



# Limit Switches FCN Series

 **ravioli**<sup>TM</sup>

# Limit Switches

## FCN Series

### Main features

The rotary limit switch series FCN 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 allow the switches to 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 and an additional linear potentiometer.

The series includes a number of optional accessories, which make mechanical applications easier and more comfortable.

For years Ravioli has been focusing on production for renewable Energy.

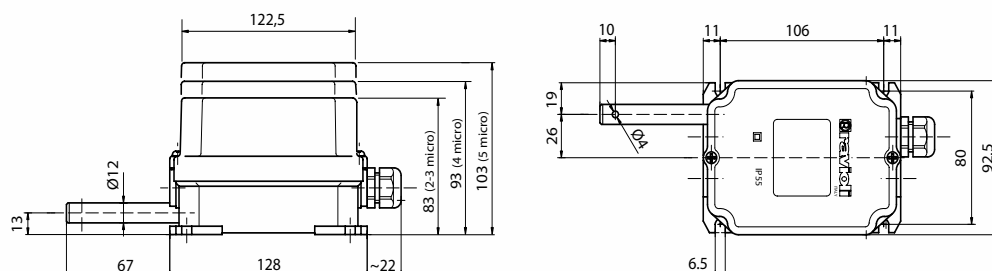
FCN limit switches, which are also used in wind turbines and solar trackers, are included in our Green e-motion Program **Green e-motion**. They represent a significant step in our project and participation to sustainability.



### Technical features

Compliance with EEC Directives	2006/42/CE	2014/35/UE
Compliance with rules	CEI EN 60947-1	CEI EN 60947-5-1
	CEI EN 60204-1	CEI 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 + 60 °C	
Drive	worm screw	
Cable entries	standard: 1 cable clamp M16 x 1,5	
Protection degree	IP 55	
Max. rotation speed	500 turns/min.	
Protection against contact voltages	double insulation CEI EN 60439-1	
Weight	approx. 460 gr.	
Omologations	CE	
Product	Made in Italy	

### Dimensions



# Contacts and regulation cams

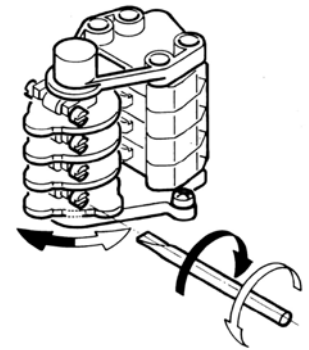
## Calibration criteria

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.

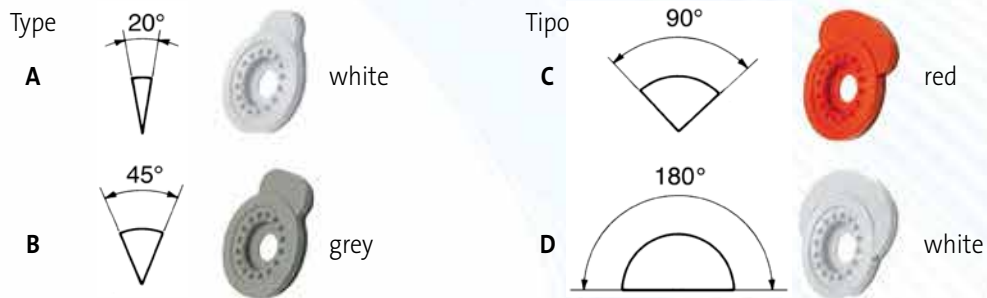
Thanks to a particular friction system, rapidity and regulation precision are assured, which makes the structure stable, steady and reliable.



## Switches features

Microswitches	1NC slow	type <b>P</b>
	1NA 1NC rapid	type <b>D</b>
	2NC progressive	type <b>M</b>
	1NA 1NC slow	type <b>MD</b>
Insulation voltage $U_i$	250V~	
Test voltage	2000 V ~	
Operating current	10(3) A	
Breaking power	according to EN 60947-5-1	
Mechanical lifetime	2x10 <sup>6</sup> op.	
Terminals	with screws	
	V	24 48 110 230
AC 15	A	10 10 6 3
Performances	V	24 48 110 220
	DC 13	A 3 1,5 1 0,5

## Cam profiles and tripping angles



## Part numbers

Product part numbers are composed as follows:

**B FCN XXX Y Z**

name of the product \_\_\_\_\_  
 reduction ratio \_\_\_\_\_  
 number of contacts (2-3-4-5)  
 type of contact (P-D-M-MD)

Where a potentiometer is required, please add:

**K 1** for 1 Kohm potentiometer - **K 5** for 5 Kohm potentiometer - **K 10** for 10 Kohm potentiometer

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



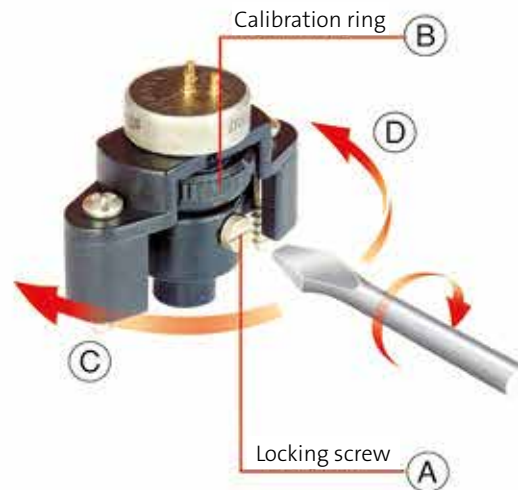
# Potentiometer

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 $R_t$	1 - 5 - 10 k $\Omega$
$R_t$ tolerance at 20°C	$\pm 20\%$
Maximum power dissipated at 70 °C	0,3 W
Actual electric angle (AEA)	340° $\pm$ 5%
Useful electrical angle	A E A - 3°
Independent linearity	$\pm 2\%$
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 $\Omega$ - 500 Vcc
Dielectric rigidity	>500 Veff - 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 · 10 <sup>6</sup> cycles

## Standard Execution

1 : 7,5 - 15 - 25 - 35 - 50 - 60 - 100 - 140 - 200 - 275 - 400 - 550 turns

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.

## Customized switches

- inox shaft
- custom-length shafts
- twin-shaft executions
- cable entry in frontal or lateral position
- different switches
- cams with different profiles
- precision accessories, like potentiometers or encoders
- custom nameplates
- custom-coloured cover

# For Your Safety

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

2014/35/UE	Low voltage Directive
2006/42/CE	Machine Directive
2011/65/UE	RoHS
CEI EN 60947-1	Low-voltage switchgear and controlgear
CEI EN 60947-5-1	Control circuit devices
CEI EN 60204-1	Safety of machinery
CEI EN 60529	Degrees of protection



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 9001:2008 Quality System Certificate.

## Respect for people and environment

Ravioli activity and production are focusing on the respect of people, following the standards which are defined in our Code of Ethic Behaviour. Such products have been developed to improve the safety of people using them, and they are free from harmful substances, in the respect of environment.

## 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°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

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
- in case a potentiometer as well as any other sensors are present, introduce the multipolar cable in the cable entry, tape and lock the cable in the gland; then connect properly the wires.
- set the position of the cams by adjusting the regulation screws (page 3)
- regulate the potentiometer (page 4)
- replace the cover and make sure that the gasket is correctly positioned in its housing.

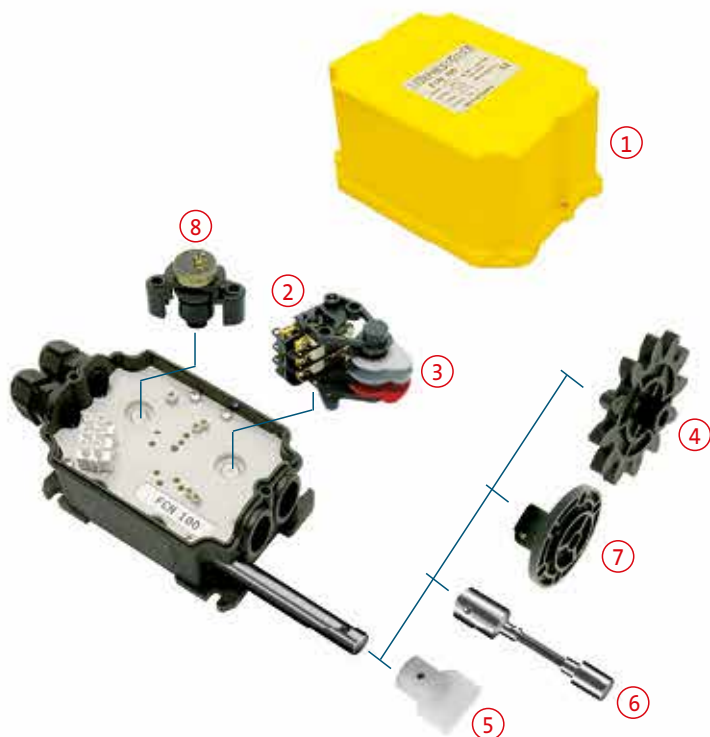
### MAINTENANCE

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.

# Spare parts and Accessories



## Spare parts

Pos.	Code	Description
1	B50454	Cover 2 - 3 contacts
	B50442	Cover 4 contacts
	B50447	Cover 5 contacts
2	BFCNAPINT	Switch 1NC slow (P)
	BFCNDINT	Switch 1NO 1NC rapid (D)
	BAP02PRFC	Switch 2NC progressive slow (M)
	BAP11FC	Switch 1NO 1NC slow (MD)

Pos.	Code	Description
3	BLEVFCNA	White cam A
	BLEVFCNB	Grey cam B
	BLEVFCNC	Red cam C
	BLEVFCND	White cam D

## Accessories

Pos.	Code	Description
4	BMOD5FC	Cog wheel M5 Z12
	BMOD6FC	Cog wheel M6 Z11
	BMOD8FC	Cog wheel M8 Z12
	BMOD10FC	Cog wheel M10 Z12
	BMOD12Z10	Cog wheel M12 Z10
	BMOD12Z12	Cog wheel M12 Z12
	BMOD14FC	Cog wheel M14 Z10
	BMOD16Z10	Cog wheel M16 Z10
	BMOD18Z10	Cog wheel M18 Z10
	BMOD18Z11	Cog wheel M18 Z11
	BMOD20Z8	Cog wheel M20 Z8
	BMOD20Z11	Cog wheel M20 Z11

Pos.	Code	Description
5	BINNFC	Male connection
6	BAFLESFC	Flexible shaft
	BAFLESFCFF	Female / female flexible shaft
7	BFLANFCN	Attachment flange
8	-	Potentiometer

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