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 **ravioli** SpA



ISO 9001: 2000
9105.RAVI

Limit Switches FCN Series

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Main features

The rotary limit switch is a device which allows you to control the movement of industrial and building machines. The shaft is connected to the motor, so that, after a certain number of turns, the cams make the switches work, and then they can carry out their pre-set manoeuvre.

The range of FCN rotary limit switches has been planned with a particular internal symmetry that allows you to have a series of 5 microswitches (on-off exits) as well as some other linear exits, and a potentiometer in the same box.

The innovative and thorough regulation of the cams allows you to set the microswitches working point linearly and micrometrically. Reduction ratios range turns out to be remarkably large, since microswitches can be fitted with guaranteed opening (EN 60947-5-1) as well as deviation or progressive double opening contacts.

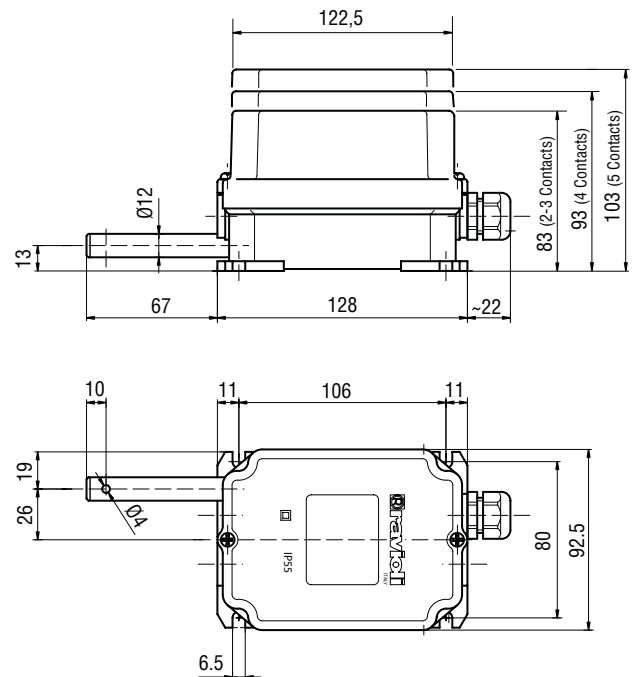
The choice of different cam profiles allows you to modify the limit switches function diagram.



TECHNICAL FEATURES

Compliance with EEC Directives	98/37/CE 2006/95/CE
Compliance with rules	EN 60947-1 EN 60947-5-1 EN 60204-1 EN 60529
Insulation voltage	250V ~
Maximum operating voltage	250V ~
Black lower casing	reinforced nylon
Yellow cover	high mechanical and thermal resistant thermoplastic
Operating temperature	- 20 °C to + 60 °C
Drive	worm screw
Cable entries	PG 11
Insulation	according to EN 60947-5-1
Protection degree	IP 55 EN 60529
Protection against contact voltages	double insulation EN 60439-1
Weight	460 g (approx.)

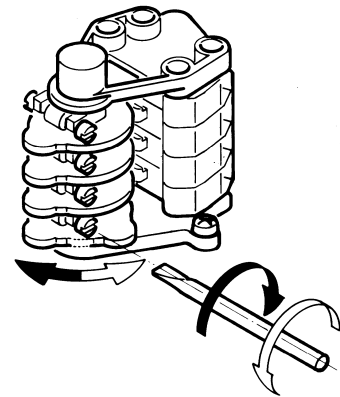
Dimensions



Contacts and Regulation Cams

Regulation criteria

Each cam is equipped with its own micrometer regulating screw. Each screw operates exclusively on the cam it is combined with, without interfering mechanically against its adjacent cams. Regulation can simply be carried out by rotating the regulating screw through a small blade screwdriver. Thanks to a particular friction system, rapidity and regulation precision are assured, which makes the structure stable, steady and reliable.



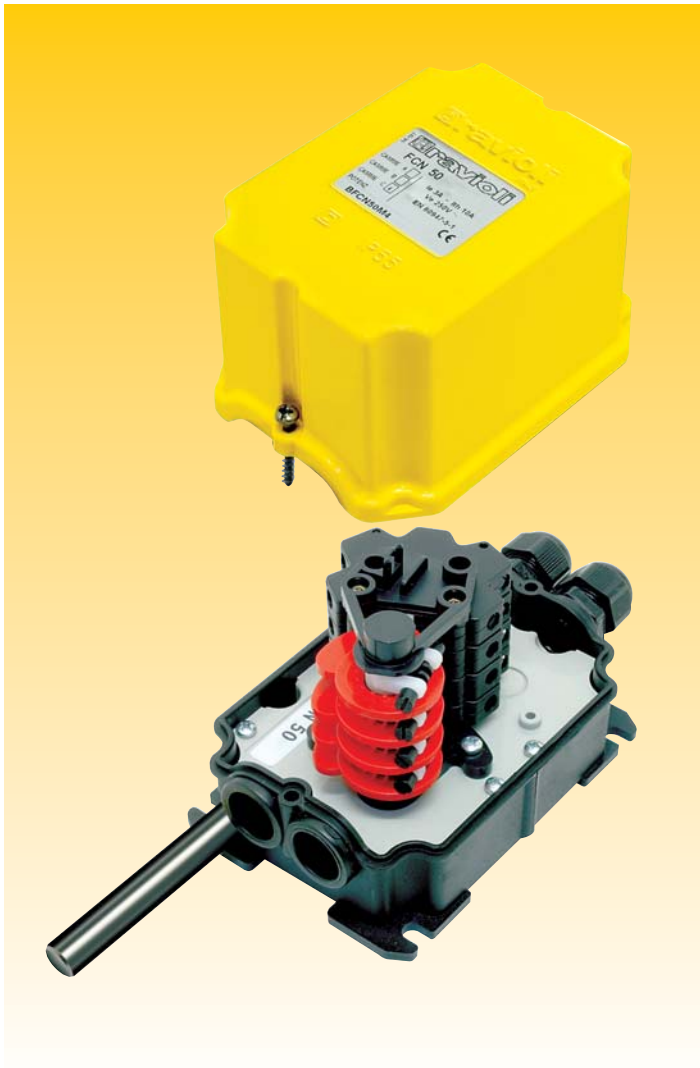
CONTACTS TECHNICAL FEATURES

Microswitches	1NC slow	type P				
	1NO 1NC rapid	type D				
	2NC progressive	type M				
	1NO 1NC slow	type MD				
Insulation voltage U_i	250 V ~					
Test voltage	2000 V ~					
Operating current	10(3) A					
Breaking power	according to EN 60947-5-1					
Mechanical lifetime	2x10 ⁶ op.					
Terminals	with screws					
Performances	AC 15	V	24	48	110	230
		A	10	10	6	3
	DC 13	V	24	48	110	220
		A	3	1,5	1	0,5

Cam profiles and tripping angles

Type	profile	color
A		White
B		Grey
C		Red
D		White

Standard Execution



- 1: 7.5 rotations
- 1: 15 rotations
- 1: 25 rotations
- 1: 35 rotations
- 1: 50 rotations
- 1: 60 rotations
- 1: 100 rotations
- 1: 140 rotations
- 1: 200 rotations
- 1: 275 rotations
- 1: 400 rotations
- 1: 550 rotations

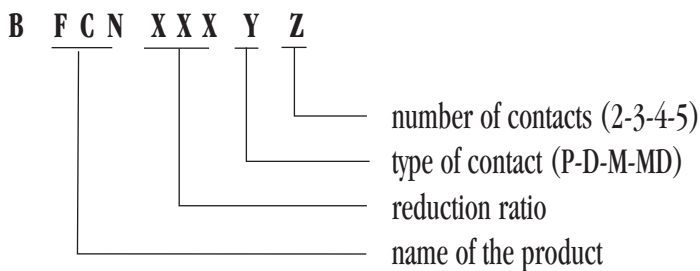
Upon request it is possible for us to transmit you some data concerning all the real turns according to the different available types of cams.

Standard executions are provided with 2 or even 4 contacts.

Limit switches with 3 and 5 contacts can also be realized upon request and according to the necessary quantity.

Order Codes

The product code is composed this way:



Where a potentiometer is required, it is necessary to add:

- K 5** for 5 Kohm potentiometer
- K 10** for 10 Kohm potentiometer

after the number of the contacts

If not specified, limit switches are supplied with white type A cams. To specify a cam different from white type A, it is necessary to add:

- B** for 45° lever
- C** for 90° lever
- D** for 180° lever

Customized switches

FCN limit switches can be customized according to the order quantity.

Specific customizations:

- shafts cut to measure
- twin-shaft execution
- cable entry in frontal or lateral position
- different contacts
- regulation cams with different profiles
- measuring accessories, such as potentiometers or encoders
- customized nameplates

For Your own Safety

The FCN series limit switches comply with the followings Directives and Norms:

2006/95/EEC	Low Voltage Directive
98/37/EEC	Machine Directive
EN 60947-1	Low-voltage switchgear and controlgear
EN 60947-5-1	Control circuit devices
EN 60204-1	Safety of machinery
EN 60529	Degrees of protection

Guaranteed Quality Product

The range of FCN series limit switches is guaranteed by our EC Certificate of Conformity, available upon request, in which it is declared that such product was created by RAVIOLI in accordance to defined and recognised Safety Regulations, and in compliance with the Quality standards stated in our ISO 9001:2000 Quality System Certificate.



Installation and maintenance requirements

INSTALLATION AND WIRING

The limit switches must be installed by qualified personnel, in compliance with the current safety norms. Before wiring, the machine power supply must compulsorily be interrupted.

Correct installation calls for working temperatures from -20°C to $+60^{\circ}\text{C}$.

The limit switch must not be used in any area which turn out to be potentially explosive, corrosive or with high sodium chloride contents.

Acid, oil and solvent may cause the device deterioration; therefore it is recommended not to use either oil or fat to lubricate any part of the limit switch.

The wiring installation must be completed and tested according to the current norms, in conformity with the electrical wiring diagram of the machine.

After the installation, it is compulsory to check if both the limit switch and the machine it controls work correctly.

Operations for limit switch installation:

- remove the cover by loosening the retaining screws
- connect the limit switch shaft to the external drive element by using a flexible joint, the male connection or the cog wheels, (page 6) in order to avoid any misalignment between the shafts
- fix firmly the limit switches by using the baseplate or the flange (page 6) to prevent it from anomalous vibrations.

Wiring Operations:

- introduce the multipolar cable into the special cable entry
- strip the cable for electrical connection to the microswitches and potentiometer
- tape the initial part of the cable
- lock the cable in the cable entry
- carry out the electrical connection by tightening the microswitch screws to maximum torque of 0,8 Nm
- set the position of the cams by adjusting the regulation screws (page 3)
- regulate the potentiometer (page 7)
- replace the cover and make sure that the gasket is correctly positioned in its housing.

MAINTENANCE

Maintenance Operations:

- check if both the screws on the cover and the inner clamps are correctly tightened
- check if the multipolar cable is secured in the cable entry
- check wiring conditions
- check the integrity of the gasket inside the cover
- check that the drive system is functioning correctly and the shafts are in alignment
- check that the limit switches are safely fixed
- check the integrity of the box

RAVIOLI S.p.a. declines any responsibility for damage deriving from incorrect installation or improper use of the product.



Accessories

The range of the accessories integrates and completes the limit switches series and facilitates their use according to particular requirements.

A series of cog wheels, a male connection and a flexible shaft are the interfaces which have specifically been designed in order to transmit the motion easily from the motor shaft to the limit switch shaft.

The fitting of a potentiometer, an encoder or another position sensor close to the micro switch group involves a linear exit in the same box.

Cog Wheels

A series of cog wheels of different diameters allows you an easy joining through pinions and belts.

Available Wheels:

- Module 5 with 12 teeth
- Module 6 with 11 teeth
- Module 8 with 12 teeth
- Module 10 with 12 teeth
- Module 14 with 10 teeth



Male Connection

- The male connection helps the joining to motors or reducing gears.



Flexible Shaft

- The flexible shaft allows you to couple the shafts that are not perfectly aligned.



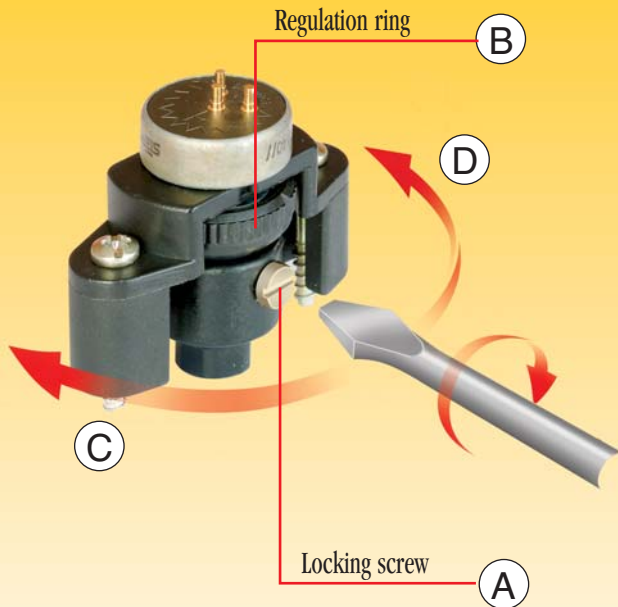
Attachment Flange

- The flange interface allows the limit switch to be fixed without the special fixing plate.



Potentiometer

The insertion of a potentiometer near the microswitch group involves a linear exit in the same box.



Regulation

- Ensure that the locking screw (A) is loosened.
- Set the desired resistance value by means of the instruments by rotating the regulating ring (B) clockwise (C) to reduce it, or anti-clockwise (D) to increase it.
- Tighten the lock screw (A)

Important:

The potentiometer follows the cams rotation direction.

ELECTRICAL FEATURES

Total resistance R_t	5 -10 k
R_t tolerance at 20°C	± 20%
Maximum power dissipated at 70 °C	0,3 W
Actual electric angle (AEA)	340° ± 5°
Useful electrical angle	A E A -3°
Independent linearity	± 2%
Output voltage stability	0,1% max
Cursor current (in cont. duty)	1 mA max
Contact load resistance	>1000 x R_t
Insulation resistance	1000 M - 500 Vcc
Dielectric rigidity	>500 V_{eff} - 50 Hz

MECHANICAL FEATURES

Operating temperature	-40 °C ÷ + 125 °C
Dimensions	diameter 22,2 mm
Regulation	see above
Mechanical angle	360° continuous
Shaft	stainless steel, with cut
Shaft guide	bush bearing
Cursor	precision contact
Mounting	sleeve
Terminals	turret
Fixing accessories	nut and washer
Useful life	5 x 10 ⁶ cycles

Upon request: encoder or other system of position instead of the potentiometer.

Spare Parts and Accessories



Spare Parts

Pos.	Code	Description
1	B50454	Cover 2 - 3 contacts
	B50442	Cover 4 contacts
	B50447	Cover 5 contacts
2	BLEVFCNA	White cam A
	BLEVFCNB	Grey cam B
	BLEVFCNC	Red cam C
	BLEVFCND	White cam D
3	BFCNAPINT	Contact 1NC slow (P)
	BFCNDINT	Contact 1NO 1NC quick (D)
	BAPO2PRFC	Contact 2NC progressive slow (M)
	BAP11FC	Contact 1NO 1NC slow (MD)

Accessories

Pos.	Code	Description
4	BMOD5FC	Cog wheel mod 5 Z12
	BMOD6FC	Cog wheel mod 6 Z11
	BMOD8FC	Cog wheel mod 8 Z12
	BMOD10FC	Cog wheel mod 10 Z12
	BMOD14FC	Cog wheel mod 14 Z10
5	BINNFC	Male connection
6	BAFLESFC	Flexible shaft
7	BFLANFCN	Attachment flange
8	—	Potentiometer
9	—	Encoder on demand