



Hermetically sealed cell

83151



HERMETICALLY SEALED MICROSWITCHES SINGLE POLE, CHANGEOVER TYPES 83 151 (150°C) AND DERIVATIVES

PRESENTATION

This is the basic component for our whole range of standard 1-pole and 2-poles hermetically-sealed limit switches plus the 3-poles version (special Limit Switches).

The CROUZET hermetic microswitch combines a snap-action switching system with high resistance to shock and vibration in an hermetically sealed miniature case which encloses an atmosphere of inert gas around its contacts, ideal for switching very low level circuits and higher currents also.

The meticulous care taken in the manufacture of this hermetically sealed cell in terms of assembly processes, cleanliness of components as well as inspection procedures, result in a product which is ideal for operation in severe environments where a high level of reliability is essential.

The CROUZET hermetically sealed cell is particularly well suited to sectors such as Aerospace, Armaments, Marine, Nuclear, etc.

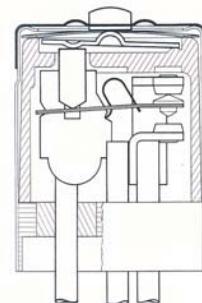
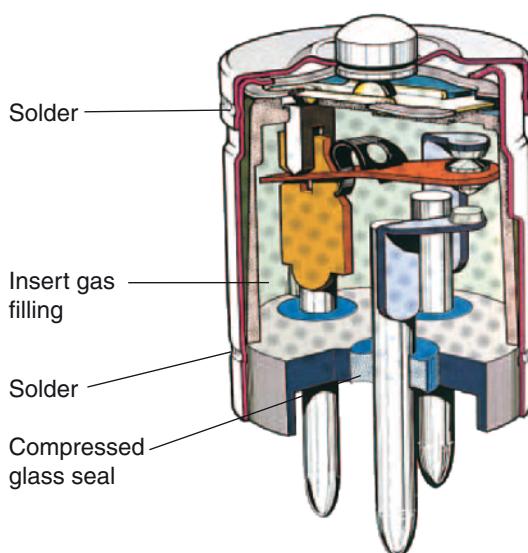
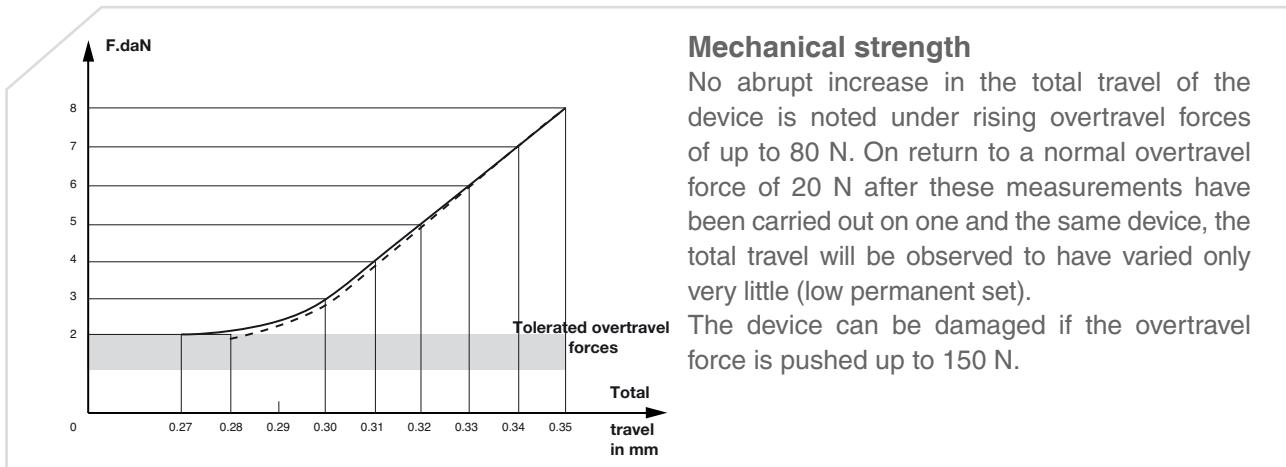


Diagram of snap-action device

ESSENTIAL CHARACTERISTICS

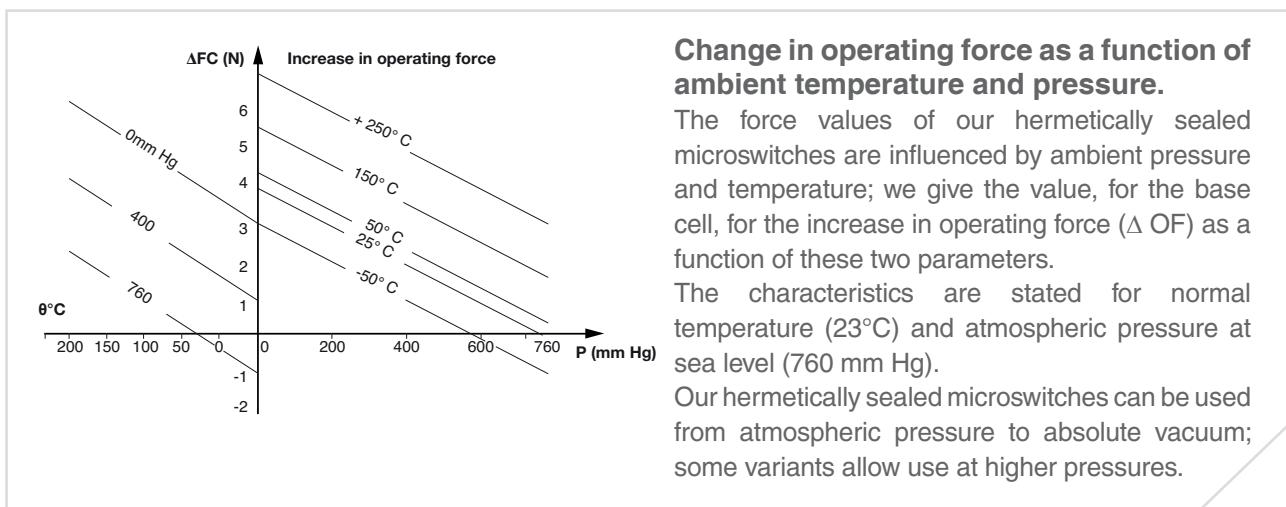
- Switching power from 1 mA to 7 A.
- Operating temperature: -55°C to 150°C : Type 83 151
-55 °C to 250°C : Type 83 1512
- Operating pressure : 1 bar : Type 83 151
From 2 to 6 bars : Type 83 1515
- Vibration resistant up to 80 g.
- Shock resistant up to 200 g.
- High level of hermetic sealing: Leakage $< 1 \times 10^{-6} \text{ cm}^3 \text{ He/S}$
- Long life: 200,000 cycles.
- Small size: ø 11 x 16.
- Numerous single pole and multipoles operating and fixing options.

DISTINCTIVE CHARACTERISTICS



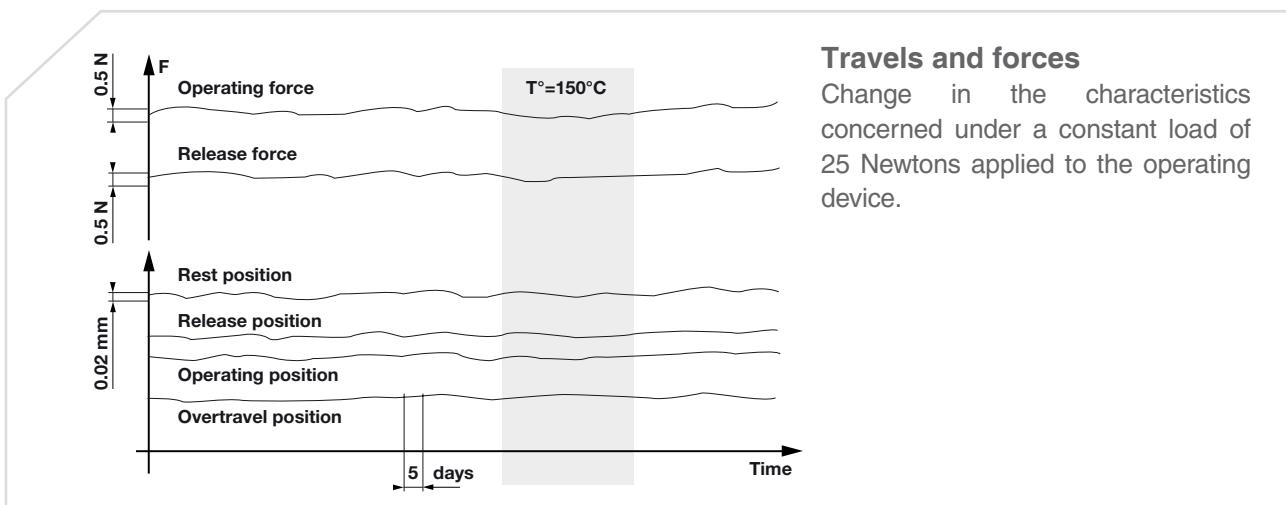
Hermetic sealing

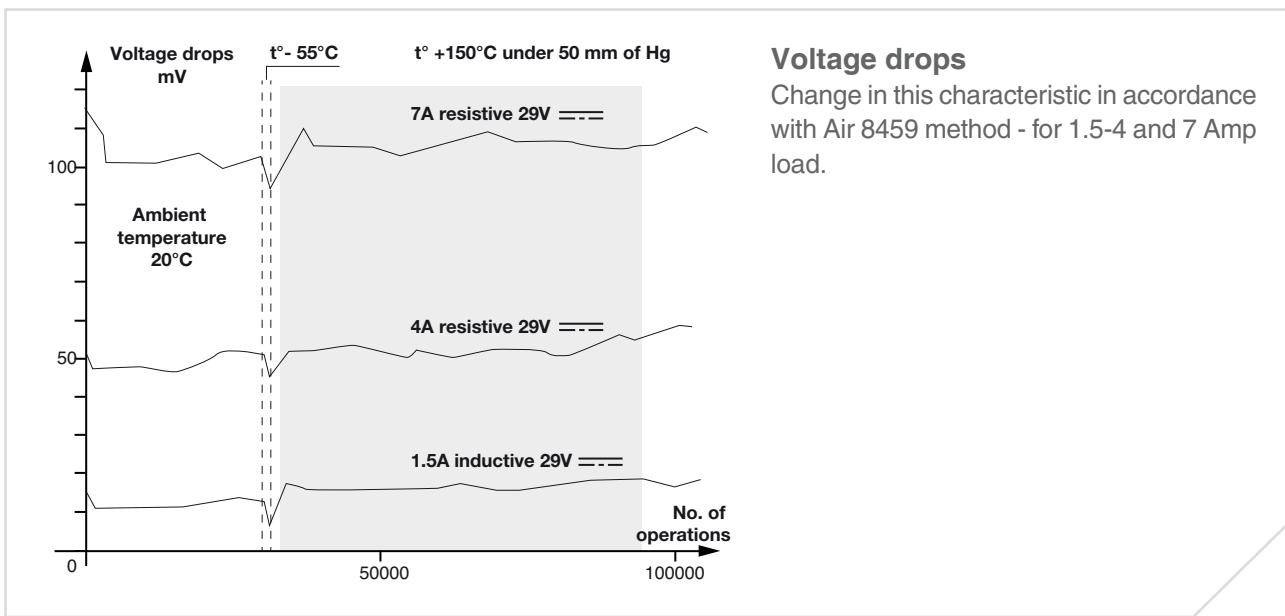
- The microswitch is filled with inert gas (nitrogen-hydrogen mixture), the internal pressure being 1 bar.
- The hermetic sealing (membrane-cap - cap-base) is achieved with a continuous seam welding bead.
- 1×10^{-8} atm cm^3/s



Reliability of characteristics

Below are two test extracts showing the stability of the essential characteristics over time and as a function of temperature.

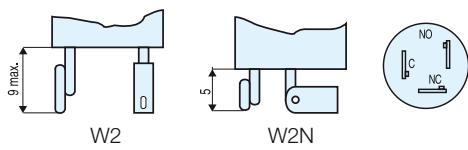




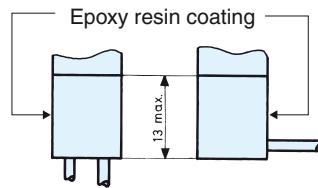
CONNECTIONS

Electrical connections are made through the base, by three ferronickel terminals, with copper core, sealed by compressed glass.

Welded



Wired



parallel to axis (//) perpendicular to axis (⊥)

Electrical diagram (actuator at rest position)

green wire C NC black wire
 NO red wire

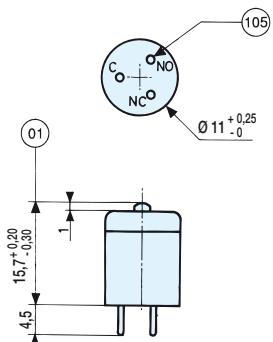
Wires: 0.38 mm² Air 4524 - length 0.50 m.

Category 140° 170°C.

Dimensions

(01) - Rest position

(105) - 3 terminals
 $\varnothing 1.3$ at 120°



PERFORMANCE DATA

| Product characteristics | Value | Unit | Under |
|---|--------------|------|------------------------|
| Min. current | 1 | mA | 5 V DC |
| Nominal current | | | |
| Resistive | 3 | A | 48 V DC ⁽¹⁾ |
| Lamp | 1 | A | 115 V - 400 Hz |
| Lamp | 2 | A | 30 V DC ⁽¹⁾ |
| Resistive | 3 | A | 30 V DC ⁽¹⁾ |
| Inductive L/R = 0.005 s | 1.5 | A | 30 V DC ⁽¹⁾ |
| Resistive | 1 | A | 220 V AC |
| Inductive - cos φ 0.8 | 0.4 | A | 220 V AC |
| Service life at nominal current ⁽³⁾ - cycles | 200 000 | | |
| Dielectric rigidity between connections and earth | 1200 | V | |
| Rigidity between connections | 1000 | V | |
| Insulation resistance (at 500 V DC) | 100 | MΩ | |
| Voltage drop at 1 A ⁽²⁾ | 0.02 | V | |
| Operating temperature | -55 +150 | °C | |
| Shock resistance ⁽³⁾ | 200/11 | g/ms | |
| Vibration resistance | 80/20 → 2000 | g/Hz | |

(1) For a service life of 100,000 cycles - Permitted current 4 A inductive 7 A resistive in contactor or breaker.

(2) Over welded connections - for wired connections add 0.1 V per metre.

(3) Value for microswitch without auxiliary actuator

HERMETICALLY SEALED MICROSWITCHES

WITH ACCESSORIES (BASIC CELL -55° +150°C 83 151 001)

Part numbers

| | | | | |
|---|--------------------------|------------|------------|------------|
| Soldered connections | W2 | 83 151 012 | 83 151 014 | 83 151 013 |
| | W2 N | 83 151 042 | 83 151 044 | 83 151 043 |
| Wire 0.38 mm ² 0.5 m long | with parallel wires | 83 151 022 | 83 151 024 | 83 151 023 |
| | with perpendicular wires | 83 151 032 | 83 151 034 | 83 151 033 |
| Mounting | by flange | • | • | • |
| | by threaded barrel | | | |
| | reinforced | | | |
| Control | via simple actuator | | | |
| | via roller actuator | | | |

Characteristics

| | | | | |
|---------------------------------|----|---------|---------|---------|
| Max. operating force | N | 10 | 10 | 10 |
| Min. release force | N | 1.5 | 1.5 | 1.5 |
| Permitted overtravel force | N | 20 | 20 | 20 |
| Positive overtravel stop | | | | |
| Service life (operations - min) | | 200 000 | 200 000 | 200 000 |
| Max. pre-travel | mm | 0.25 | 0.25 | 0.25 |
| Max. differential travel | mm | 0.05 | 0.05 | 0.05 |
| Min. overtravel | mm | 0.08 | 0.08 | 0.08 |
| Weight (without wires) | g | 5 | 5 | 13 |

Dimensions

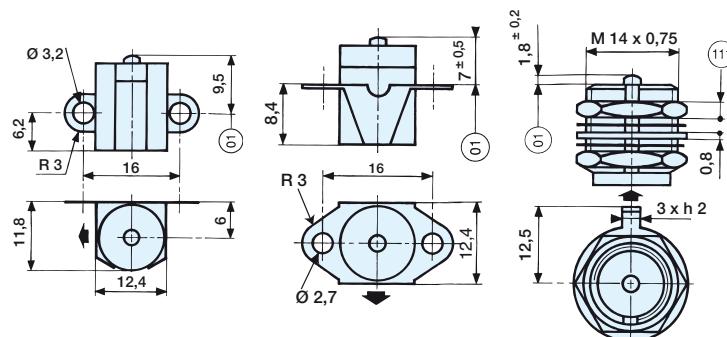
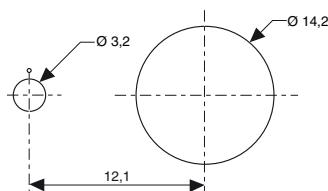
Add the dimensions of the various connections to find the total dimensions

→ indicates the wire direction

01 - Tripping point

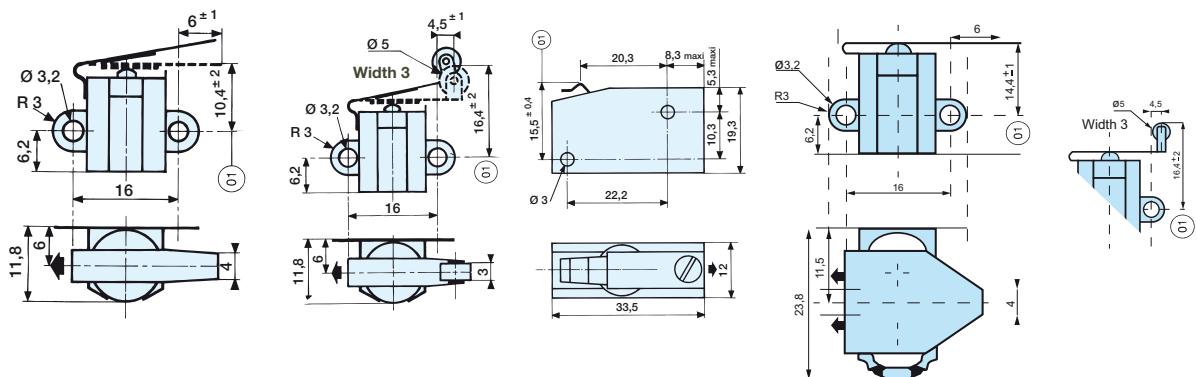
111 - Nut h 2.5 x 17/flat

Panel cut-out



| 2-POLES | | | | |
|------------|------------|------------|------------|------------|
| 83 560 011 | 83 560 012 | 83 560 014 | 83 560 311 | 83 560 312 |
| 83 560 041 | 83 560 042 | 83 560 049 | 83 560 341 | 83 560 342 |
| 83 560 021 | 83 560 022 | 83 560 030 | 83 560 321 | 83 560 322 |
| 83 560 031 | 83 560 032 | 83 560 039 | 83 560 331 | 83 560 332 |
| • | • | • | • | • |
| • | • | • | • | • |
| • | • | • | • | • |

| | | | | |
|------------|------------|-------------|------------|------------|
| 5 | 5 | 2.5 -> 8 | 15 N | 15 N |
| 0.5 | 0.5 | 1.5 | 1.5 N | 1.5 N |
| | | 50 | | |
| | | • | | |
| 100 000 | 100 000 | 100 000 | 100 000 | 100 000 |
| 6 | 6 | 0.3 -> 0.75 | 6 | 6 |
| 0.8 | 0.8 | 0.3 | 1.5 | 1.5 |
| 0.4 -> 0.8 | 0.4 -> 0.8 | 0.3 | 0.4 -> 0.8 | 0.4 -> 0.8 |
| 6 | 7 | 21 | 12 | 13 |



HERMETICALLY SEALED MICROSWITCHES HIGHT PRESSURE FROM 2 TO 6 BARS

These variants of the basic type 83 151 feature a compensating system which allow them to be used at pressures above atmospheric.

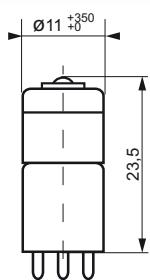
(for other characteristics please refer to basic model type 83 151 0)

Characteristics

| Permitted pressure | Bar | 2 | 6 |
|---------------------------|-----|-----|-----|
| Operating force max. | N | 25 | 47 |
| Overtravel max. - force * | N | 45 | 80 |
| Release force min. * | N | 11 | 22 |
| Weight (without leads) * | g | 8,5 | 8,5 |

* Figures at atmospheric pressure at ground level

Dimensions



Connections

W2 Ref. 83151504
W2N Ref. 83 151 503

HERMETICALLY SEALED MICROSWITCHES SINGLE POLE, CHANGEOVER TYPES 83 151 (250°) AND DERIVATIVES

WITHOUT ACCESSORIES (BASIC CELL -55° +250°C 83 151 201)

This basic component is the same design as the 83 151 001 standard cell but is adapted for operation in high temperatures up to 250 °C.

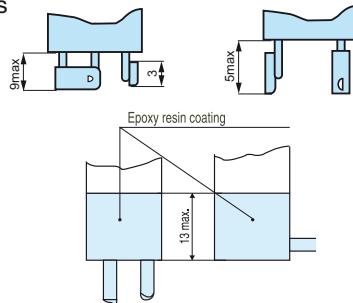
| Characteristics | Unit | Value |
|---|-----------------|------------------|
| Nominal current at 30 VDC | | |
| Resistive | A | 1 |
| Inductive L/R = 5 ms | A | 1 |
| Service life at nominal current (min. operations) | Min. operations | 20 000 / 100 000 |
| Voltage drop at 1 A ⁽¹⁾ | V | 0.06 |
| Max. operating force ⁽²⁾ | N | 14 |
| Min. release force | N | 1.5 |
| Max. permitted overtravel force | N | 20 |
| Max. pre-travel | mm | 0.25 |
| Max. differential travel | mm | 0.05 |
| Min. overtravel | mm | 0.08 |
| Weight (without wires) | g | 13 |

(1) On soldered connections. For wired connections add 0.18 V per metre. Category 250°, 280°.

(2) Characteristics at : $\theta = 250^{\circ}\text{C}$ atmospheric pressure at ground level.

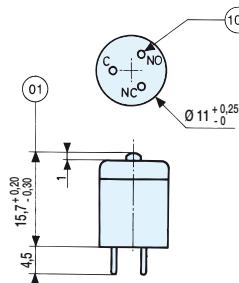
Connections

With wires : 500 mm of length or soldered terminals



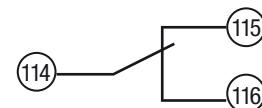
Dimensions

01 - Rest position
105 - 3 terminals Ø 1.3 at 120°



Electrical diagram

114 - C
115 - NC
116 - NO



WITH ACCESSORIES (BASIC CELL -55° +250°C 83 151 201)

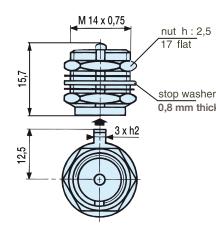
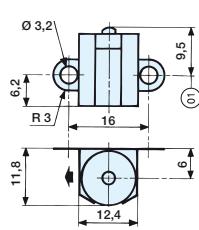
Control accessories equipped with type 83 151 201 sensitive changeover

Part numbers

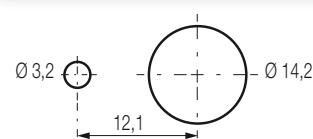
| | SINGLE-POLE | SINGLE-POLE |
|------------------------|-------------|-------------|
| W2 terminals output | 83 151 212 | 83 151 213 |
| // wires output | 83 151 222 | 83 151 223 |
| ⊥ wires output | 83 151 232 | 83 151 233 |
| W 2 N terminals output | 83 151 242 | 83 151 243 |
| Weight without wires | 6 g | 13 g |

Add the dimensions of the various connections for the total dimensions. The mechanical characteristics are those of the 83 151 201 changeover.

→ indicates the direction of the wires.



Panel cut-out



LIMIT SWITCHES BASED ON HERMETICALLY SEALED MICROSWITCHES (250°)

WITHOUT ACCESSORIES (BASIC CELL -55° +250°C 83 151 201)

Part numbers

| | SINGLE-POLE |
|------------------------|-------------|
| W2 terminals output | 83 770 211 |
| // wires output | 83 770 221 |
| ⊥ wires output | 83 770 231 |
| W 2 N terminals output | 83 770 241 |

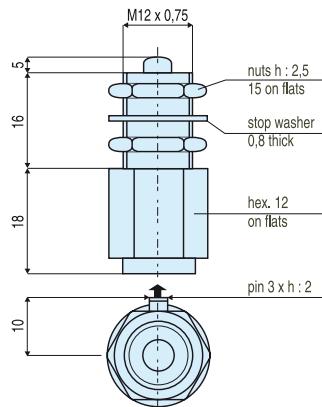
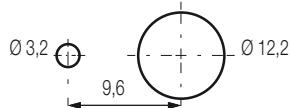
Add the dimensions of the various connections to find the total dimensions

Mechanical characteristics :

| | |
|-----------------------------------|-------------------------------|
| - Max. operating force | 22 N |
| - Min. release force | 1.5 N |
| - Max. permitted overtravel force | 50 N positive overtravel stop |
| - Pre-travel | 0.1 to 0.3 mm |
| - Max. differential travel | 0.05 mm |
| - Min. overtravel | 3 mm |
| - Weight without wires | 20 g |

► indicates the direction of the wires

Panel cut-out



LIMIT SWITCHES BASED ON HERMETICALLY SEALED MICROSWITCHES (150°)

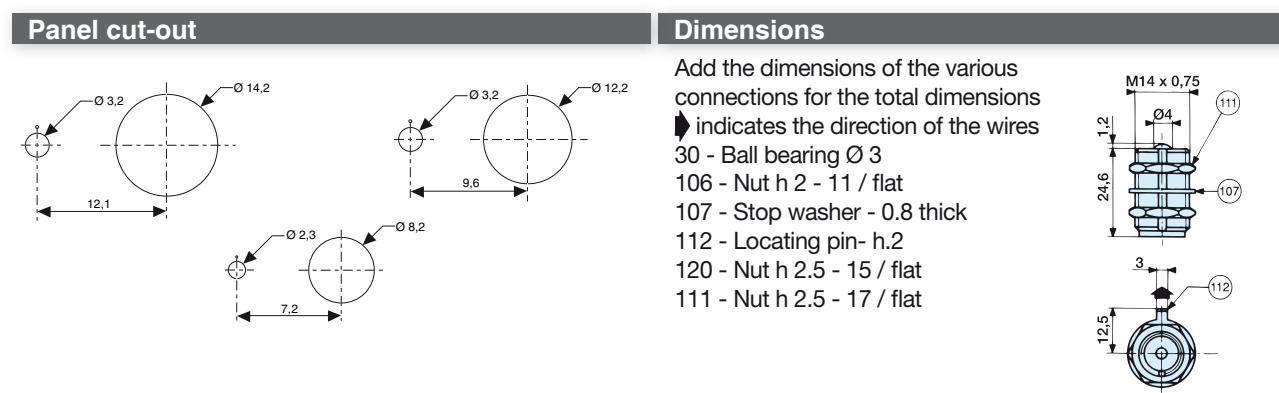
MECHANICAL CAPACITY

We adapt the telescopic sub-assemblies for our hermetically sealed limit switches according to pressure and operating temperature requirements. Our products can therefore be used at atmospheric pressure or in an absolute vacuum and at a temperature of -50° to +250°C (depending on the type of hermetically sealed basic cell).

BASIC CELL -55° +150°C 83 151 001

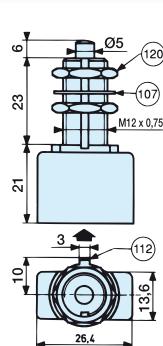
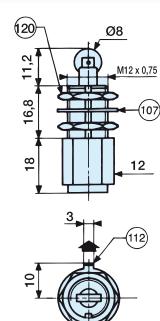
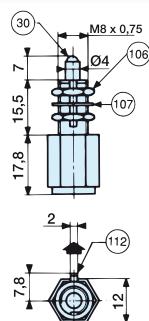
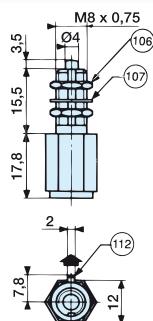
| Part numbers | | |
|--|--------------------------|------------|
| Soldered connections | W2 | 83 770 012 |
| | W2 N | 83 770 042 |
| Wire 0.38 mm ² 0.50 m long | with parallel wires | 83 770 022 |
| | with perpendicular wires | 83 770 032 |
| Control simple plunger | single-pole | • |
| | two-poles | |
| With single-pole ball plunger | | |
| With single-pole roller plunger | | |

| Characteristics | Unit | Value |
|---------------------------------|------|---------------|
| Max operating force | N | 12 |
| Min. release force | N | 1.5 |
| Permitted overtravel force | N | 20 |
| Positive overtravel stop | | |
| Max. pre-travel | mm | 0.3 |
| Max. differential travel | mm | 0.05 |
| Min. overtravel | mm | 1 |
| Resistance to shocks | g/ms | 100/11 |
| Resistance to vibrations | g/Hz | 50/800 → 2000 |
| Weight (without wires) | g | 21 |
| Service life (operations - min) | | 100 000 |



| | | | |
|------------|------------|------------|------------|
| 83 770 011 | 83 770 014 | 83 770 015 | 83 771 011 |
| 83 770 041 | 83 770 044 | 83 770 045 | 83 771 041 |
| 83 770 021 | 83 770 024 | 83 770 025 | 83 771 021 |
| 83 770 031 | 83 770 034 | 83 770 035 | 83 771 031 |
| • | | | • |
| | • | | |
| | | • | |

| | | | |
|---------------|---------------|---------------|---------------|
| 12 | 12 | 12 | 30 |
| 1.5 | 1.5 | 1.5 | 3 |
| 50 | 50 | 50 | 80 |
| • | • | • | • |
| 0.3 | 0.3 | 0.3 | 0.5 |
| 0.05 | 0.05 | 0.05 | 0.15 |
| 3 | 3 | 3 | 5 |
| 100/11 | 100/11 | 100/11 | 100/11 |
| 50/800 → 2000 | 50/800 → 2000 | 50/800 → 2000 | 50/800 → 2000 |
| 15 | 15.5 | 20 | 47.5 |
| 100 000 | 100 000 | 100 000 | 100 000 |



Electrical diagram (actuator at rest)

green wire C



NC black wire
NO red wire

Wires: 0.38 mm² - length 0.50 m.

Category 140° 170°C.

In dimension diagrams → indicates the orientation of the wires.

Investigation tests K1 EDF HM63/10466-PF/ET



To view the original document, see page 124.

**ELECTRICITE DE FRANCE
RESEARCH & DESIGN DEPARTMENT**

Electrical Equipment Department

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ECUELLES
BP No. 1 – 77520 MORET-SUR-LOING
Tel: (6) 070-68-20

**Project led by Mr FREMONT
Tel: 070.65.87**

Yr Ref:

Re: K1 investigation tests
SP 48-16 sensitive switches

Dear Sirs

Please find enclosed two copies of the reports on the tests to which we have subjected your SP 48-16 sensitive switches.

These tests demonstrated that the hermetically sealed cell 83 151 506 (6 bar) satisfied the operating and environmental conditions (especially in accidents) required for K1 safety equipment.

However, they have led to modifications being made to the connection method and control system:

- single-wire connection with STYCAST 2651 resin filler/Catalyst 9
- stiffener on the operating lever to reduce the sensitivity to vibrations with extension of this lever to reduce the actuating force

Yours faithfully

Ph. ROUSSARIE

Head of the “DC, Insulated Cables, Materials for Electrical Engineering, Automation Equipment” Department

Enc. 2 copies of note HM63/8057
2 copies of note HM63/8064
2 copies of note HM63/8065

1 copy sent to M.Petit PARIS

R.C. PARIS B 552 081 317

CEN SACLAY

radiation hardness test report



To view the original document, see page 124.

TECHNICATOME

MAN/73/014

C.E.N. SACLAY

REACTOR CONSTRUCTION DIVISION

DEPARTMENT: D.E.F.

SECTION: HANDLING

WITHSTAND TO GAMMA RAYS OF ELECTRICAL COMPONENTS SUCH AS MICROSWITCHES
FOR USE IN HOT CELLS

CONTENTS

- 1 – SUBJECT
- 2 – CHARACTERISTICS OF HERMETICALLY SEALED CELLS BEFORE IRRADIATION
- 3 – OPERATING CONDITIONS OF HERMETICALLY SEALED CELLS
- 4 – IRRADIATION (test conditions)
- 5 – CHARACTERISTICS OF HERMETICALLY SEALED CELLS AFTER IRRADIATION
- 6 – CONCLUSION

DIAGRAMS

- 1 – IRRADIATOR
- 2 – SOURCE
- 3 – PAGURE CELL (C.A.P.R.I.)
- 4 – HERMETICALLY SEALED CELL REF: 83-151-001 (CROUZET)

1 – SUBJECT

Tests were conducted to determine the withstand to GAMMA rays (integral dose of 10 rads) of CROUZET microswitch type electrical components (hermetically sealed cells) that might be suitable for installing in the irradiated component cell of the PHENIX reactor, a 100 kilocurie α – β – γ type cell.

2 – CHARACTERISTICS OF HERMETICALLY SEALED CELLS BEFORE IRRADIATION

These hermetically sealed cells are fully sealed microswitches, filled with inert gas (hydrogenated nitrogen) at a pressure of 1 bar.

Part number: 83-151-001

Materials used (see diagram IV)

| | |
|----------------------|--|
| 1) Cover: | Z 5 CN 18-08 (annealed) |
| 2) Membrane: | Stainless steel 18-08 Arc 2702 S |
| 3) Plunger: | Stainless steel 18-08 with sulphur |
| 4) Plunger washer: | Z CR 177 (annealed) |
| - Terminals: | |
| 5) | 48% Ferronickel baseplate |
| 6) | Fritted glass pearls |
| 7) | Ferronickel terminals with copper core and 5 micron electroless nickel plating |
| 8) Common terminal: | |
| 9) Top terminal} | UZ 22 N 18 3/4 cold-rolled nickel silver, gold-plated with 3 to 4 microns |
| 10) Bottom terminal} | 1/2 hard nickel silver |
| 11) Contact: | Ag graphite 5/1000 |
| 12) Bell insulator: | Micaver |
| 13) Plunger: | Micaver |
| 14) Lever: | Z 12 CN 18/10 – 3/4 hard |
| 15) Spring washer: | ZCR 177 cold-rolled 150 kg/mm ² |
| 16) Wire bundle: | Epoxy resin – Stycast 2651 |
| 17) Wires: | Filotex 1800 |

3 – OPERATING CONDITIONS OF HERMETICALLY SEALED CELLS

In the irradiated component cell of the PHENIX reactor:

| | |
|----------------------|--------------------------------------|
| - Atmosphere: | Nitrogen with 2% max. oxygen content |
| - Pressure: | 2 mbar |
| - Temperature: | 50°C approx. |
| - Relative humidity: | 2% max. |
| - Maximum dose rate: | ≤ 5.105 R/hr |

4 – IRRADIATION (test conditions)

| | |
|----------------------|---|
| - Date: | from 15/03/1972 to 10/04/10972 |
| - Place: | PAGURE cell (CAPRI) at C.E.N./SACLAY |
| - Source: | 20,000 curies of cobalt 60 – consisting of 10 bars of 2000 Ci |
| - Atmosphere: | Air |
| - Pressure: | Atmospheric |
| - Temperature: | 20°C approx. |
| - Relative humidity: | 60% approx. |
| - Exposure dose: | 1.078 109 rads |
| - Dose rate: | 2.2 106 R/hr |
| - Duration: | 490 hrs |
| - Distance: | in basket no. 2 (at the heart of the source) |
| - Integral dose: | almost equivalent to the exposure dose, ie. 1.078 109 rads. |

NB: During its irradiation with γ rays, no endurance tests were conducted.

5 – CHARACTERISTICS OF HERMETICALLY SEALED CELLS AFTER IRRADIATION

Comparison of tests and results BEFORE and AFTER irradiation

| TESTS | Cell no. 7344 | | Cell no. 7338 | |
|--------------------------|---------------|-------------|---------------|-------------|
| | Before | After | Before | After |
| Differential travel | 0.025 | 0.025 | 0.035 | 0.035 |
| Overtravel | 0.13 | 0.13 | 0.13 | 0.13 |
| Overtravel after release | 0.13 | 0.13 | 0.10 | 0.10 |
| Total travel | 0.28 | 0.28 | 0.27 | 0.27 |
| Actuating force | 540 | 550 | 540 | 520 |
| Release force | 360 | 360 | 340 | 320 |
| Equilibrium point | NONE | NONE | NONE | NONE |
| Off/on burn-out | 1450 - 1200 | 1450 - 1300 | 1450 - 1250 | 1400 - 1300 |
| Voltage drop: | | | | |
| - NC | 10 | 8 | 10 | 7 |
| - NO | 9 | 7 | 9 | 6 |

6 – CONCLUSION

The test results highlight that the characteristics of the hermetically sealed cells have not undergone any significant change and that they are suitable for the operating conditions of the irradiated component cell in the PHENIX reactor.

However, it should be noted that no endurance tests were conducted with γ ray flux.