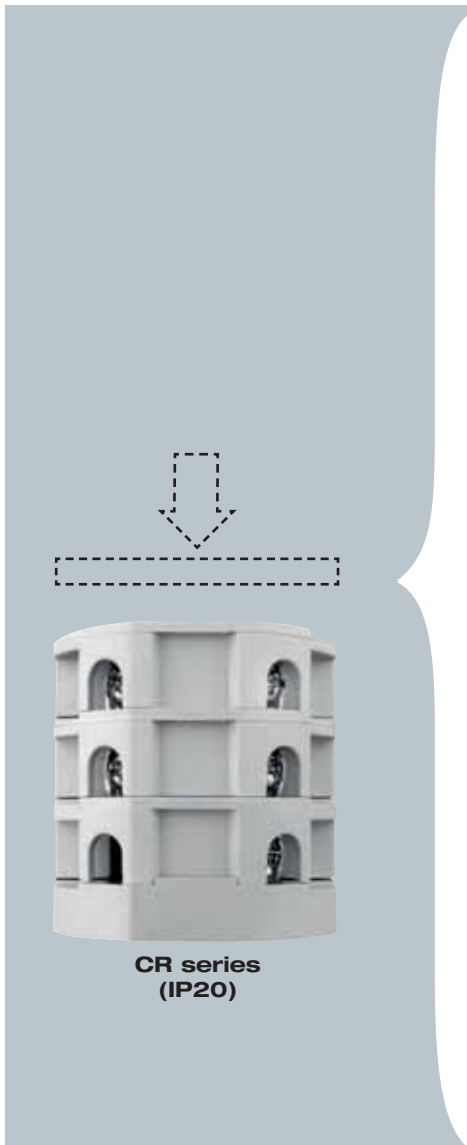
Custom terminals

- Protruding to the switch, for rear mounting version



Latching
mechanism
CA/CR
012...040

■ Latching mechanism in 3 different interchangeable fixing housing



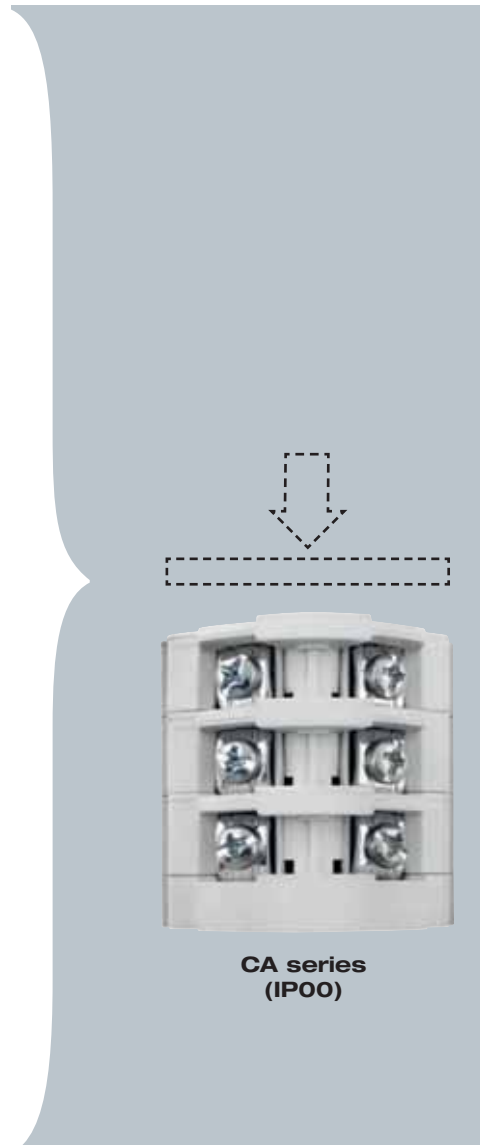
square - 48x48 mm
(1.89"x1.89")




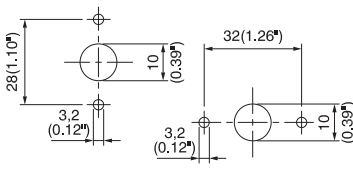

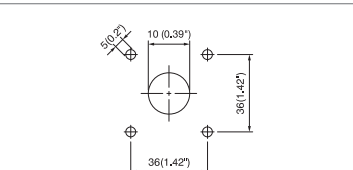

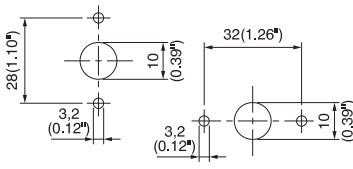

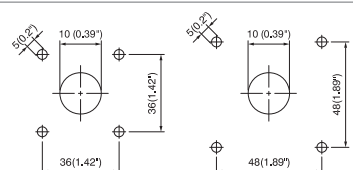

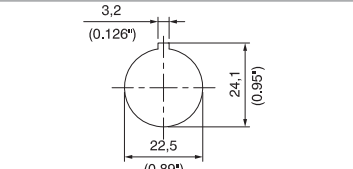

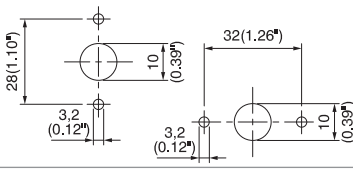



square - 60x60 mm
(2.36"x2.36")



round - Ø 40 mm
(1.57")



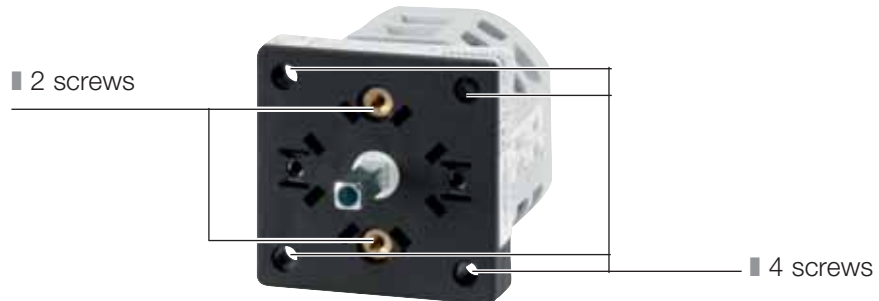
**Latching mechanism
CA/CR
012...040**

Type	Model	Dimensions	Product	Holes	Drilling template
Fixing housing CR/CA 012...040	Square	48x48 mm (1.89"x1.89")		2 holes, 28mm (1.10") verticals 2 holes 32mm (1.26") horizontals (optional)	
				4 holes, 36x36mm (1.42"x1.42")	
		60x60 mm (2.36"x2.36")		2 holes, 28mm (1.10") verticals 2 holes, 32mm (1.26") horizontals (optional)	
				4 holes, 36x36mm (1.42"x1.42") 4 holes, 48x48mm (1.89"x1.89")	
	Round	Ø22 mm (0.87")		1 holes, Ø22mm (0.87")	
		Ø40 mm (1.57")		2 holes, 28mm (1.10") verticals 2 holes, 32mm (1.26") horizontals (optional)	
Fixing adapter	T	Ø40 mm (1.57")		2 holes, 30mm (1.18") verticals 2 holes, 32mm (1.26") verticals 2 holes, 30mm (1.18") horizontals 2 holes, 32mm (1.26") horizontals	
	Q1	48x48 mm (1.89"x1.89")		2 holes, 34mm (1.34") verticals 2 holes, 40mm (1.57") verticals 2 holes, 34mm (1.34") horizontals 2 holes, 40mm (1.57") horizontals 2 holes, 20x35mm (0.79"x1.38") diagonals	
	Q2			2 holes, 32mm (1.26") verticals 2 holes, 40mm (1.57") verticals 2 holes, 32mm (1.26") horizontals 2 holes, 40mm (1.57") horizontals 2 holes, 12,2x30mm (0.48"x1.18") diagonals	

The fixing adapter in the table are useful in case of particular fixing requirements; they enclose the most known and used types of fixing on the market.

Fixing types

■ Rear mounting:



■ Base mounting:

Body

- 2 Screws
- DIN rail

Plates and handles

- 2 screws
- 4 screws
- Quick fixing Ø22



**CR/CA
012...040
protections**

- Protections in PVC
- Different diameters for an easy connection even in case of multiple cables and bigger sections

CA/CR 012...026



Ø 48mm (1.89")



Ø 53mm (2.09")



Ø 56mm (2.20")

CA/CR 025...040



Ø 58mm (2.28")



Ø 70,5mm (2.78")

Standard solutions

In addition to solutions made to customer specifications, Bremas offers a complete range of standard products.

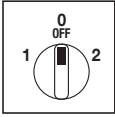

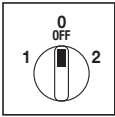
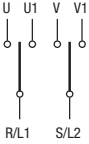
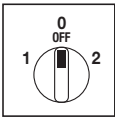
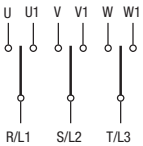
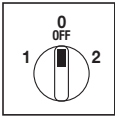
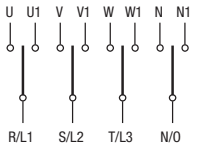
Standard products are designed and developed in line with the most common requirements from the market.




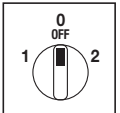
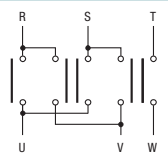

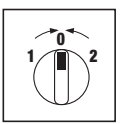
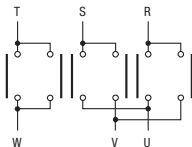
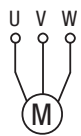
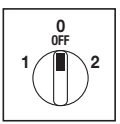
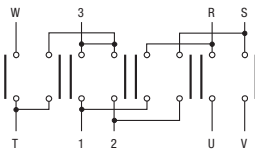
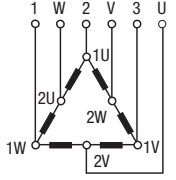
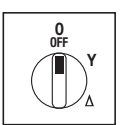
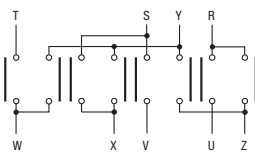
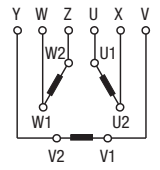
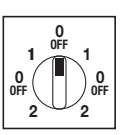
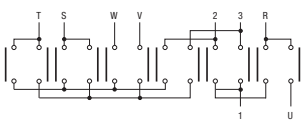
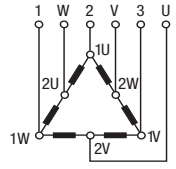
Circuit diagrams

cam switches


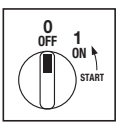
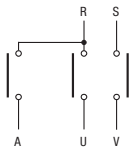
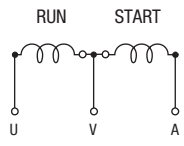
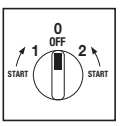
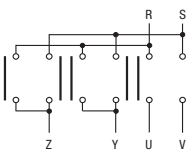
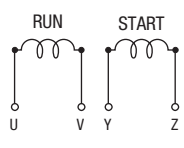
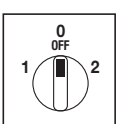
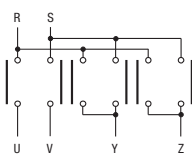
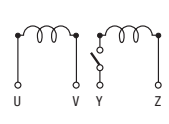
Switches																														
plate	diagram	function	circuit diagram	contact/element description	element no.																									
	0001	ON-OFF switch 1 pole		<table border="1"> <tr><td></td><td>0</td><td></td><td></td><td>CR</td><td></td></tr> <tr><td></td><td>1</td><td>X</td><td></td><td>CA</td><td>60°</td></tr> <tr><td>Contact</td><td></td><td>1</td><td>3</td><td>CQ</td><td></td></tr> <tr><td>Element</td><td></td><td>1</td><td>4</td><td>Angle</td><td></td></tr> </table>		0			CR			1	X		CA	60°	Contact		1	3	CQ		Element		1	4	Angle		1	
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Element		1	4	Angle																										
	0002	ON-OFF switch 2 pole		<table border="1"> <tr><td></td><td>0</td><td></td><td></td><td>CR</td><td></td></tr> <tr><td></td><td>1</td><td>X</td><td>X</td><td>CA</td><td>60°</td></tr> <tr><td>Contact</td><td></td><td>1</td><td>3</td><td>CQ</td><td></td></tr> <tr><td>Element</td><td></td><td>2</td><td>4</td><td>Angle</td><td></td></tr> </table>		0			CR			1	X	X	CA	60°	Contact		1	3	CQ		Element		2	4	Angle		1	
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	0003	ON-OFF switch 3 pole		<table border="1"> <tr><td></td><td>0</td><td></td><td></td><td>CR</td><td></td></tr> <tr><td></td><td>1</td><td>X</td><td>X</td><td>CA</td><td>60°</td></tr> <tr><td>Contact</td><td></td><td>1</td><td>3</td><td>CQ</td><td></td></tr> <tr><td>Element</td><td></td><td>2</td><td>4</td><td>Angle</td><td></td></tr> </table>		0			CR			1	X	X	CA	60°	Contact		1	3	CQ		Element		2	4	Angle		2	
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Element		2	4	Angle																										
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	1	X	X	CA	60°																									
Contact		1	3	CQ																										
Element		2	4	Angle																										
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Element		2	4	Angle																										
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	1	X	X	CA	90°																									
Contact		1	3	CQ																										
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Switches																																																																							
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	0005	Change-over switch 1 pole		<table border="1"> <tr><td></td><td>2</td><td></td><td>×</td><td></td><td>CR</td><td rowspan="3">60°</td></tr> <tr><td></td><td>0</td><td></td><td></td><td></td><td>CA</td></tr> <tr><td></td><td>1</td><td></td><td>×</td><td></td><td>CQ</td></tr> <tr><td>Contact</td><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>Angle</td></tr> <tr><td>Element</td><td></td><td>1</td><td></td><td></td><td></td><td></td></tr> </table>		2		×		CR	60°		0				CA		1		×		CQ	Contact		1	2	3	4	Angle	Element		1					1																																	
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	0006	Change-over switch 2 pole		<table border="1"> <tr><td></td><td>2</td><td></td><td>×</td><td></td><td>×</td><td>CR</td><td rowspan="3">60°</td></tr> <tr><td></td><td>0</td><td></td><td></td><td></td><td></td><td>CA</td></tr> <tr><td></td><td>1</td><td></td><td>×</td><td></td><td>×</td><td>CQ</td></tr> <tr><td>Contact</td><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>Angle</td></tr> <tr><td>Element</td><td></td><td>1</td><td></td><td></td><td></td><td>2</td><td></td><td></td><td></td><td></td></tr> </table>		2		×		×	CR	60°		0					CA		1		×		×	CQ	Contact		1	2	3	4	5	6	7	8	Angle	Element		1				2					2																						
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	0007	Change-over switch 3 pole		<table border="1"> <tr><td></td><td>2</td><td></td><td>×</td><td></td><td>×</td><td>×</td><td>CR</td><td rowspan="3">60°</td></tr> <tr><td></td><td>0</td><td></td><td></td><td></td><td></td><td></td><td>CA</td></tr> <tr><td></td><td>1</td><td></td><td>×</td><td></td><td>×</td><td>×</td><td>CQ</td></tr> <tr><td>Contact</td><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>Angle</td></tr> <tr><td>Element</td><td></td><td>1</td><td></td><td></td><td></td><td>2</td><td></td><td></td><td></td><td>3</td><td></td><td></td><td></td><td></td></tr> </table>		2		×		×	×	CR	60°		0						CA		1		×		×	×	CQ	Contact		1	2	3	4	5	6	7	8	9	10	11	12	Angle	Element		1				2				3					3											
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	0039	Change-over switch 4 pole		<table border="1"> <tr><td></td><td>2</td><td></td><td>×</td><td></td><td>×</td><td>×</td><td>×</td><td>CR</td><td rowspan="3">60°</td></tr> <tr><td></td><td>0</td><td></td><td></td><td></td><td></td><td></td><td></td><td>CA</td></tr> <tr><td></td><td>1</td><td></td><td>×</td><td></td><td>×</td><td>×</td><td>×</td><td>CQ</td></tr> <tr><td>Contact</td><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>Angle</td></tr> <tr><td>Element</td><td></td><td>1</td><td></td><td></td><td></td><td>2</td><td></td><td></td><td></td><td>3</td><td></td><td></td><td></td><td>4</td><td></td><td></td><td></td><td></td></tr> </table>		2		×		×	×	×	CR	60°		0							CA		1		×		×	×	×	CQ	Contact		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Angle	Element		1				2				3				4					4
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Motor control switches 3 phase

plate	diagram	function	circuit diagram	contact/element description	 element no.																																																																							
	0008	Reversing switch 3 pole		<table border="1"> <tr> <td>2</td> <td></td> <td>XX</td> <td>XX</td> <td></td> <td>CR</td> <td rowspan="3">60°</td> </tr> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td>CA</td> </tr> <tr> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td>CQ</td> </tr> <tr> <td>Contact</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> <td>11</td> <td>12</td> <td>Angle</td> </tr> <tr> <td>Element</td> <td>1</td> <td>2</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	2		XX	XX		CR	60°	0					CA	1					CQ	Contact	1	2	3	4	5	6	7	8	9	10	11	12	Angle	Element	1	2	3											 3																								
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	0036	Reversing switch 3 pole with spring return to "off"		<table border="1"> <tr> <td>2</td> <td></td> <td>XX</td> <td>XX</td> <td></td> <td>CR</td> <td rowspan="3">45°</td> </tr> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td>CA</td> </tr> <tr> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td>CQ</td> </tr> <tr> <td>Contact</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> <td>11</td> <td>12</td> <td>Angle</td> </tr> <tr> <td>Element</td> <td>1</td> <td>2</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	2		XX	XX		CR	45°	0					CA	1					CQ	Contact	1	2	3	4	5	6	7	8	9	10	11	12	Angle	Element	1	2	3											 3																								
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	0009	Changing switch Dahlander pole		<table border="1"> <tr> <td>2</td> <td>X</td> <td>XX</td> <td>XX</td> <td>XX</td> <td>CR</td> <td rowspan="3">60°</td> </tr> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td>CA</td> </tr> <tr> <td>1</td> <td></td> <td>X</td> <td>XX</td> <td>XX</td> <td>CQ</td> </tr> <tr> <td>Contact</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> <td>11</td> <td>12</td> <td>13</td> <td>14</td> <td>15</td> <td>16</td> <td>Angle</td> </tr> <tr> <td>Element</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	2	X	XX	XX	XX	CR	60°	0					CA	1		X	XX	XX	CQ	Contact	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Angle	Element	1	2	3	4														 4																
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	0011	Reversing switch Pole changing		<table border="1"> <tr> <td>2</td> <td>X</td> <td>XX</td> <td>XX</td> <td>XX</td> <td>CR</td> <td rowspan="3">45°</td> </tr> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td>CA</td> </tr> <tr> <td>1</td> <td>X</td> <td>XX</td> <td>XX</td> <td>X</td> <td>CQ</td> </tr> <tr> <td>Contact</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> <td>11</td> <td>12</td> <td>13</td> <td>14</td> <td>15</td> <td>16</td> <td>17</td> <td>18</td> <td>19</td> <td>20</td> <td>21</td> <td>22</td> <td>23</td> <td>24</td> <td>Angle</td> </tr> <tr> <td>Element</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	2	X	XX	XX	XX	CR	45°	0					CA	1	X	XX	XX	X	CQ	Contact	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Angle	Element	1	2	3	4	5	6																				 6
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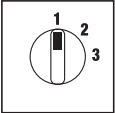
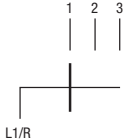
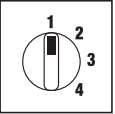
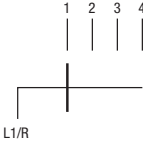
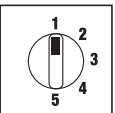
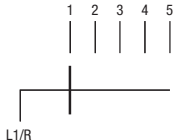
Motor control switches single phase

plate	diagram	function	circuit diagram	contact/element description	 element no.																																												
	0031	Switch single-phase motor + aux phase		<table border="1"> <tr> <td>Avv</td> <td>X</td> <td>XX</td> <td>XX</td> <td>CR</td> <td rowspan="3">45°</td> </tr> <tr> <td>1</td> <td></td> <td></td> <td></td> <td>CA</td> </tr> <tr> <td>0</td> <td></td> <td></td> <td></td> <td>CQ</td> </tr> <tr> <td>Contact</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>Angle</td> </tr> <tr> <td>Element</td> <td>1</td> <td>2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	Avv	X	XX	XX	CR	45°	1				CA	0				CQ	Contact	1	2	3	4	5	6	7	8	Angle	Element	1	2								 2								
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	0032	Reversing Switch single-phase motor + aux phase		<table border="1"> <tr> <td>Avv</td> <td>XX</td> <td>XX</td> <td>XX</td> <td>CR</td> <td rowspan="3">45°</td> </tr> <tr> <td>1</td> <td></td> <td></td> <td></td> <td>CA</td> </tr> <tr> <td>Avv</td> <td>X</td> <td>XX</td> <td>XX</td> <td>CQ</td> </tr> <tr> <td>Contact</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> <td>11</td> <td>12</td> <td>Angle</td> </tr> <tr> <td>Element</td> <td>1</td> <td>2</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	Avv	XX	XX	XX	CR	45°	1				CA	Avv	X	XX	XX	CQ	Contact	1	2	3	4	5	6	7	8	9	10	11	12	Angle	Element	1	2	3											 3
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Element	1	2	3																																														
	0034	Reversing Switch single-phase motor + centrif.		<table border="1"> <tr> <td>2</td> <td>XX</td> <td>XX</td> <td>CR</td> <td rowspan="3">45°</td> </tr> <tr> <td>0</td> <td></td> <td></td> <td>CA</td> </tr> <tr> <td>1</td> <td>XX</td> <td>X</td> <td>CQ</td> </tr> <tr> <td>Contact</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> <td>11</td> <td>12</td> <td>Angle</td> </tr> <tr> <td>Element</td> <td>1</td> <td>2</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	2	XX	XX	CR	45°	0			CA	1	XX	X	CQ	Contact	1	2	3	4	5	6	7	8	9	10	11	12	Angle	Element	1	2	3											 3			
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Voltmeter & Ammeter switches

plate	diagram	function	circuit diagram	contact/element description	element no.																																																																																																																																																																																												
	0016	Voltmeter switch 3 concatenated voltages		<table border="1"> <tr> <td>L3-L1</td> <td>X</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>CR</td> <td></td> </tr> <tr> <td>L2-L3</td> <td></td> <td></td> <td></td> <td>X</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>CA</td> <td>45°</td> </tr> <tr> <td>L1-L2</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>CQ</td> <td></td> </tr> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Contact</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Angle</td> </tr> <tr> <td>Element</td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	L3-L1	X	X																CR		L2-L3				X	X													CA	45°	L1-L2	X					X												CQ		0																				Contact	1	2	3	4	5	6	7	8											Angle	Element		1																			2																																																																			
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	MZ24	Multi step switch with OFF 2 pole 4 steps		<table border="1"> <tr><td>4</td><td></td><td></td><td></td><td>X</td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR</td></tr> <tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td>X</td><td>X</td><td></td><td></td><td></td><td></td><td>X</td><td>CA 45°</td></tr> <tr><td>2</td><td></td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CQ</td></tr> <tr><td>1</td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>X</td><td></td><td></td></tr> <tr><td>0</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>Contact</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>Angle</td></tr> <tr><td>Element</td><td>1</td><td>2</td><td>3</td><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>	4				X	X								CR	3						X	X					X	CA 45°	2		X											CQ	1	X										X			0														Contact	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Angle	Element	1	2	3	4														4											
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	MZ33	Multi step switch with OFF 3 pole 3 steps		<table border="1"> <tr><td>3</td><td>X</td><td></td><td></td><td></td><td>X</td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR</td></tr> <tr><td>2</td><td></td><td></td><td></td><td>X</td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>X</td><td>CA 45°</td></tr> <tr><td>1</td><td></td><td></td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>X</td><td>X</td><td></td><td></td><td></td><td>CQ</td></tr> <tr><td>0</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>Contact</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>Angle</td></tr> <tr><td>Element</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>	3	X				X	X											CR	2				X	X											X	CA 45°	1			X									X	X				CQ	0																		Contact	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Angle	Element	1	2	3	4	5																	5	
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