

PURCHASE SPECIFICATION
FOR
PROGRAMMABLE ROTARY CAM SWITCHES
FOR
OIL RIG APPLICATION



SPECIFICATION NO : OR 12360
REVISION NO : REV 00
DATE OF REVISION : 28.01.09

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BHARAT HEAVY ELECTRICALS LIMITED- BHOPAL

Specification for Programmable Rotary Cam Switches

01. Introduction

This specification covers the requirement of programmable rotary cam switches for use in generator control & motor field control for oil rig application. The switches should be suitable for operation at an ambient temperature of 55 degree C and high degree of saline atmospheric condition with relative humidity of 95% as applicable to oil rig application.

The specification includes following programmable switches.

Item No	Item Description	BHEL Style code
Item 01	Ammeter Selector Switch 5 Position, 9 Pole	BP9048095794
Item 02	Voltmeter Selector Switch 5 Position, 6 Pole	BP9048095808
Item 03	Governor / Engine Switch 3 Position, 9 Pole	BP9048095816
Item 04	Synchronizing Switch 2 Position, 6 Pole	Bp9048126657
Item 05	Field Supply Selector Switch 3 Position, 13 Pole	BP9048097444
Item 06	Hand-Off-Auto Switch 3 Position, 2 Pole	BP9048123089

02. General Requirement

The basic rotary cam switch assembly shall complete with contact block assembly, operator or handle and the legend plate. The number of contacts shall be as per attached annexures for switch program and data sheet. The switch assembly shall be flush type suitable for panel mounting. The operator or handles for these switches shall be suitable for single hole mounting for a 22mm diameter mounting hole. These operator or handles shall meet IP-65 protection category.

The contact assembly shall be suitable for 240VAC & DC operation whereas general purpose current for the contact block shall be minimum 10A. The switches shall be stay put type with make before break contacts on changeover ie. the contact shall not open while switching from one position to another. The switch assembly to be supplied along with required legend marking as shown in respective annexures.

02. Brief description of Various Program Switches

1. **Item 01 : Ammeter Selector Switch**

The switch shall be type 9003 rotary cam switch of Square-D brand of M/s Group Schneider make. The switch is a 5 position, 9 pole program switch used in generator panels for selection of current reading in various phases ie. A, B or C phase. The switch assembly shall be complete with contact size K2I, operator handle type-KBD1C, 60mm x 60mm chrome bezel with black knob. The switching angle shall be 45 degree. The program for the switch is attached as an Annexure-1.

The switch assembly to be supplied along with required legend marking as shown in Annexure-1.

2. **Item 02 : Voltmeter Selector Switch**

The switch shall be type 9003 rotary cam switch of Square-D brand of M/s Group Schneider make. The switch is a 5 position, 6 pole program switch used in generator panels for selection of voltage reading between various phases ie. AB, BC or CA or Bus voltage. The switch assembly shall be complete with contact size K2F, operator handle type-KBD1C, 60mm x 60mm chrome bezel with black knob. The switching angle shall be 45 degree. The program for the switch is attached as an Annexure-2.

The switch assembly to be supplied along with required legend marking as shown in Annexure-2.

3. **Item 03 : Governor/ Engine Switch**

The switch shall be type 9003 rotary cam switch of Square-D brand of M/s Group Schneider make. The switch is a 3 position, 9 pole program switch used in generator panels for control of engine speed in idle & run mode. The switch assembly shall be complete with contact K2I, operator handle type-KBD1C, 60mm x 60mm chrome bezel with black knob. The switching angle shall be 45 degree. The program for the switch is attached as an Annexure-3.

The switch assembly to be supplied along with required legend marking as shown in Annexure-3.

4. **Item 04 : Synchronizing Switch**

The switch shall be type 9003 rotary cam switch of Square-D brand of M/s Group Schneider make. The switch is a 2 position, 6 pole program switch used in generator panels for synchronization of engine with main bus voltage & frequency. The switch assembly shall be complete with contact size K2F, Key operator type-KBD1S, 60mm x 60mm chrome bezel with key handle for locking facility. The key should be removable in any position. The switching angle shall be 45 degree. The program for the switch is attached as an Annexure-4.

The switch assembly to be supplied along with required legend marking as shown in Annexure-4.

5. **Item 05 : Field Supply Selector Switch**

The switch shall be type 9003 rotary cam switch of Square-D brand of M/s Group Schneider make. The switch is a 3 position, 13 pole program switch used in field panel for selection of A, A+B or B motor shunt field supply. The switch assembly shall be complete with contact size K2N, operator handle type-KBC1B, 45mm x 45mm chrome bezel with black knob. The switching angle shall be 45 degree. The program for the switch is attached as an Annexure-5.

The switch assembly to be supplied along with required legend marking as shown in Annexure-5.

6. **Item 06 : Hand-Off-Auto Selector Switch**

The switch shall be type 9003 rotary cam switch of Square-D brand of M/s Group Schneider make. The switch is a 3 position, 2 pole program switch used in field panel for selection of field supply in Hand or Auto mode. The switch assembly shall be complete with contact size K2B, operator handle type-KBC1B, 45mm x 45mm chrome bezel with black knob. The switching angle shall be 45 degree. The program for the switch is attached as an Annexure-6.

The switch assembly to be supplied along with required legend marking as shown in Annexure-6.

03. General Term & Conditions

01. All the items to be supplied as per delivery mentioned in delivery schedule. However, the delivery schedule should not be more than 10-12 weeks from the date of firm purchase order.
02. Packing: The item should be properly packed to avoid any kind of transit damage.
03. Supplier to provide warranty of 18 months from date of supply or 12 months from the date of commissioning against failure of any item/system due to design/manufacturing deficiencies or quality lapses.
04. The supplier shall furnish 3 sets of test & guarantee certificates for each item along with the supply.
05. All other terms & conditions shall be as per standard BHEL terms & conditions.

BHEL Specification No-OR12360

Push Buttons and Operator Interface Specifiers Guide
Class 9003, Type K - Rotary Cam Switch

Annexure - 1 to OR12360

Ammeter Selector Switch 5 Position 9 Pole

Customer	PO Number	PO NO.
Date		Qty

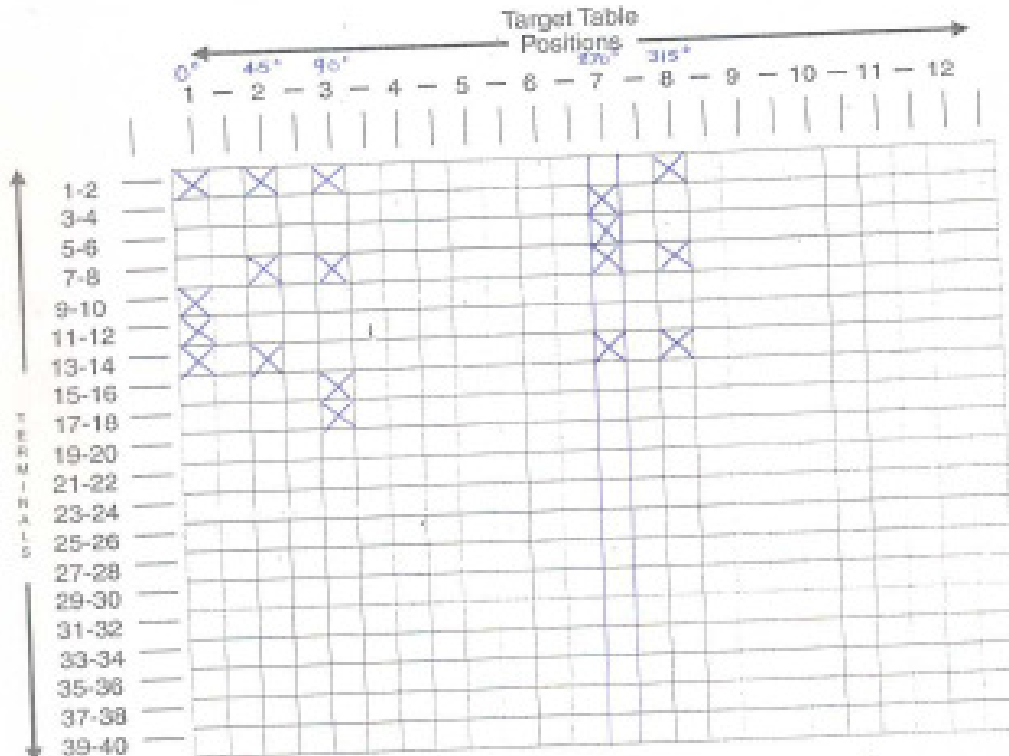
To order custom cam switches:

1. Indicate the contact size at right (900302-100).
2. Indicate desired switching angle at right, if the switching angle is not indicated, the factory will determine the angle from the recommended column of the table on right.
3. For the example on page 240, fill in target table below.
4. Indicate operator/handle type.
5. If operator/handle bezel has legend and legend marking is desired, indicate legend marking on back of this form.
6. If separate legend is required, indicate legend type on right and marking on back of this form.

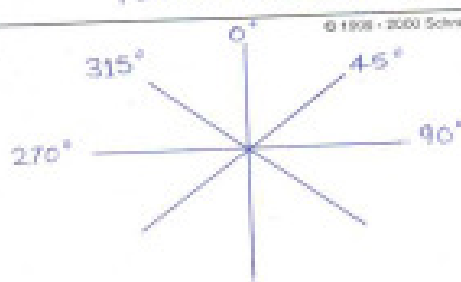
Switching Angle	Maximum Number of Positions	See Ordering Instructions at left
0°	4	P 2
45°	8	P 3
90°	8	P 4
180°	12	P 12

Contact size: Class 9003 Type: K 2 I
 Switching angle: 45°
 Operator/handle type: Class 9003 Type: KBDIC (60mm X 60mm)
 Separate legend: Class 9003 Type: _____

See page 240 for Target Table Explanation

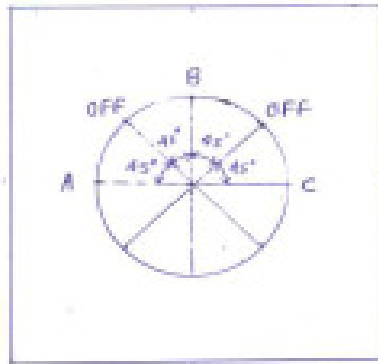


Note: - The Contact does not open while switching from one position to another (Switching Contact closed without break or changeover)



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Signature
 8/11/03
 श्रीमत् अशोक राजेश अग्रवाल
 प्रबंधक (अनुसंधान) (By Manager Research)
 कक्षा अभियांत्रिकी प्रयोगशाला
 Control Equipment Engineering Division
 BHEL, BHOPAL, INDIA



Legend Marking for operator bezel
for
Ammeter Selector Switch

BHEL Specification No - OR12360

Push Buttons and Operator Interface Specifiers Guide
Class 9003, Type K - Rotary Cam Switch

Annexure-2 to OR12360

Voltmeter Selector Switch 5 Position & Pole

Customer		No. 60	
Date	PO Number	Qty	

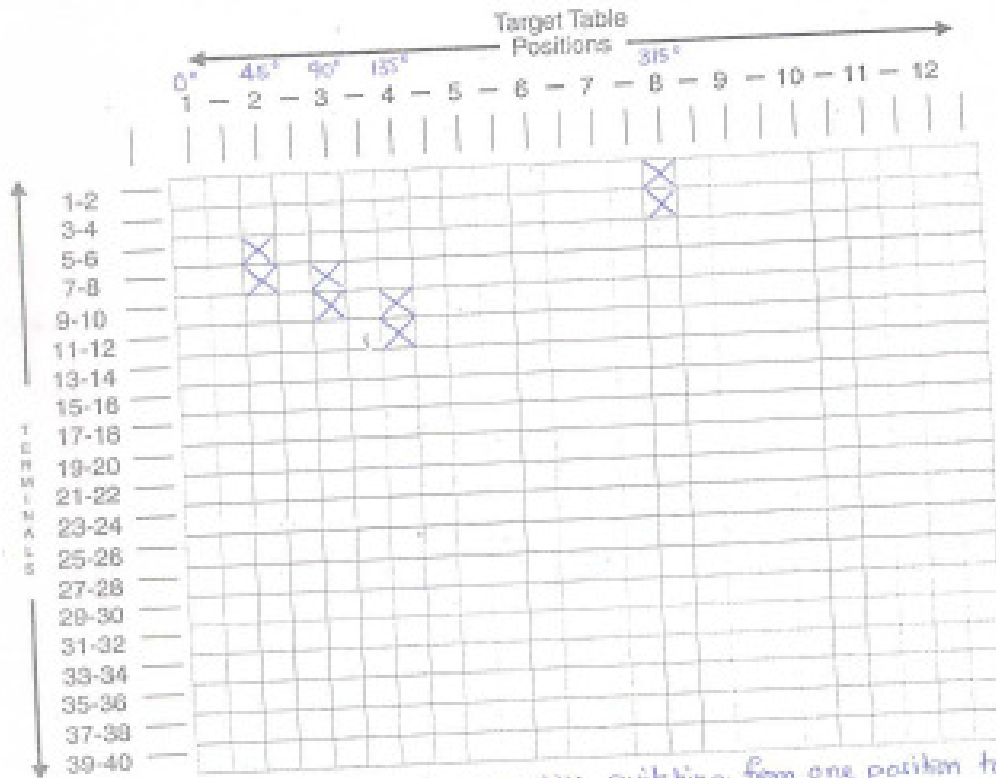
To order custom cam switches:

1. Indicate the contact size at right (9003K2-K3).
2. Indicate desired switching angle at right. If the switching angle is not indicated, the factory will determine the angle from the recommended column of the table on right.
3. Per the example on page 240, fill in target table below.
4. Indicate operator/handle type.
5. If operator/handle bezel has legend and legend marking is desired, indicate legend marking on back of this form.
6. If separate legend is required, indicate legend type on right and marking on back of this form.

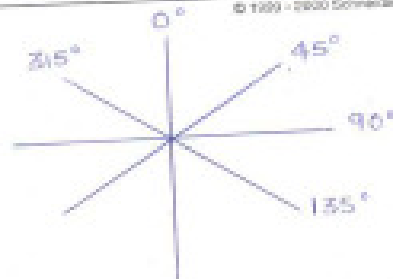
Switching Angle	Maximum Number of Positions	See Ordering Instructions at left
0°	4	0-3
45°	8	4-7
90°	8	8-11
135°	12	12-15

Contact size	Class 9003	Type	K2-F 45°
Switching angle	Class 9003	Type	KBDIC (60mm x 60mm)
Operator/handle type	Class 9003	Type	
Separate legend	Class 9003	Type	

See page 240 for Target Table Explanation

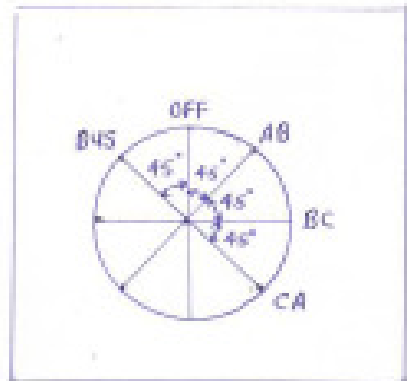


Note:- The Contacts does not open while switching from one position to another (switching contact closed without break on change over)



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Signature
 24/03/2023
 श्री अशोक राजेश आग्निवाल
 Sr. Officer (Design) / Dy. Manager (Design)
 Control Equipment Division
 BHEL, BHOPAL



Legend Marking for operator bezel
for
Voltmeter Selector Switch

Annexure-3 to OR12360 Governor Switch 3 position 9 Pole

Customer	FD. No.	
Date	FD. Number	Qty.

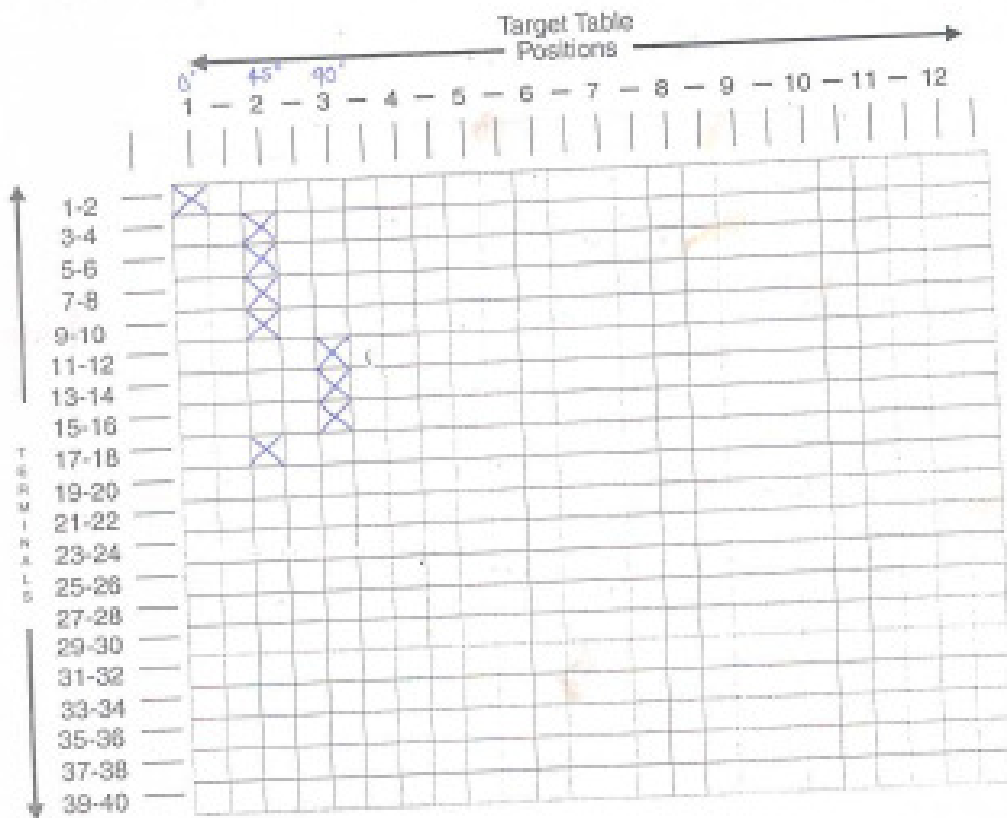
To order custom cam switches:

1. Indicate the contact size at right (9003K2-K8).
2. Indicate desired switching angle at right. If the switching angle is not indicated, the factory will determine the angle from the recommended column of the table on right.
3. For the example on page 240, fill in target table below.
4. Indicate operator/handle type.
5. If operator/handle base has legend and legend marking is desired, indicate legend marking on back of this form.
6. If separate legend is required, indicate legend type on right and marking on back of this form.

Switching Angle	Maximum Number of Positions	See Ordering Instructions at left
0°	4	2-3
45°	6	4-5
90°	8	6-7
180°	12	8-12

Contact size	Class 9003	Type	K2J
Switching angle		Type	45°
Operator/handle type	Class 9000	Type	K8BDC (60mm X 60mm)
Separate legend	Class 9001	Type	

See page 240 for Target Table Operation




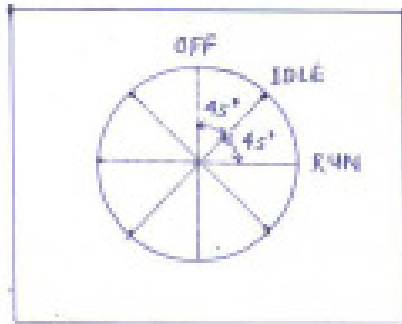
11/00

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 RAJESH AGRAWAL / RAJESH AGRAWAL
 RA (Sales / Services) / Dy. Manager (Design)
 Control Equipment Division
 40, P.O. Box, Gurgaon (Haryana), INDIA



Legend marking for operator bezel
for
Governor / Engine Switch

Annexure - 4
to
OR12360

Synchronous Switch, 2 Position, 6 Pole
With Key Operator

Push Buttons and Operator Interface Specifiers Guide
Class 9003, Type K - Rotary Cam Switch

Customer		P.O. No.	
Date		City	

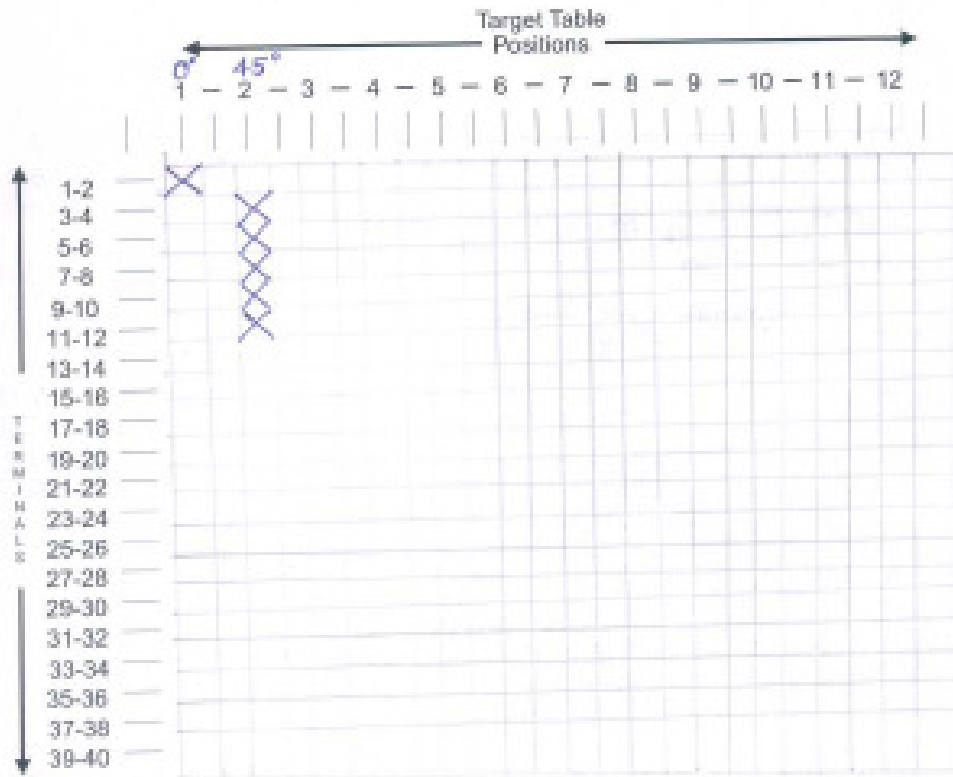
To order custom cam switches:

1. Indicate the contact size at right (9003K2-K05).
2. Indicate desired switching angle at right. If the switching angle is not indicated, the factory will determine the angle from the recommended column of the table on right.
3. For the example on page 240, fill in target table below.
4. Indicate operator handle type.
5. If operator handle base has legend and legend marking is desired, indicate legend marking on back of the form.
6. If separate legend is required, indicate legend type on right and marking on back of this form.

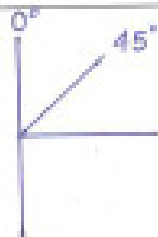
Switching Angle	Maximum Number of Positions	See Ordering Instructions at Right
15°	4	23
22.5°	6	24
30°	8	25
45°	12	26

Contact size	Class 900	Type	K 2E
Switching angle		Type	45°
Operator handle type	Class 9003	Type	KBD1S (45 mm x 45 mm)
Separate legend	Class 9003	Type	

See page 240 for Target Table Explanation



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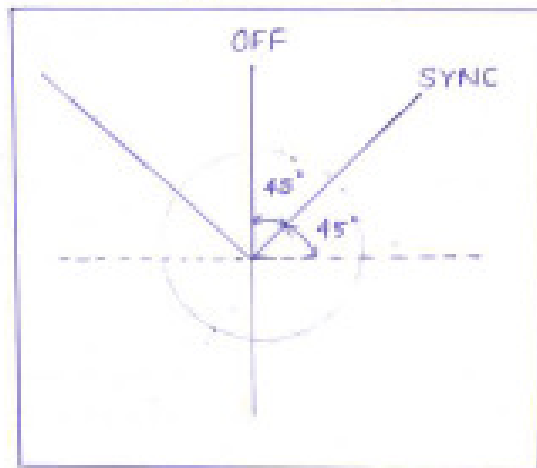


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Legend Marking:
for position - 1 → OFF
for position - 2 → SYNC

Legend Marking :



Legend marking for operator bezel
for
Synchronizing Switch

Customer	P.O. No.	
Date	P.O. Number	Qty

To order custom cam switches:

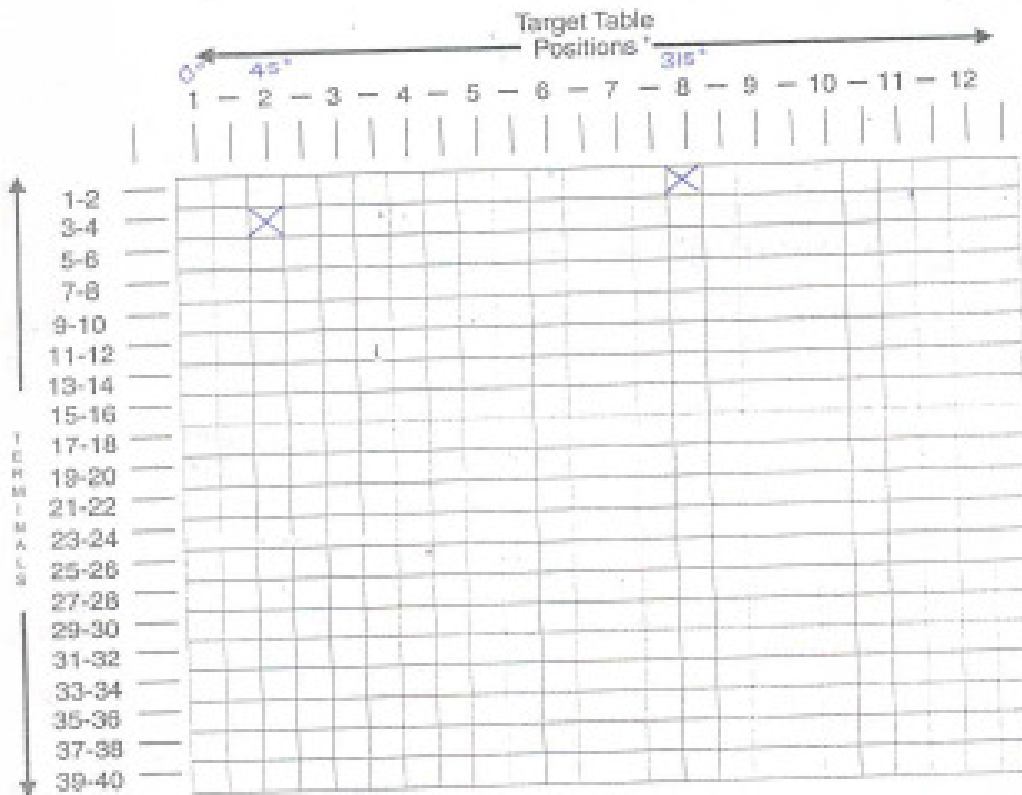
1. Indicate the contact size at right (000K0-K02).
2. Indicate desired switching angle at right. If the switching angle is not indicated, the factory will determine the angle from the recommended column of the table on right.
3. For the example on page 242, fill in target table below.
4. Indicate operator/handle type.
5. If operator/handle base has legend and legend marking is desired, indicate legend marking on back of this form.
6. If separate legend is required, indicate legend type on right and marking on back of this form.

Switching Angle	Maximum Number of Positions	See Ordering Instructions at Left
0°	4	2-3
30°	5	4-5
45°	6	6-7
90°	12	8-12

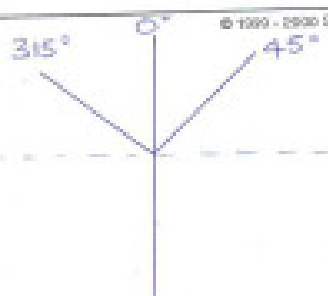
Contact size	Class 9003	Type	K2B
Switching angle		Type	45°
Operator/handle type	Class 9003	Type	KBC1B (45mm x 16mm)
Separate legend	Class 9003	Type	

Note - For legend marking refer back side of the form.

See page 242 for Target Table Representation



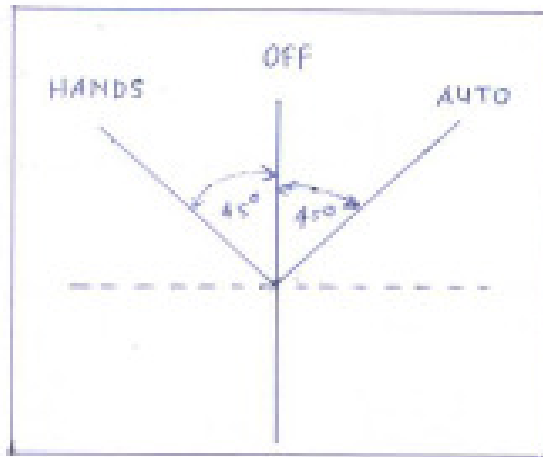
1103



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Rajesh
#1103

राजेश अग्रवाल / RAJESH AGRAWAL
Jr. In-charge (Software) / Jr. Manager (Design)
Control Equipment Engineering Division
BHEL, Bhopal



Legend marking for operator Bezel
for
HANDS-OFF-AUTO SWITCH

Jaijyoti
14/10/24
Sr. Engg - CEG

Annexure-6 to OR12360 Field Supply Switch 3 Position 13 Pole

Customer		P.O. No.	
Date	P.O. Number	City	

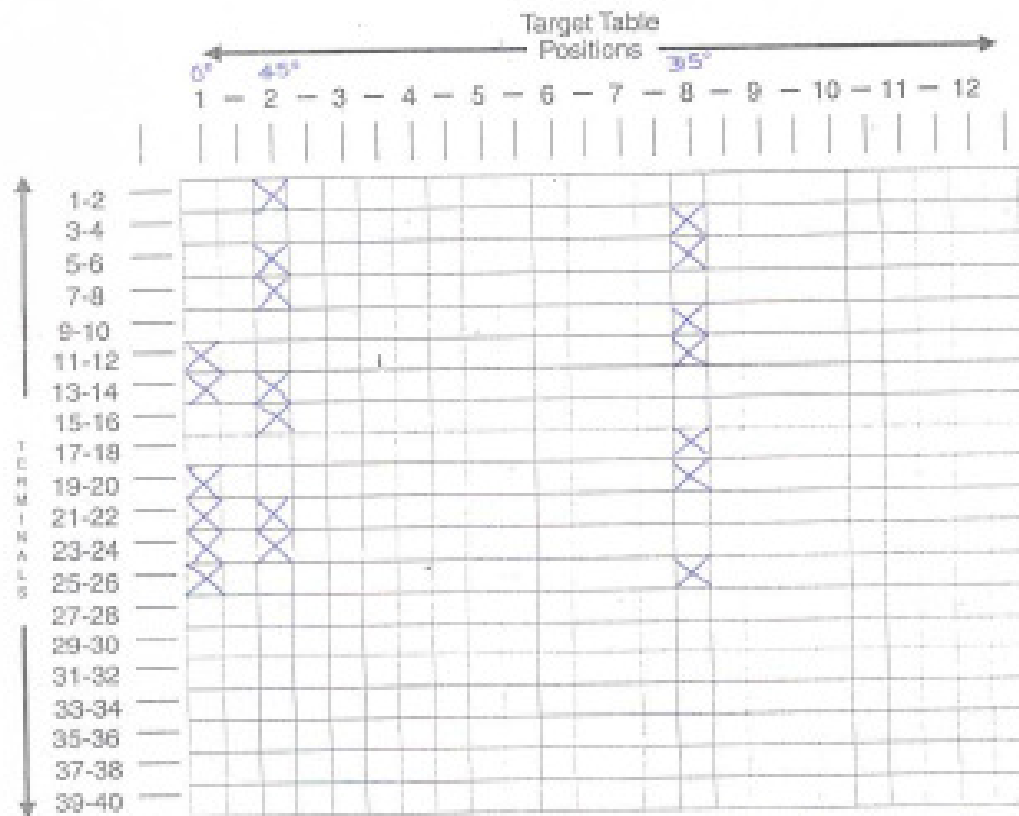
To order custom cam switches:

- Indicate the contact size at right (300292-400).
- Indicate desired switching angle of right. If the switching angle is not indicated, the factory will determine the angle from the recommended column of the table on right.
- For the example on page 240, fill in target table below.
- Indicate operator/handle type.
- If operator/handle bezel has legend and legend marking is desired, indicate legend marking on back of this form.
- If separate legend is required, indicate legend type on right and marking on back of this form.

Switching Angle	Maximum Number of Positions	See Detailing Instructions at left
30°	6	2-3
45°	8	4-5
60°	8	6-7
90°	12	8-12

Contact size	Class 9003	Type	K2N
Switching angle		Type	45°
Operator/handle type	Class 9003	Type	KBC1B (45mm x 46mm)
Separate legend	Class 9003	Type	

See page 240 for Target Table Explanation



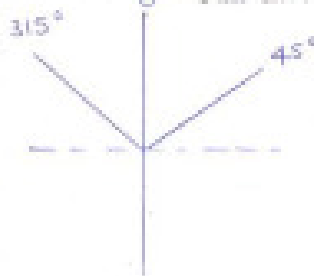
Note: - The contacts does not open while switching from one position to another (switching contact closed without break on changeover)



11/00

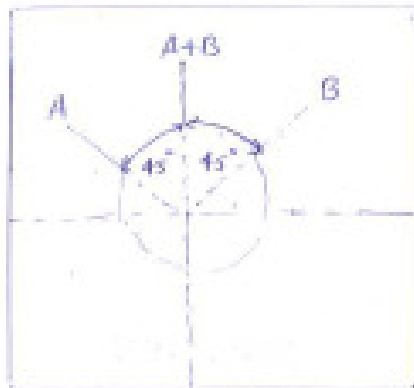
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Rajesh
01/03

श्रीमत् प्रबोधि/RAJESH AGRAWAL
अधीक्षक (अभियन्ता)/Asst. Manager (Design)
नियंत्रण प्रणाली विभाग/Control System Engineering Division
B. P. L. एन., भद्रपुर/ BHEL, BHUPAL



Legend marking for operator Bezel.