ADVANCED ELECTRICAL PROTECTION

Selection Guide
ABOUT CROUZET

Crouzet is an independent company manufacturing mechatronic components for demanding applications in Aerospace & Transportation, Energy, Building and Machinery Industry.

Crouzet provides Switches and Sensors, Electromechanical Actuators, Electrical Protection Equipment, Cockpit Controls, Automation Controllers and Relays, and Instrumentation Services.

Since 1921, Crouzet has a heritage of close collaboration with customers in the development of products, from standard components to fully customized solutions.

Crouzet’s customers and partners can rely on our teams worldwide to always meet and often exceed their expectations. Driven by innovation, our experts are focused on designing and delivering the right product for the right application.

Crouzet is your trusted partner of choice to face industrial challenges of today and tomorrow.

WORLDWIDE PRESENCE

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## ELECTRICAL PROTECTION

## ELECTRICAL DISTRIBUTION
WIRE PROTECTION

HOW DOES IT WORK?

ELECTROMECHANICAL CIRCUIT BREAKERS

In this type of Circuit Breaker, the current sensing is done by a bi-metal. The bi-metal is also part of the actuator that will open the line: the bi-metal is bent by heat coming from the current, the bi-metal moves the key lock, releases the latch and opens the line.

The Circuit Breaker bi-metal bends and releases the latch according to the overload current value and the overload duration (the bending is independent of the current direction).

If any, the auxiliary contact are galvanically isolated from the power and gives the state of the contacts (open or closed).

SOLID STATE CIRCUIT BREAKERS (SSCB)

In this type of Circuit Breaker, the current sensing is done by a shunt or a Hall sensor in DC or a Current Transformer (CT) in AC. A microcontroller or FPGA acquires the current and simulates the i²t curve, the switch function is often done by MOSFETS, bipolar transistors, SCR (i.e. thyristors).

The microcontroller will integrate the current going through the shunt and will open the MOSFET according to the current value and overload duration.

«LIGHT, SIMPLE AND SAFE»

Light:
Our single phase EN2495 and MIL MS33201 V compliant model is the lightest in the world (<20 g with screws, washers and nut).

Simple:
› Designed to be reused several times, spare components are not required
› Can sometimes be used as a switch (within the defined endurance limits), they therefore perform a dual function of switching and protecting

Safe:
› Our intrinsic fail safe** and trip free* conception enable a high level of safety (generally 10⁻⁹ Flight Hours (FH) of not opening on a short circuit)
› The temperature compensation ensures high performance over a wide temperature range (usually -60°C to +125°C)
› Excellent resistance to mechanical stress
› High current level peaks and high current flows tolerance

«MORE THAN A THERMAL SWITCH»

A SSCB is more than a thermal switch because when it is connected to a data bus, it provides intrinsically functions such as:
› A remote switching ability (useful in application: contactor or relay function)
› Dimmer or chopper function (useful in applications such as: motor speed control, light dimming, soft start)
› Current monitoring (prognostic applications, load failure detection)

Also,
› They are not susceptible to vibrations (useful in applications with high acceleration (Gs): aircraft, guns…)
› They generate no audio noise (useful in applications such as: submarines, electric tanks, medical…)
› They can become a PLD with a protected power output (see p. 37)
› They can protect the load (see p. 37).

* Trip free: even if the pushbutton is maintained in the closed position, the opening of the contacts (and therefore of the electric circuit) is ensured in the event of a current surge or short-circuit.
** Intrinsically safe (Fail safe): the Circuit Breaker has been designed with a fuse element to ensure that the electric circuit is opened in the extreme case of a blocked mechanism or glued contacts.
WIRE & STRUCTURE & FUEL TANK PROTECTION

EWIS PROTECTION
The 14CFR Part 25 subpart H requirements asks aircraft OEM to consider the electrical wiring interconnection as a system. This means that the airworthiness of the wiring must be guaranteed for the complete lifetime of the aircraft. AFCBs are a way to obtain compliance to AC 25 1701-1.

The Advisory Circular (AC 251701-1) gives guidance for subpart H compliancy and indicates that a safety analysis of the Electric Wiring Interconnection Systems (EWIS) has to be done. To certify the EWIS, the constructor must show a proactive approach to mitigate risks and perform a zonal analysis (EZAP). When performing this analysis, it is very important to keep in mind that «regardless of probability, any single arcing failure should be assumed for any power carrying line» (page 31 of the AC) because the traditional way of thinking which was: «optional systems, like in flight entertainment, cannot cause a catastrophic failure condition» is not a valid assumption.

Locations where arcing must be mitigated:

- A In flight entertainment area
- B Cargo and baggage compartment door actuators
- C Fuel tanks
- D SWAMP area (Severe Wind And Moisture Problem area) such as wires in landing gear well or cockpit window heater or wing defrost heaters
- E Galleys to protect electrical socket appliances such as: Cooktop ovens, waste compacting machines, coffee machines etc...
- F Places where due to vibration, heat, aging or after an incorrect maintenance operation there is a risk of a power line touching:
  1. a critical hydraulic actuator line
  2. pressurized air line (air duct) or flight critical data line
  3. mechanical control system cable
  4. oxygen lines
  5. fuel lines
  6. water and water/waste line (and below them in case of dripping)
  7. hot air ducts

In case of an arc inside a bundle, arc fault technology will preclude a chain reaction in the bundle from inducing the loss of the complete bundle. Instead there will be a «controlled» deterioration of the wire(s) giving time for maintenance to be aware of the fault (by using the information coming from the circuit breaker) and thus avoiding a potential catastrophic situation.

HOW DOES ARC FAULT PROTECTION WORK?
AFCBs combine the safety of standard Circuit Breakers and high accuracy electronics to mitigate arcing. Each standard thermal Circuit Breaker is equipped with an electronic board in order to analyze the current waveform in real time to detect if arcing is occurring.

The algorithm in the electric board works faster than the thermal bi-metal function as shown on the adjacent chart.

ARC FAULT WILL CLEAR THE FAULT FASTER THAN THERMAL PROTECTION
In case of an electric hazard, the arcing energy (thus mechanical damage) is divided by a magnitude (generally 10) as shown in the adjacent chart.

The quick opening time of the GFCB-AFCB (generally 12 msec) will not release sufficient energy to puncture the conduit or the tank’s skin (a pure thermal circuit breaker will open on an arc or a shorting current in 200 ms, thus 10 times slower which releases sufficient energy to puncture the tank’s skin or conduit).

CARBON COMPOSITE (CFRP) PROTECTION
Carbon Fibres Reinforced Polymer (CFRP) can be damaged (delamination) and can ignite in case of arcing. The use of arc fault protection will mitigate damage and risk significantly as illustrated below:
WIRE & HUMAN & FUEL TANK PROTECTION
GROUND FAULT CIRCUIT BREAKER (GFCB) WITH ARC FAULT

FUEL TANK PROTECTION
Following SFAR88 recommendation, the FAA and EASA have compelled PART 25 aircrafts to protect fuel tanks with Ground Fault. The purpose of these Ground Fault protection device is to preclude fuel tank puncture by reducing drastically the amount energy liberated by a fault.

Documents AC25981 and AMC25981(a) state that:
any components located in or adjacent to a fuel tank must be qualified to meet standards that assure, during both normal and failure conditions, ignition of flammable fluid vapors will not occur.

The reduction of damage concerns also:
» Pylons & nacelles and small dimension aircraft where power line are routed near data buses or hydraulic tubes.
» Wings where torque tube disconnections can cause severe damage to the wiring.
» Composite wings with high power electric actuators (EHA, EBHA) in the vicinity of fuel tanks.

THE GF-AFCB: A GFI CAPTURING LINE TO LINE ARCING
Traditional Ground Fault protection do not capture series arcing or line to line arcing because these two faults do not create a leakage current to the ground (i.e. the CT that measures the homopolar current will still read «zero» with one of these 2 faults occurring). By adding arc fault detection on each line, the GF-AFCB is a GFI and a circuit breaker that detects these 2 wire faults.

THE GF-AFCB STRUCTURE

ARC FAULT INTERRUPTER

HOW DOES IT WORK?
» Built in test
The GF-AFCB provides built-in test features that allow aircraft maintenance personal to verify that ground fault protection is functional, or that a ground fault has occurred: data issued from the led on the flat of the threaded barrel gives this information.

» Severed wire detection
The GF-AFCB includes «severed wire detections» (ie broken or cut wire) to preclude the heating of a motor if it is stalled (blocked) or running on only 2 phase (typical time detection is 1 second).

The above has been implemented because AC25981 states page 9.3.1:
(c) «[…] Automatic protective means, such as arc/ground fault interrupters or other means, should be provided to shut down the pump when a single electrical phase failure occurs. Periodic inspections or maintenance of these features may be required».

ON A «STAR» (WYE) LOAD, WITH GROUNDED CENTER, THE BEHAVIOR OF THE GFCB IS THE FOLLOWING

Trouble shooting the wire with information from the breaker reader

The following pictures are screenshots of the laptop running the breaker reader software after a fault has occurred.
ELECTRICAL PROTECTION
HIGH SHOCK AND VIBRATION BREAKERS

Our High-Performance Thermal Circuit Breakers exceed the standard for shock and vibration for military applications.

It has always been troublesome for electrical systems engineers to find the best suitable circuit breakers for harsh environments. Crouzet has developed a specific series of circuit breakers which go far beyond the current standards.

When used in the vicinity of cannons or missile launchers and in circuit breaker panels installed next to machine guns (e.g. helicopters, jet fighters or armored vehicles) the high «shock and vibration» family avoids installing silent blocks on panels or on circuit breakers (while maintaining top circuit protection performance).

For the single pole circuit breaker the High Shock and Vibration products multiply by two the endurance level to random and sinus vibrations, compared to AS8091 level or basic MS33201 levels.

ELECTRICAL DISTRIBUTION
FROM SSCB TO SSPC

FROM SSCB TO SSPC
Using the most recent solid state technology, Crouzet has developed 2 generic Solid State Circuit Breakers (SSCB): One for 28 VDC applications, the other for 115 VAC applications.

A Solid State Circuit Breaker is composed of a microcontroller, a switch and a data bus. This enables a SSCB to provide more than just thermal protection; its role encompasses electrical functions such as: relay, gradator, chopper, ground fault, soft start, current measurement.

These functions can be used for light dimming, motor speed control, intermittent load command (on/off), inrush current limitation, sequential power ON of loads, load failure detection. This is why they become Solid State Power Controllers (SSPC).

WHEN DO I NEED A SSPC?
Cost efficiency will depend on the ability to encompass several of the previous functions.

When thinking of an SSPC solution the following chart must be kept in mind:

<table>
<thead>
<tr>
<th>Trip Information</th>
<th>Must I Think of An SSPC Solution?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON/OFF</td>
<td>=</td>
</tr>
<tr>
<td>Pi</td>
<td>= +</td>
</tr>
<tr>
<td>High Inrush (8X)</td>
<td>+</td>
</tr>
<tr>
<td>Arc Fault</td>
<td>+</td>
</tr>
<tr>
<td>GFI</td>
<td>+</td>
</tr>
<tr>
<td>Secure Open</td>
<td>+</td>
</tr>
<tr>
<td>Trip Acknowledge</td>
<td>=</td>
</tr>
</tbody>
</table>

Typical circuit protection on following military platforms:
- Fighter Aircraft
- Military Land Tracked and Wheeled Vehicles
- Military Helicopters
- Missile Launchers
- Ground Air Defense Systems
- Naval Shipboard Applications

EASY TO OPERATE
Both 115 VAC and 28 VDC SSPC components are delivered with a laptop/tablet interface that enables a quick appropriation of SSPC features. Command from the laptop are transferred through CAN bus. The laptop/tablet interface can be replaced by a MCU or Utilities Management System (UMS) that sends and receives data frames through CAN2.0B.

The typical set of orders/queries is:
- ON/OFF: Powers ON/OFF the load
- RESET: Resets the elementary switch after arc or thermal trip
- STATUS: Asks for trip reason
- CURRENT: Asks for current (A) value
- BACKUP: Programs the behavior when data bus is disconnected
ELECTRICAL DISTRIBUTION
CIRCUIT BREAKER PANELS

SUPPLIER OF CIRCUIT BREAKER PANELS
ON SEVERAL JET AND HELICOPTER PROGRAMS

crouzet has extensive experience in the design, development and production of illuminated and non-illuminated circuit breaker panels in Push/Pull or Push/Push versions, wire or PCB-FASTON version.

OUR KNOW HOW

As a manufacturer of CB panels we will optimise your needs:
- Geometry, connection and mounting as specified by your requirements and constraints
- Customised marking of the front panel
- Labelling of circuit breaker functions by engraving or easily-modified labels
- Reduced weight due in part to our specially developed light weight Circuit Breaker and busbars
- Expertise in mechanical and thermal limits (wire gauges, suitable sizes for circuit breakers, optimum distribution of circuit breaker, …)
- Expertise in busbars and connections with all the safety requirements (segregation, protection, …)
- ATP performed by automatic test benches

PREDICTABLE PANEL MASS FOR PANELS CONTAINING ONLY CBs

- grams/protected line

<table>
<thead>
<tr>
<th>Technology</th>
<th>Constraints</th>
<th>Wire + casing</th>
<th>PCB + casing</th>
<th>PCB + no casing</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rear or side connector</td>
<td>Side connector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56 CB military helicopter panel &amp; 150 CB regional jet panel</td>
<td>None</td>
<td>56 CB military helicopter panel &amp; 150 CB regional jet panel</td>
<td>55 CB search and rescue helicopter panel</td>
<td>16 CB PCB panel kit</td>
<td>World Record</td>
</tr>
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</table>

THE KIT:
Crouzet is the first company to invent the concept of “do it yourself” circuit breakers panels and with this technique, it has created the lightest extractible circuit breaker panel in the world. The concept is based on a generic PWB carrying 16 Push Fit CBs that you can duplicate (if several bus bars are needed or if more Circuit Breakers are needed).

KIT CONSTITUTION

The kit is composed of spacers, a PCB board, FASTON Circuit Breakers, and positioning rings. The front plate is compatible with accessories (Circuit Breaker gags and obturators).

PREQUALIFICATION

To reduce development time the kit is qualified to harsh environment.
The use of the panel or its sub-sets enables the quick fielding of a qualified solution. If the assembly recommendation and circuit breaker locations are respected, Crouzet guarantees the electrical and vibrational behavior of the kit:
- Temperature and electrically from -55°C to 71°C with a 100% utility factor (150 A output)
- Vibrations: Random and Sinusoidal rays (Harsh Helicopter Level)
- Crash, fungus, sand and dust.

BUS BARS:

Traditional bus bar (rectangular)
Crouzet bus bar (flexible)

Use of frog legs CB (45° or 60°) is necessary
The flexible bus bar is compatible of many CB families

THE «DO IT YOUR SELF» KIT & BUS BARS

<table>
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<th>KIT CONSTITUTION</th>
<th>BUS BARS</th>
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</thead>
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<tr>
<td></td>
<td>Traditional bus bar (rectangular)</td>
</tr>
<tr>
<td></td>
<td>Crouzet bus bar (flexible)</td>
</tr>
<tr>
<td></td>
<td>To replace this CB, the removal of the bus bar is not needed</td>
</tr>
<tr>
<td></td>
<td>The flexible bus bar is compatible of many CB families</td>
</tr>
</tbody>
</table>
The RCCB’s primary use is to power loads that do not need to be permanently ON (to optimize energy). This is why it is used:

- For powering hydraulic actuators of cargo bay doors
- For powering Electro Hydraulic Actuators (EHA) and Electro Backup Hydraulic Actuators (EBHA)
- For powering ON and OFF the galleys or In Flight Entertainment (IFE)

The RCCB contacts are CLOSED and OPENED (load is set ON and OFF) only once or twice during the flight; it is designed to commute at least 100,000 times, giving the aircraft a minimum of 50,000 cycles (take off and landing).

- A unique feature: a mobile contact (in orange) that closes first and opens last; this contact rich in tungsten endures rebound at closing time and arcing at opening time. The blue contact rich in silver ensures a low voltage drop during steady state operation; this association guarantees 100,000 cycles under rated current with a power factor of 0.7.

The RCCB merges a contactor function and a circuit breaker function in a single unit. The contactor is closed when 28 V is applied on the command input. The RCCB has a status display window and a mechanical «TRIP indicator».

When the CB has tripped, the mechanical «TRIP indicator» is «popped out» and must be pushed back in manually to RESET the circuit breaker.

Our real MTBF figure of 300,000 Flight Hours (field value) during 20 years of service have convinced our customers to mount the RCCB successively on:

- Galleys feeders
- Cargo doors actuation motors
- Flight control power packs (EHA and EBHA) of primary flight control actuators (spoilers; ailerons; rudder)

Hereafter is an illustration of the main aircraft locations of the RCCB:

> A unique feature: a signal contact withstanding «medium» current:

Using c1 b1 d1 «medium current signal contacts» it is possible to command 2 RCCBs with only one switch (here switch S1):
**SELECTION GUIDE**

**CHOICE BY STANDARD AND RATING**

**ATTACHMENT HARDWARE CODIFICATION**

**SIMULATOR CBs**

**ATTACHMENT HARDWARE CODIFICATION**

**Delivery hardware code**

**Connection and attachment hardware kits EN 6113**

**Delivery conditions**

**Kit part-no.**

**Components of the hardware kits**

**Single part no.**

**Description**

**Pieces per kit**

**Hardware code**

**Hardware kit part**
SMALL MODEL CIRCUIT BREAKER SINGLE POLE
DPMU

REFERENCES

Technical File SP4374/9944 SP9930 SP4356

General Characteristics

Voltage drop compliance EN2495/2995/MS3320/AS33201 EN2495/2995/MS3320/AS33201
Auxiliary contact current 0.1..0.2 A 0.1..0.2 A
Working life (endurance) at 5x RC 50 cycles 50 cycles
Insulation resistance above 100 MΩ above 100 MΩ
Endurance cycles 5000 (with L/R: 5 ms) 5000 (with cos φ: 0.7)
Dielectric 1500 V 1500 V
Breaking current 1 co + 2 OC 6000 A 2500 A
MTBF FH (Typical) > 7.2 M > 7.2 M > 7.2 M > 7.2 M > 7.2 M > 7.2 M > 7.2 M > 3.6 M
Mass without mounting hardware (g) < 18 < 18 < 18 < 18 < 18 < 18 < 20 < 20
Mass with mounting hardware (g) < 21 < 20 < 20 < 20 < 20 < 20 < 22 < 22

NORMATIVE REFERENCES

EN 3773-004
EN 2995-004/005

Electrical

Voltage: 100..415 V 100..415 V
Current: 1 A..63 A 1 A..63 A
Tripping time: 100 ms 100 ms
No signal contact
Non polarised / polarised

Dimensions

Max. L 100 mm Max. W 32 mm Max. H 11.5 mm

Panel Cutout Recommendation

Thickness: 1.6 mm → 3 mm

Curves

Maximum and minimum limit of ultimate trip

<table>
<thead>
<tr>
<th>Rating</th>
<th>1.5 → 5 A</th>
<th>7.5 → 25 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-tripping point at 20°C</td>
<td>1.15 * RC</td>
<td>1.15 * RC</td>
</tr>
<tr>
<td>Tripping point at 20°C</td>
<td>1.4 * RC</td>
<td>1.4 * RC</td>
</tr>
<tr>
<td>Tripping time at 2 °C</td>
<td>2 s → 15 s</td>
<td>4 s → 30 s</td>
</tr>
<tr>
<td>Non-tripping point at 125°C</td>
<td>1 °C</td>
<td>1 °C</td>
</tr>
</tbody>
</table>

Ambient temperature

-40 °C +150 °C

Humidity

Test b RTCA DO160 10 cycles
Salt spray 48 h 5% NaCl

Environmental

Humidity: Test b RTCA DO160 10 cycles
Salt spray 48 h 5% NaCl
### SMALL MODEL CIRCUIT BREAKER THREE POLE DPMT

#### REFERENCES

<table>
<thead>
<tr>
<th>Rating</th>
<th>No signal contact</th>
<th>Non polarised/polarised signal contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 A</td>
<td>84 410 001</td>
<td>84 411 001</td>
</tr>
<tr>
<td>2 A</td>
<td>84 410 002</td>
<td>84 411 002</td>
</tr>
<tr>
<td>2.5 A</td>
<td>84 410 003</td>
<td>84 411 003</td>
</tr>
<tr>
<td>3 A</td>
<td>84 410 004</td>
<td>84 411 004</td>
</tr>
<tr>
<td>4 A</td>
<td>84 410 005</td>
<td>84 411 005</td>
</tr>
<tr>
<td>5 A</td>
<td>84 410 006</td>
<td>84 411 006</td>
</tr>
<tr>
<td>6 A</td>
<td>84 410 007</td>
<td>84 411 007</td>
</tr>
<tr>
<td>7.5 A</td>
<td>84 410 008</td>
<td>84 411 008</td>
</tr>
<tr>
<td>10 A</td>
<td>84 410 009</td>
<td>84 411 009</td>
</tr>
<tr>
<td>15 A</td>
<td>84 410 010</td>
<td>84 411 010</td>
</tr>
<tr>
<td>20 A</td>
<td>84 410 011</td>
<td>84 411 011</td>
</tr>
<tr>
<td>25 A</td>
<td>84 410 012</td>
<td>84 411 012</td>
</tr>
<tr>
<td>32 A</td>
<td>84 410 013</td>
<td>84 411 013</td>
</tr>
</tbody>
</table>

#### General Characteristics

- **Color**: Black color
- **Insulation resistance**: Above 100 MΩ
- **Electrical**:
  - **Mechanical**:
    - Operating force: 40kPa (4) / 69kPa (3)
    - Load opening/closing: no load / 500 cycles
    - Load: 25 / 500 cycles
- **Tightening torque**: B fundamental recommended: 0.5 to 0.6 Ncm maximum: 1.2 Ncm
- **Environmental**:
  - Operating temperature: -40°C / +70°C
  - Storage temperature: -55°C to +125°C
  - Humidity: Test B RTCA DO160 10 cycles

#### Dimensions

- **Rating**: 1.5 to 25 A
- **Ambient temperature**: 20°C ± 5°C
- **Short circuit breaking capacity**: 100 kA at 250 VAC 50 Hz / 250 VDC 50 Hz
- **Non-trip threshold**: 125°C (direct overload)
- **Non-tripping point**: 20°C
- **Curves**
  - **Minimum trip time**: 0.1 s
  - **Maximum trip time**: 5 s

#### Mechanical

- **Molding material**: Moule 1.00 / Moule 1.00
- **Polarisation**: No polarisation / polarisation
- **Current rating**: 100 A / 200 A
- **Auxiliary contact current**: 3 A
- **Current carrying capacity**: 100 A / 200 A

#### Environmental

- **Duty cycle**: 50 % / 60 %
- **Humidity**: Test B RTCA DO160 10 cycles
- **Operating temperature**: -40°C / +70°C
- **Accelerating vibration**: 17 g
- **Vibration**: EN (at 23°C)
- **Random (10-2000 Hz)**: 5.6 Gms at 10% of RC
- **Shock**: 50 g for 11 impulses 6 directions

#### Technical file

- **Conformity standard**: EN 60947-6-1
- **Technical file**: GPL

#### Mounting hardware

- **Threaded**: M3x0.5 / M4
- **Screw**: UNC
- **Mounting hardware**: 6.3 / UNC

#### Button

- **QPL**: Yes
- **Black color**: Yes
- **Lug neck**: Yes
BIG MODEL CIRCUIT BREAKER SINGLE POLE

DGMU

REFERENCES

Mounting hardware

<table>
<thead>
<tr>
<th>Rating</th>
<th>15 A</th>
<th>20 A</th>
<th>30 A</th>
<th>50 A</th>
<th>25 A</th>
<th>40 A</th>
<th>60 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screw</td>
<td>M12-75</td>
<td>M12-100</td>
<td>7/16</td>
<td>7/16</td>
<td>M12-100</td>
<td>M12-100</td>
<td>M12-100</td>
</tr>
<tr>
<td>Terminal</td>
<td>0-32 UNC</td>
<td>0-32 UNC</td>
<td>M4</td>
<td>M4</td>
<td>M4</td>
<td>M4</td>
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Suction

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Conformity standard

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<th>EN 2794-003</th>
<th>EN 3661-006</th>
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<tr>
<td>BACC 18R &amp; 18X like</td>
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Mass / MTBF / Vibration / Technical file

| Mass without mounting hardware (g) | 81 | 81 | 81 | 81 |
| Mass with mounting hardware (g) | 85 | 85 | 85 | 85 |
| MTBF (Typical) | > 10 M | > 10 M | > 10 M | > 10 M |
| Technical File | SP0305 | - | - | SP0305 |

GENERAL CHARACTERISTICS

Electrical

<table>
<thead>
<tr>
<th>28 VDC</th>
<th>115 VAC (400 Hz)</th>
<th>115 VAC 50Hz-230 VAC 50Hz</th>
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<tr>
<td>3,5 N &lt; push &lt; 55 N</td>
<td>5 N &lt; pull &lt; 40 N</td>
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Endurance (manual open/close) no load: 5000 cycles on resistive load: 2500 cycles

Tightening torque: barrel nut: recommended: 4 ± 0.2 N·m maximum: 5.5 N·m terminal screw: recommended: 2.35 ± 0.15 N·m maximum: 2.5 N·m

Environmental

| Salt spray | 480 (1.5% NaCl) |
| Humidity Test | 50 % RH (20°C) |
| Operating temperature | -40°C to +70°C |
| Acceleration (particular) | 45 g (3500 g/s) |
| Shock | 50 g 3 pulse 11 max. 6 directions |
| Vibration (measured) | 0.26 g RMS (MIL-STD-883 method 2040 A condition A with 50 % of RC) |
| Vibration (measured at RC) | 0.26 g RMS (MIL-STD-883 method 2040 A condition C with 50 % of RC) |

DIMENSIONS

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<tr>
<th>84 306 0 &amp; 84 306 8</th>
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<th>84 306 6</th>
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<td>Thickness 1.6 mm → 3 mm</td>
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PANEL CUTOUT RECOMMENDATION

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<th>84 306 8 Bus-Bar EN 3661-006</th>
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<td>Versions 84 306 0 - 3 - 6</td>
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<table>
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CONTACT CROUZET
BIG MODEL CIRCUIT BREAKER THREE POLE
DGMT

REFERENCES

<table>
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<tr>
<th>Rating</th>
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<tr>
<td>50 A</td>
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<td>84 313 005</td>
<td>84 313 007</td>
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</table>

Mounting hardware

- Threaded barrel M10-100
- Terminal screws M4
- Hole ø5.5 for Bus-Bar & 45° angle

Button

- Green color
- Black color

Conformity standard

- EN 60921
- EN 3662
- 100000000 Ohm

Technical file

- MIL-S-9685
- MIL-S-9685
- MIL-S-9685
- MIL-S-9685
- MIL-S-9685
- MIL-S-9685
- MIL-S-9685
- MIL-S-9685

GENERAL CHARACTERISTICS

Electrical

- Breaking current 1CO + JOC0D: 2000 A, 100 A long trip
- Electrician voltage: 1500 V
- Endurance electric overloads: 5000 cycles with cos ϕ: 0.7
- Insulation resistance: above 100 MΩ
- Working life (maximum): 30 cycles
- Auxiliary contact current: 0.1 A
- Voltage drop compliance: EN2665/EN3662

Mechanical

- Operating force: 200 kgf per 200 mm (50 mm pull-out)
- Endurance (manual open/close): on resistance load: 2500 cycles
- Tightening torque: barrel nut: recommended: 4 ± 0.25 Nm, maximum: 5.5 Nm, terminal screw: recommended: 2.35 ± 0.15 Nm, maximum: 2.5 Nm

Environmental

- Altitude: 4000 m / 13000 ft
- Humidity: Test b: 90 % RH, 40°C, 10 cycles
- Operating temperature: -5°C to 40°C
- Acceleration: up to 40 g
- Shock: 5 g x 11 axes ± 6 directions
- Vibration (ambient): 2.5 g x 11 axes ± 6 directions
- Vibration (random at 40°C): 2.5 g x 11 axes ± 6 directions

REFERENCES

- Electrical
  - 115/200 VAC (400 Hz)
  - 115/200 VAC 60 Hz-230/400 VAC 50 Hz
- Breaking current: 2000 A + 150 A long trip
- Electrician voltage: 1500 V
- Endurance electric overloads: 5000 cycles with cos ϕ: 0.7
- Insulation resistance: above 100 MΩ
- Working life (maximum): 30 cycles
- Auxiliary contact current: 0.1 A
- Voltage drop compliance: EN2665/EN3662

Mechanical

- Operating force: 200 kgf per 200 mm (50 mm pull-out)
- Endurance (manual open/close): on resistance load: 2500 cycles
- Tightening torque: barrel nut: recommended: 4 ± 0.25 Nm, maximum: 5.5 Nm, terminal screw: recommended: 2.35 ± 0.15 Nm, maximum: 2.5 Nm

Environmental

- Altitude: 4000 m / 13000 ft
- Humidity: Test b: 90 % RH, 40°C, 10 cycles
- Operating temperature: -5°C to 40°C
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- Electrical
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  - 115/200 VAC 60 Hz-230/400 VAC 50 Hz
- Breaking current: 2000 A + 150 A long trip
- Electrician voltage: 1500 V
- Endurance electric overloads: 5000 cycles with cos ϕ: 0.7
- Insulation resistance: above 100 MΩ
- Working life (maximum): 30 cycles
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- Shock: 5 g x 11 axes ± 6 directions
- Vibration (ambient): 2.5 g x 11 axes ± 6 directions
- Vibration (random at 40°C): 2.5 g x 11 axes ± 6 directions
# FROG LEGS TERMINALS
## SMALL MODEL CIRCUIT BREAKER

## REFERENCES

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<td>84 406 009</td>
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## Dimensions

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<td>84 410 0.5 - 30 mm</td>
<td>84 410 0.5 - 30 mm</td>
</tr>
<tr>
<td>84 417 2 - 30 mm</td>
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</table>

## General Characteristics

### Electrical

- **Breaker rating** (1.5x) = 100% rated
- **Non-tripping temperature** at 25°C
  - Single pole: 1.15 * RC
  - Three pole: 1.4 * RC
- **Mounting hardware (no load)**
  - 2500 cycles
- **Mounting hardware (resistive load)**
  - 2500 cycles
- **Tightening torque (barrel) recommended**: 4 ± 0.25 N.m
- **Tightening torque (terminal screw) recommended**: 1.6 ± 0.1 N.m

### Mechanical

- **Operating force**
  - 3-5 N < push < 45 N
  - 8 N < pull < 80 N
- **Endurance mechanical (no load)**
  - 5000 cycles
- **Tightening torque (barrel) recommended**: 4 ± 0.25 N.m
- **Tightening torque (terminal screw) recommended**: 1.6 ± 0.1 N.m

### Environmental

- **Salt spray**
  - 80% NaCl 10 cycles
- **Humidity**
  - 95% RH 10 cycles
- **Operating temperature**
  - -20°C to +50°C for all ratings except 30 A - -60°C to +90°C
- **Acceleration**
  - 10 g / 50 mm
- **Shock**
  - 50 g, 11 ms

## Curves

Trip times envelope for temperature from -55°C to 125°C (direct overload)

- **Single pole**
- **Three pole**
### PUSH-PULL PUSH-FIT 6.3 MM BLADE
#### SMALL MODEL CIRCUIT BREAKER

**REFERENCES**

<table>
<thead>
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**Mounting hardware**
- Straight terminals without screws
- Barrel threadings
  - Conical barrel

**Conformity standard**
- EN 3495*
- EN 2995* 004 005
- EN3773-006
- EN3774-006
- AS 33201

* for thermal performance and auxiliary contact performance

**Electrical Characteristics**

<table>
<thead>
<tr>
<th>Single pole</th>
<th>Three pole</th>
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<tr>
<td>28 VDC</td>
<td>110 VAC (400 Hz)</td>
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<td>115 VAC (400 Hz)</td>
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**Environmental Characteristics**

<table>
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<th>Three pole</th>
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<td>4 ± 0.25 N.m</td>
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<tr>
<td>4 ± 0.25 N.m</td>
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<tr>
<td>4 ± 0.25 N.m</td>
<td>5.0 N.m</td>
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**Mechanical Characteristics**

- Operating force
  - 28 VDC: 3.5 N < push < 45 N / 5 N < pull < 80 N
  - 115 VAC: 3.5 N < push < 45 N / 5 N < pull < 80 N

<table>
<thead>
<tr>
<th>General Characteristics</th>
<th>Single pole</th>
<th>Three pole</th>
</tr>
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<tbody>
<tr>
<td>Breaking current 1CO + 2OCO</td>
<td>6000 A</td>
<td>2500 A</td>
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<td>Electrical endurance 5000 V</td>
<td>1000 V</td>
<td>1000 V</td>
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<tr>
<td>Endurance cycles 5000 (with L/R: 3 ms)</td>
<td>5000 (with cos φ 0.7)</td>
<td>5000 (with cos φ 0.7)</td>
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<td>Insulation resistance above 100 MΩ</td>
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<td>Working life (endurance) at 5xRC</td>
<td>10000 cycles</td>
<td>10000 cycles</td>
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<tr>
<td>Voltage drop compliance</td>
<td>100 MΩ</td>
<td>100 MΩ</td>
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<tr>
<td>Mechanical Operating force</td>
<td>3.5 N &lt; push &lt; 45 N / 5 N &lt; pull &lt; 80 N</td>
<td>3.5 N &lt; push &lt; 45 N / 5 N &lt; pull &lt; 80 N</td>
</tr>
<tr>
<td>Endurance 6000 A</td>
<td>2500 A</td>
<td></td>
</tr>
<tr>
<td>Tightening torque (mercal force)</td>
<td>4 ± 0.25 N.m maximum: 5.0 N.m</td>
<td></td>
</tr>
<tr>
<td>Tightening torque (terminal screw)</td>
<td>4 ± 0.25 N.m maximum: 5.0 N.m</td>
<td></td>
</tr>
</tbody>
</table>

**Dimensions**

- Required panel thickness for centring grommet 79219333: 1.6 mm

---

**PUSH-FIT 0.25 INCH TAB**

**CURVES**

- Trip times envelope for temperature from -55°C to 125°C (direct overload)
  - 28 VDC: 1CO + 2OCO
  - 115 VAC (400 Hz): 1CO + 2OCO

- Maximum and minimum limit of ultimate trip
  - Non tripping point at 25°C
  - Tripping point at 25°C
  - Tripping time at 2 * RC

- Maximum and minimum limit of ultimate trip at 125°C
  - Non tripping point
  - Tripping point
  - Tripping time

---

**GENERAL CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Single pole</th>
<th>Three pole</th>
</tr>
</thead>
<tbody>
<tr>
<td>28VDC</td>
<td>0-60VDC</td>
</tr>
<tr>
<td>115 VDC</td>
<td>0-60VDC</td>
</tr>
<tr>
<td>2500 A</td>
<td>0-60VDC</td>
</tr>
<tr>
<td>5000 A</td>
<td>0-60VDC</td>
</tr>
<tr>
<td>1000 V</td>
<td>0-60VDC</td>
</tr>
<tr>
<td>5000 A</td>
<td>0-60VDC</td>
</tr>
<tr>
<td>1500 V</td>
<td>0-60VDC</td>
</tr>
<tr>
<td>5000 A</td>
<td>0-60VDC</td>
</tr>
<tr>
<td>5000 A</td>
<td>0-60VDC</td>
</tr>
<tr>
<td>5000 A</td>
<td>0-60VDC</td>
</tr>
<tr>
<td>10000 cycles</td>
<td>10000 cycles</td>
</tr>
<tr>
<td>10000 cycles</td>
<td>10000 cycles</td>
</tr>
<tr>
<td>10000 cycles</td>
<td>10000 cycles</td>
</tr>
<tr>
<td>10000 cycles</td>
<td>10000 cycles</td>
</tr>
</tbody>
</table>

**Environmental**

- Salt spray: 48h 5% NaCl
- Humidity: Test b RTCA DO160 10 cycles
- Operating temperature: -60°C +90°C
- Acceleration (centrifugal) up to 40 g
- Shock: 50 g 3 halfsine 11 msec
- Vibration (sinusoidal) single pole: 9.26 Grms (MIL STD 202 method 204 D condition B with 90% of RC)
- Vibration (random) single pole: 9.26 Grms (MIL STD 202 method 214 A condition E with 90% of RC)

**Mechanical**

- Operating force
  - 28 VDC: 3.5 N < push < 45 N / 5 N < pull < 80 N

**Environmental**

- Salt spray: 48h 5% NaCl
- Humidity: Test b RTCA DO160 10 cycles
- Operating temperature: -60°C +90°C
- Acceleration (centrifugal) up to 40 g
- Shock: 50 g 3 halfsine 11 msec
- Vibration (sinusoidal) single pole: 0.44 g 4 sin 70 to 2000 Hz
- Vibration (random) single pole: 0.28 gms 4 sin 204 D condition B with 90% of RC

---

**REFERENCES**

- EN 2495*
- EN 2995* 004 005
- EN3773-006
- EN3774-006
- AS 33201

* for thermal performance and auxiliary contact performance
PUSH-PUSH & FLYING LEADS VERSION
SINGLE POLE SMALL MODEL CIRCUIT BREAKER

Read also p. 48

REFERENCES

Rating
1 A 84 405 001
1.5 A 84 405 040
2 A 84 405 002
2.5 A 84 405 012
3 A 84 405 003
5 A 84 405 005 84 405 045
7.5 A 84 405 007
10 A 84 405 010
15 A 84 405 015
20 A 84 405 020
25 A 84 405 025

Mounting hardware
Faston terminal Barrel nut M12-100 + 500mm flying leads

Button color
White

Conformity standard
UL 60 950-3-08
SAM 614-40
EN 3773-3774*
our equipment complies with EN standards

Mass / MTBF / Technical file

Indigo
> 1.15 > 1.8

MTBF file (Typical) > 3.6 M > 3.6 M

Technical file SP 4397 & SP 9925

GENERAL CHARACTERISTICS

Electrical
Breaking current (CO + 3DDC) 1500 A 1000 A
Direct current 1500 V 1000 V
Insulation resistance above 100 MΩ above 100 MΩ
Working life time/5°K RC 1000 cycles 1000 cycles
Auxiliary contact current 6.1.2 A 0.1.2 A

Mechanical
Operating force no load 40 000 cycles
Endurance on maximum load 40 000 cycles
Tightening force (panel nut) recommended: 4 N/6, Max: 5 N/6
Tightening force (screw nut) 1.7 N/7c = 0.1

Environmental

Salt spray 48h 5% NaCl
Humidity Test b RTCA-OD80 10 cycles
Operating temperature -40°C +55°C
Acceleration up to 20 g
Vibration up to 50 g (10 Hz)
Vibration (measured) 10 g/6s from 13 to 2000 Hz
Vibration (random at 54°C) up to 0.26 Gmax from 10 to 2000 Hz

Read also p. 48

CURVES

Trip times envelope for temperature from -55°C to 125°C (direct overload)

Maximum and minimum limit of ultimate trip

<table>
<thead>
<tr>
<th>Rating</th>
<th>1 = 3 A</th>
<th>5 = 25 A</th>
<th>5 = 25 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-tripping point at 25°C</td>
<td>1.15 s</td>
<td>1.15 s</td>
<td>1.15 s</td>
</tr>
<tr>
<td>Tripping point at 25°C</td>
<td>1.4 s</td>
<td>1.4 s</td>
<td>1.4 s</td>
</tr>
<tr>
<td>Tripping time at 2 °C</td>
<td>2 s = 15 s</td>
<td>5 s = 15 s</td>
<td>10 s = 20 s</td>
</tr>
</tbody>
</table>

DIMENSIONS

PANEL CUTOUT RECOMMENDATION

Thickness 1.6 mm → 3 mm

CONTACT Crouzet
GROUND FAULT & ARC FAULT CIRCUIT BREAKER
GF-AFCB 115/200 VAC 360 .. 800 Hz

Read also p. B-11

### REFERENCES

<table>
<thead>
<tr>
<th>Rating</th>
<th>3 A</th>
<th>5 A</th>
<th>7.5 A</th>
<th>10 A</th>
<th>15 A</th>
<th>20 A</th>
<th>25 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>84 411 130</td>
<td>84 411 137</td>
<td>84 411 139</td>
<td>84 411 140</td>
<td>84 411 141</td>
<td>84 411 142</td>
<td>84 411 143</td>
</tr>
<tr>
<td>Breaker reader + CD</td>
<td>84 401 503</td>
<td>84 401 505</td>
<td>84 401 507</td>
<td>84 401 510</td>
<td>84 401 515</td>
<td>84 401 520</td>
<td>84 401 525</td>
</tr>
</tbody>
</table>

Accessories: breaker reader + CD: 84 411 131
** on request the GFCS is available in star or triangle configuration with different trip thresholds

#### Mounting hardware

- Threaded barrel: M12-0.75, M12-100
- M4

#### Button color

- Green
- Black

#### Conformity standard

- EN 2592 - EN 2996
- EN 2495
- AS 5692

** for thermal part

#### Mass / MTBF / Technical file

- Without mounting hardware: < 141, < 141, < 31
- With mounting hardware: < 150, < 150, < 33
- MTBF FH (Typical): > 150 000, > 150 000, > 450 000

#### GENERAL CHARACTERISTICS

** Electrical

- Breaking current: 1CO + 2OCO: 2300 A
- Dielectric: 1500 V
- Endurance cycles: 5000 (with cos φ: 0.7)
- Insulation resistance: > 10^6 Ω
- Working life (endurance at 5°C): 50 cycles
- Auxiliary contact current: 0.1..0.2 A
- Voltage drop compliance: MS14154/AS14154A/EN2592/2996/3774

** Mechanical

- Operating force: 11.0 to 16.5 N
- Endurance: 500 cycles
- Tightening torque (barrel nut): 8 N≤F<80 N
- Tightening torque (terminal screw): 1.7 N≤F<1.8 N

** Environmental

- Humidity: According IEC60068-2-1 category B
- Operating temperature (1 to 15 A): -40°C to +125°C
- Operating temperature (20 and 25 A): -60°C to +110°C
- Acceleration (vibrations):
  - up to 5 g (11g max. -10 g min.)
  - 10 g, PK from 5 to 2000 Hz
- Vibration (random at 5°C):
  - 5.68 G rms from 15 to 2000 Hz

#### CURVES

- Thermal trip
- Ground fault trip thresholds

#### PANEL CUTOUT RECOMMENDATION

- Thickness 1.6 mm → 2.4 mm

#### DIMENSIONS

- 84 401 5
- 84 411 1
DUMMY CIRCUIT BREAKER
DUMMY & WATERTIGHT PUSH PULL CB

CHOICE BY CIRCUIT BREAKER SIZE

Small Model Single Pole DPMU

<table>
<thead>
<tr>
<th>Initial Family</th>
<th>Signal contact</th>
<th>Ref.</th>
<th>Conformity</th>
<th>Barrel threadings</th>
<th>Terminal screw</th>
<th>Control button</th>
<th>Technical file</th>
</tr>
</thead>
<tbody>
<tr>
<td>84 404 0xx</td>
<td>Yes</td>
<td>84 404 001</td>
<td>AS0004</td>
<td>M12-0.75</td>
<td>705</td>
<td>Active</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 404 0xx</td>
<td>No</td>
<td>84 404 002</td>
<td>E296A01</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 404 0xx</td>
<td>No</td>
<td>84 404 004</td>
<td>E296A01</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 404 0xx</td>
<td>Yes</td>
<td>84 404 006</td>
<td>E296A01</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 404 0xx</td>
<td>No</td>
<td>84 404 007</td>
<td>E296A03</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
</tr>
</tbody>
</table>

Big Model Single Pole DGMU

<table>
<thead>
<tr>
<th>Initial Family</th>
<th>Signal contact</th>
<th>Ref.</th>
<th>Conformity</th>
<th>Barrel threadings</th>
<th>Terminal screw</th>
<th>Control button</th>
<th>Technical file</th>
</tr>
</thead>
<tbody>
<tr>
<td>84 413 0xx</td>
<td>Yes</td>
<td>84 413 001</td>
<td>AS0004</td>
<td>M12-0.75</td>
<td>705</td>
<td>Active</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 413 0xx</td>
<td>No</td>
<td>84 413 002</td>
<td>E296A01</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 413 0xx</td>
<td>No</td>
<td>84 413 004</td>
<td>E296A01</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 413 0xx</td>
<td>Yes</td>
<td>84 413 006</td>
<td>E296A01</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 413 0xx</td>
<td>No</td>
<td>84 413 007</td>
<td>E296A03</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
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</table>

Small Model Three Pole DPMT

<table>
<thead>
<tr>
<th>Initial Family</th>
<th>Signal contact</th>
<th>Ref.</th>
<th>Conformity</th>
<th>Barrel threadings</th>
<th>Terminal screw</th>
<th>Control button</th>
<th>Technical file</th>
</tr>
</thead>
<tbody>
<tr>
<td>84 404 0xx</td>
<td>Yes</td>
<td>84 404 001</td>
<td>AS0004</td>
<td>M12-0.75</td>
<td>705</td>
<td>Active</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 404 0xx</td>
<td>No</td>
<td>84 404 002</td>
<td>E296A01</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 404 0xx</td>
<td>No</td>
<td>84 404 004</td>
<td>E296A01</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 404 0xx</td>
<td>Yes</td>
<td>84 404 006</td>
<td>E296A01</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 404 0xx</td>
<td>No</td>
<td>84 404 007</td>
<td>E296A03</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
</tr>
</tbody>
</table>

Big Model Three Pole DGMT

<table>
<thead>
<tr>
<th>Initial Family</th>
<th>Signal contact</th>
<th>Ref.</th>
<th>Conformity</th>
<th>Barrel threadings</th>
<th>Terminal screw</th>
<th>Control button</th>
<th>Technical file</th>
</tr>
</thead>
<tbody>
<tr>
<td>84 414 0xx</td>
<td>Yes</td>
<td>84 414 001</td>
<td>AS0004</td>
<td>M12-0.75</td>
<td>705</td>
<td>Active</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 414 0xx</td>
<td>No</td>
<td>84 414 002</td>
<td>E296A01</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 414 0xx</td>
<td>No</td>
<td>84 414 004</td>
<td>E296A01</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 414 0xx</td>
<td>Yes</td>
<td>84 414 006</td>
<td>E296A01</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
</tr>
<tr>
<td>84 414 0xx</td>
<td>No</td>
<td>84 414 007</td>
<td>E296A03</td>
<td>M12-0.75</td>
<td>705</td>
<td>Pushed in</td>
<td>SP4001</td>
</tr>
</tbody>
</table>

CHOICE BY STANDARD

ASNE0496

<table>
<thead>
<tr>
<th>Corresponding functional Circuit Breaker</th>
<th>Model code</th>
<th>Dimension &amp; Alt Hardware</th>
<th>Part-number</th>
</tr>
</thead>
<tbody>
<tr>
<td>E296A01</td>
<td>EN4728</td>
<td>B (no control button)</td>
<td>84 404 006</td>
</tr>
<tr>
<td>E296A02</td>
<td>EN4728</td>
<td>B (no control button)</td>
<td>84 404 007</td>
</tr>
<tr>
<td>E296A03</td>
<td>EN4728</td>
<td>B (no control button)</td>
<td>84 404 008</td>
</tr>
</tbody>
</table>

To understand attachment hardware codification, please see page 19.

DIMENSIONS

Due to the upside down position of the CB and watertightness, there is no water ingress even with condensation.

When button is pulled out, calculator is RESET.

Watertight according to MIL PRF8805-E

When button is pulled out, calculator is RESET.

Watertight according to MIL PRF8805-E

PANEL CUTOUT RECOMMENDATION

› Thickness 1.6 mm ➞ 3 mm
Please, refer to the according technical file
Crouzet is proud to contribute towards the “greener Aircraft” through its bus connected components and through its never ending quest for more compact and lighter solutions. Crouzet delivers 3 standard distribution components:

- RCCB
- A Circuit Breaker panel Kit
- Solid State Circuit Breakers

With smart management, loads can be powered off during some flight phases and in rush current can be reduced. This technique will decrease the electrical network complexity and weight. Using information provided by the load, SSCB and RCCB’s role can encompass wire protection and load protection.

**LOAD AND WIRE PROTECTION WITH SSPC**

**LOAD AND WIRE PROTECTION WITH RCCB**
CIRCUIT BREAKER PANEL KIT

Panel Kit for Push-Fit 6.3 mm Blade CB

Read also page 15

REFERENCES

- Complete panel (PCB)
- Right angle 90°
- Spacers
- Straight 180°

<table>
<thead>
<tr>
<th>Complete panel lega</th>
<th>84 361 941</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete panel small</td>
<td>84 361 940</td>
</tr>
<tr>
<td>Spacers</td>
<td>70 219 431</td>
</tr>
<tr>
<td>Centring grommet</td>
<td>70 219 440</td>
</tr>
<tr>
<td>Panel with 32 receptacles</td>
<td>70 219 430</td>
</tr>
<tr>
<td>Panel with 16 receptacles</td>
<td>70 219 442</td>
</tr>
</tbody>
</table>

Connections:
- 8 spacers
- 16 grommets
- 32 receptacles

Connection possibilities:
- EN4165 (2 modules of 8 size 16 pins) with pins soldered on the vertical PCB
- EN4165 (2 modules of 8 size 16 pins) held by 79219440 with crimped contact pins
- Flying leads soldered on the vertical PCB

Circuit Breaker type:
- Faston without auxiliary contact | 84 408 0xx |
- Faston with auxiliary contact non-polarized | 84 408 8xx |
- Faston with auxiliary contact polarized | 84 408 6xx |

Weight (g):
- Without standard CB (only mechanical panel) < 351
- Panel with 16 Circuit Breakers < 528

MTBF FH (Typical) > 60 000

GENERAL CHARACTERISTICS

- Electrical:
  - Insulated current: 15*4+6*10+6*5=150 A from -60°C to 71°C
  - Insulated power: 150*28=4200 W
  - Prospective current (blocked mechanism): 1800 A 28 VDC (no copper tracks destruction)
  - Dielectric: 500 VDC between 2 copper tracks and between each track and power feeder

- Mechanical:
  - Torque (max) N.m:
    - Power stud (M6) 3.9
    - Every screw/spacer (M3) 2
  - Locktite on every screw/spacer (not on power stud nut)

- Environmental:
  - DO-160 section:
    - Test:
      - 4: Altitude
      - 5: Temperature
      - 6: Humidity
      - 7: Shock
      - 8: Vibration
      - 9: Pollution degree
      - 10: Fluids
      - 11: Sand and dust
      - 12: Fungus resistance
      - 14: Salt spray
      - 15: Magnetic effect
      - 16: EMI
      - 25: Inflammability
  - Category: method
    - N/A
    - Similarly
    - Test
    - Demonstration
    - Demonstration
    - Demonstration
    - N/A

- PIN TO CB AFFECTATIONS

<table>
<thead>
<tr>
<th>Connector EN 4165</th>
<th>8 T 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>F1</td>
</tr>
<tr>
<td>Pin 2</td>
<td>F2</td>
</tr>
<tr>
<td>Pin 3</td>
<td>F3</td>
</tr>
<tr>
<td>Pin 4</td>
<td>F4</td>
</tr>
<tr>
<td>Pin 5</td>
<td>F5</td>
</tr>
<tr>
<td>Pin 6</td>
<td>F6</td>
</tr>
<tr>
<td>Pin 7</td>
<td>F7</td>
</tr>
<tr>
<td>Pin 8</td>
<td>F8</td>
</tr>
</tbody>
</table>

- Dimensions and Specific Zones for CB Ratings: 84 408 XXX family

- Panel Cutout Recommendation for CB 84 408 XXX Family

- How Does It Work?

The assembly is qualified and distributes securely up to 150 A under 71°C with a configuration carrying four 15 A, six 10 A and six 5 A Circuit Breakers (thus a total of 16 CBs).

The distribution connector can be mounted on the vertical PCB or distribution leads can be soldered on the vertical PCB.

- If leads are soldered directly on the vertical PCB, the maximum currents are:
  - Red zone: 15 A max
  - Yellow zone: 10 A max
  - Green zone: 5 A max

- If EN 4165 is soldered and used with leads the size 16 pins limit the current to 13 A:
  - Max output: 4*13+6*10+6*5=142 A

- Recommended panel thickness for centring grommet 79219333: 1.6 mm
REMOTE CONTROL CONTROLLER & CIRCUIT BREAKER
RCCB 115/200 VAC 360-800 Hz

HOW DOES IT WORK?
The RCCB merges a contactor function and a circuit breaker function in a single unit. This association gives the following unique advantages:

- Reduction of the length of generally large cross-sections wires (mass reduction and harness simplification)
- Reduction of voltage drop (reduced number of contacts)
- Reduction of envelope
- Improved reliability (less components)

The contactor is closed when 28 V is applied on the command input. The RCCB has a status display window and a mechanical «TRIP indicator» when the CB has tripped, the mechanical «TRIP indicator» is «popped out» and must be pushed back in manually to RESET the circuit breaker (see page 16).

The «protection function» overrides the «contactor function». After tripping, the RCCB must therefore be reset manually, this avoids any risk of spurious restarting.

REFERENCES
GENERAL CHARACTERISTICS
- Acceleration (centrifugal) up to 10 g
- Vibration (random) 5.8 g from 10 to 2000 Hz
- Shock 25 g - 11 ms
- Operating temperature -40°C to +85°C
- Salt spray 48h at 5% NaCl
- Weight < 550 g
- Tightening torque (barrel nut) 3 +/- 0.2 Nm
- Max. admissible force (R push button) 50 N
- Operating force (R push button) < 10 N
- Endurance at 2*RC 1 000 cycles
- Resetting after trip By push on front R button
- Operating circuit disable after break Yes
- Visual indication of trip status by R button on front plate Yes
- Trip status auxiliary contact (incorporated diode) 28 VDC 10 to 200 mA
- Integrated load resistance (on current transformer output) - 50 Ω
- Current transformer ratio - 0.5 Volt rms for 10 A rms
- Contactor Endurance cycles with RC at 40°C cos Fi=0.7 100 000 cycles
- Insulation resistance ≥ 100 MΩ
- Dielectric stength I leakage < 1 mA @ 1500 V~
- Auxiliary contact n°2 SPDT type
- Auxiliary contact n°1 SPDT type
- Direct visual indication of contacts position on front plate OPEN / CLOSE
- Min. Hold-in voltage 10 V=
- Max. continuous hold-in current 300 mA
- Contactor Function
- Connector retaining screw M3x0.5 -
- Connexion screws (to power feeders lugs) 6 screws 8-32 UNC-3A
- Fixing screws (to panel or closet wall) 3 screws 10-32 UNF-3B
- Mounting hardware
- Dimensioning
- TRIPPING CHARACTERISTICS
- Control
- Electrical protection
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