

# BAT 7001

## auxiliary supply for circuit breakers and protection relays

The **BAT 7001** device contributes to optimum performance of electrical power systems by guaranteeing the stand alone operation of circuit breakers and / or protection relays while avoiding the problems linked to the installation and the maintenance of auxiliary supply systems using batteries. Its design is a result of C.E.E's exceptional experience in the field of the electrical power system protection using static protective relays (more than 450,000 units in operation throughout the world).

## Principles and applications

The function of the **BAT 7001** is to supply the auxiliary energy needed to trip circuit breakers and / or for the operation of digital protection relays, in applications where no dc supply (batteries / chargers) or uninterruptable ac supply (inverter) is available.

tripping circuit breakers, independent of all other load connected on the other reservoir (C1).

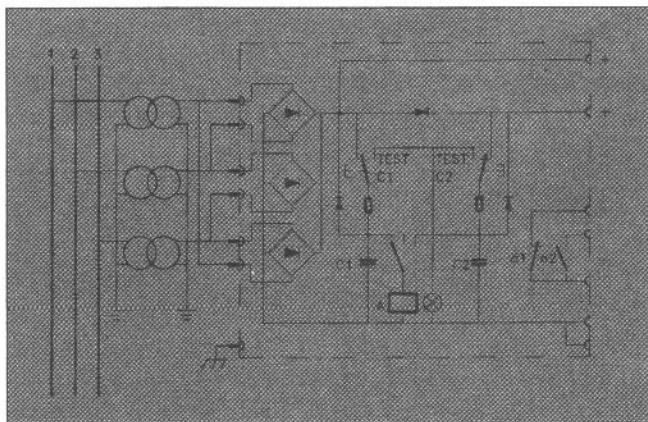
### - Principles

The **BAT 7001** is connected to an 50Hz or 60Hz ac voltage supply, single phase, two-phase or three-phase. This supply is, in general, provided by instrument voltage transformers.

After rectification of the ac voltage, auxiliary energy is stored in two capacitors C1 and C2, through current limiting resistors.

The use of diodes allows on the one hand, to provide energy at a short discharge time constant and on the other hand, to make available a reservoir of energy (C2) aimed at

### SIMPLIFIED OPERATION AND CONNECTION DIAGRAM



*The ultimate in power network supervision*

## - Availability

To complement the mechanical design, the **BAT 7001** possesses an alarm relay which changes state as soon as the voltage to its terminals disappears. This relay can be switched into or out of service by the operator, and if need be can supervise either the voltage of energy sources (C1) and (C2) or (C2) on its

own. Two volt free contacts on the alarm relay are provided.

The operator can also verify the charge on capacitors (C1) and (C2) with the help of two push buttons situated on the front plate, these allow their simultaneous discharge through a green lamp, which should remain lit for at least 10 seconds.

# General characteristics

## 1- Inputs - Outputs

### AC input and output quantities

|                                                                                           |                                                                                            |
|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| . 3 voltage inputs. Single, two or three phase connection                                 |                                                                                            |
| . Rated voltage                                                                           | $U_n = 100\text{ V}-110\text{ V}-120\text{ V}$ or $U_n = 220\text{ V}-240\text{ V}$        |
| . Rated frequency                                                                         | 50/60 Hz                                                                                   |
| . Operating range                                                                         |                                                                                            |
| $U_n = 100\text{ V}-110\text{ V}-120\text{ V}$                                            | $U_e = 80\text{ V}$ to $132\text{ V}$ i.e. $100\text{ V} - 20\%$ to $120\text{ V} + 10\%$  |
| $U_n = 220\text{ V}-240\text{ V}$                                                         | $U_e = 175\text{ V}$ to $264\text{ V}$ i.e. $220\text{ V} - 20\%$ to $240\text{ V} + 10\%$ |
| . Overload capacity                                                                       |                                                                                            |
| $U_n = 100\text{ V}-110\text{ V}-120\text{ V}$                                            | 170 V - 10 s                                                                               |
| $U_n = 220\text{ V}-240\text{ V}$                                                         | 280 V - 10 s                                                                               |
| . C1 and C2 capacitor time constant                                                       | $T = 0.5\text{ s}$                                                                         |
| (C1= energy source for protective relay output<br>C2= energy source for trip coil output) |                                                                                            |
| . I <sub>e</sub> maximum load current for the pair of capacitors C1 and C2                | $I_e < 1\text{ A}$                                                                         |

### Auxiliary dc output voltage for 38-250V PROCOM relays

|                                                     |                                                                   |
|-----------------------------------------------------|-------------------------------------------------------------------|
| . Supply options                                    | 1 or 2 RMS 7992, RMST 7992, RMSD 7921<br>1 RMSR 7991, 1 RMSR 7992 |
| . No load dc output voltage $U_s$                   | $U_s = 1.4 U_e$                                                   |
| . dc output voltage when loaded (2 RMS 7992 relays) | approx 1.15 $U_e$                                                 |

### Auxiliary dc output voltage for trip coils

|                                                                                                                               |                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| . Associated circuit breakers                                                                                                 | $U_e = 100-110-120\text{Vac}$ :<br>circuit breaker $V_n = 100-110-125\text{ Vdc}$ $P < 100\text{ W}$<br>$U_e = 220-240\text{ Vac}$ :<br>circuit breaker $V_n = 220-240\text{ Vdc}$ $P < 200\text{ W}$                                                          |
| . No load dc output voltage                                                                                                   | $U_s = 1.4 U_e$                                                                                                                                                                                                                                                |
| . Energy stored in 400 ms E                                                                                                   |                                                                                                                                                                                                                                                                |
| 1 capacitor available (C1 dedicated to supplying one or 2 RMS relays)                                                         | $E = 7.5\text{ joules}$ at $100\text{ V}$ , $E = 9\text{ joules}$ at $110\text{ V}$<br>$E = 11\text{ joules}$ at $120\text{ V}$ , $E = 18.5\text{ joules}$ at $220\text{ V}$<br>$E = 22\text{ joules}$ at $240\text{ V}$<br>$E = \text{above values} \times 2$ |
| 2 capacitors available (self powered protection relay)                                                                        |                                                                                                                                                                                                                                                                |
| . Voltage guaranteed at the terminals of C1 and C2 when there is no external load, no alarm relay "a" and after loss of $U_e$ | 90% $U_s$ after 10 mn<br>70% $U_s$ after 30 mn                                                                                                                                                                                                                 |

## Alarm

|                                                                                                                                                                                                                                        |                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| . 3 positions (ALARM) switch enabling the "a" alarm relay (1 NO and 1 NC contact) to be switched either to the terminals of C1 (position C1) or to the terminals of C1 and C2 in parallel (position C2) or out of service (position 0) | "a" alarm relay picked up with voltage present on the capacitors, reset when no voltage is present       |
| . Change in the voltage $U_s$ , in the event of the loss of the input voltage with the alarm relay in service an no external load                                                                                                      | $> 70\% U_s$ in 10 s                                                                                     |
| . "a" relay characteristics                                                                                                                                                                                                            |                                                                                                          |
| Ur reset voltage                                                                                                                                                                                                                       | $U_r = 20\text{ V}$ for $U_n = 100-110-120\text{ V}$<br>$U_r = 40\text{ V}$ for $U_n = 200-240\text{ V}$ |

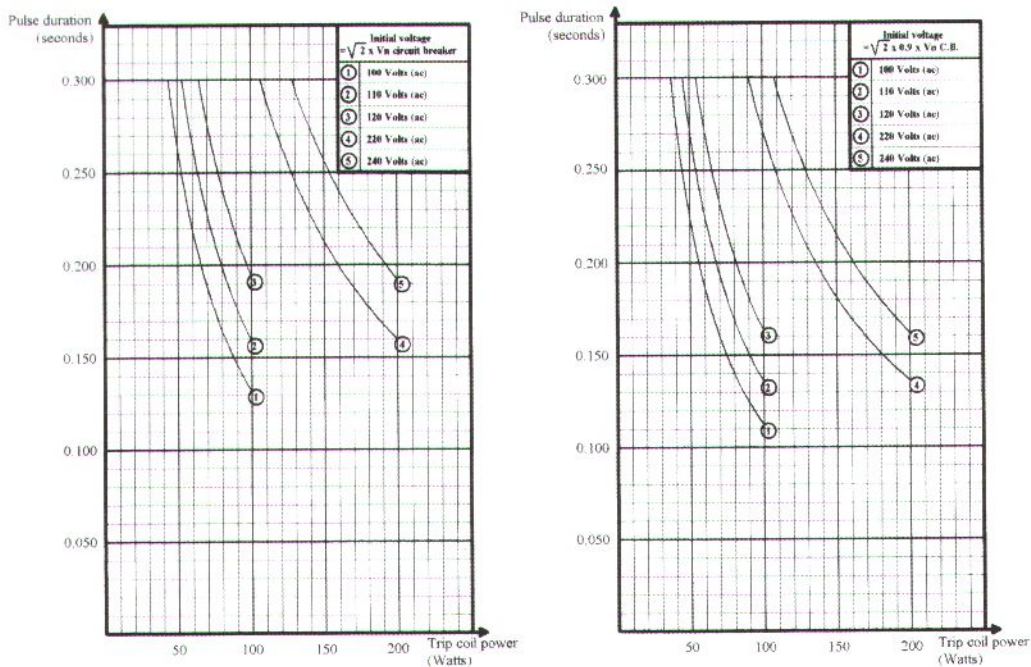


Figure n° 1  
Circuit breaker tripping.  
Maximum pulse duration  
on the circuit breaker.

(b) Auxiliary supply for protection relays

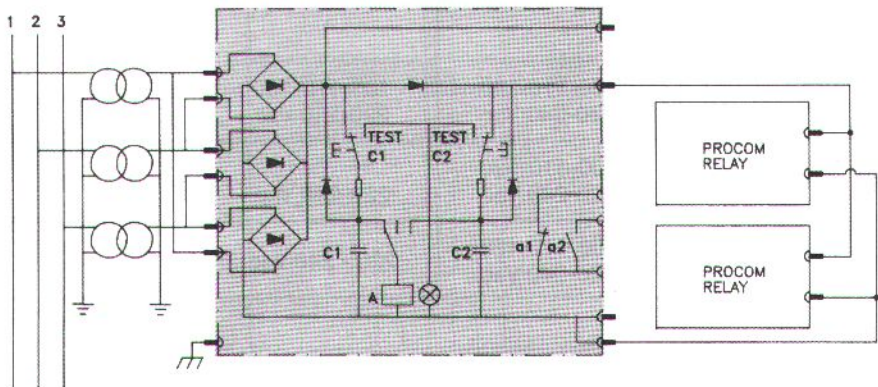
The **BAT 7001** is able to provide auxiliary voltage to protection relays from the **PROCOM** series. These relays can withstand a large variation of this voltage without this affecting their operation. During a fault, the ac supply disappears. The **BAT 7001** delivers the energy from the two reservoirs (C1 + C2) to supply the protection relays. The relays are operational provided that the auxiliary voltage remains above 38 VDC. (Refer to application scheme n° 2)

Figure n° 2 indicates the maximum operating time, the number and the type of **PROCOM** relays, with or without the alarm relay in service.

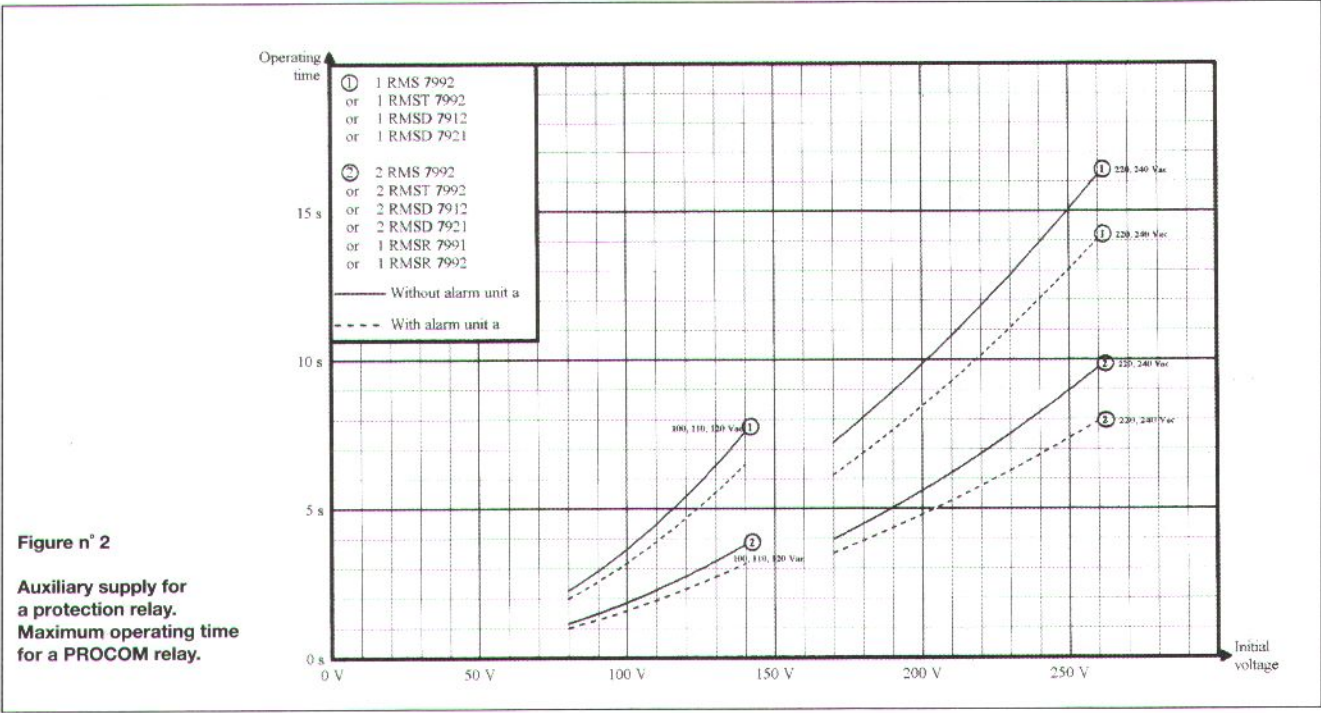
The level of the input ac supply to the **BAT 7001** being between 100 VAC and 240 VAC, **PROCOM** series relays with the auxiliary voltage range 38 V - 250 VAC/DC have to be used.

As the **PROCOM** relay operating time when supplied by the **BAT 7001** is limited, it is advisable to use an independent time operating characteristic the maximum setting of which is given by the time given in Figure n° 2, less twice the maximum opening time of the circuit breaker.

It is recommended not to use the **BAT 7001** device for the auxiliary supply of traditional electronic relays as these, in general, withstand a limited variation in the auxiliary voltage on their terminals (+ 10 % ; - 20 % Vn).



APPLICATION DIAGRAM N° 2  
AUXILIARY POWER SUPPLY FOR A PROTECTION RELAY



(c) Circuit breaker trip and auxiliary supply for PROCOM protection relays

In this application, the energy source (C2) is solely dedicated to tripping the circuit breaker, while (C1) provides the auxiliary supply to **PROCOM** relays and if needs be, assists with tripping the circuit breaker. (See application scheme n° 3)

The maximum duration of the electrical impulse provided by the unit, dependent upon the power absorbed by the circuit breaker trip coil, is represented in Figure n° 3. This maximum duration corresponds to the time difference between the instant where energy reservoir voltage is equal

to its initial value and the instant where this voltage reaches 70 % of the rated voltage of the circuit breaker trip coil.

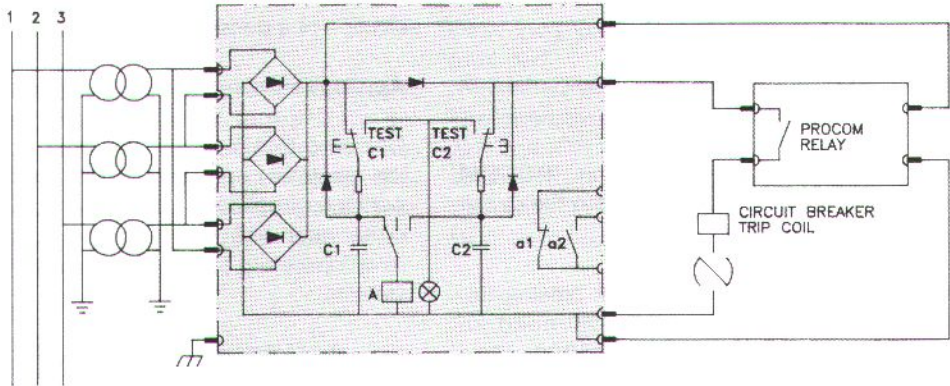
So as to preserve enough energy to guarantee tripping, it is recommended to supply the **BAT 7001** from an input ac voltage the level of which is given in Table 2.

Figure n° 4 indicates the maximum operating time, the number and the type of **PROCOM** relays, with or without the alarm relay in service.

The other recommendations given in paragraphs (a) and (b) are equally applicable.

| $t_R$ = circuit breaker trip time | P = Tripping coil power    |                            |                            |             |             |
|-----------------------------------|----------------------------|----------------------------|----------------------------|-------------|-------------|
|                                   | P<25W                      | 25W<P<50W                  | 50W<P<100W                 | 100W<P<150W | 150W<P<200W |
| $t_R \leq 2$ cycles               | 100-110-120<br>220-240 Vac | 100-110-120<br>220-240 Vac | 100-110-120<br>220-240 Vac | 220-240 Vac | 220-240 Vac |
| $2 < t_R < 5$ cycles              | 100-110-120<br>220-240 Vac | 100-110-120<br>220-240 Vac | 220-240 Vac                | 240 Vac     | —           |
| $5 < t_R < 8$ cycles              | 100-110-120<br>220-240 Vac | 100-110-120<br>220-240 Vac | 220 - 240 Vac              | —           | —           |

TABLE 2



APPLICATION DIAGRAM N° 3  
CIRCUIT BREAKER TRIPPING AND  
AUXILIARY POWER SUPPLY FOR A PROCOM RELAY

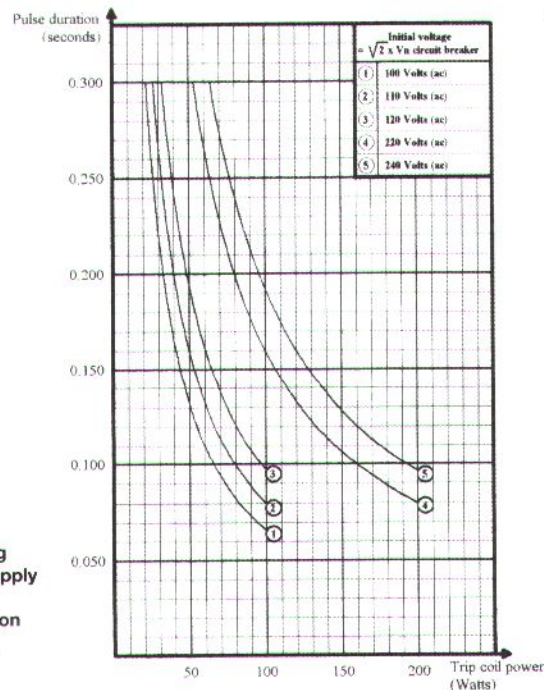


Figure n° 3  
Circuit breaker tripping and auxiliary power supply for a protection relay. Maximum pulse duration on the circuit breaker.

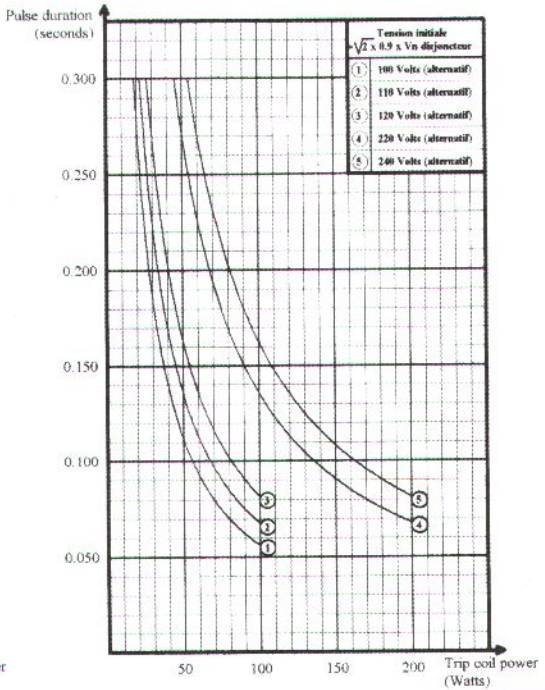
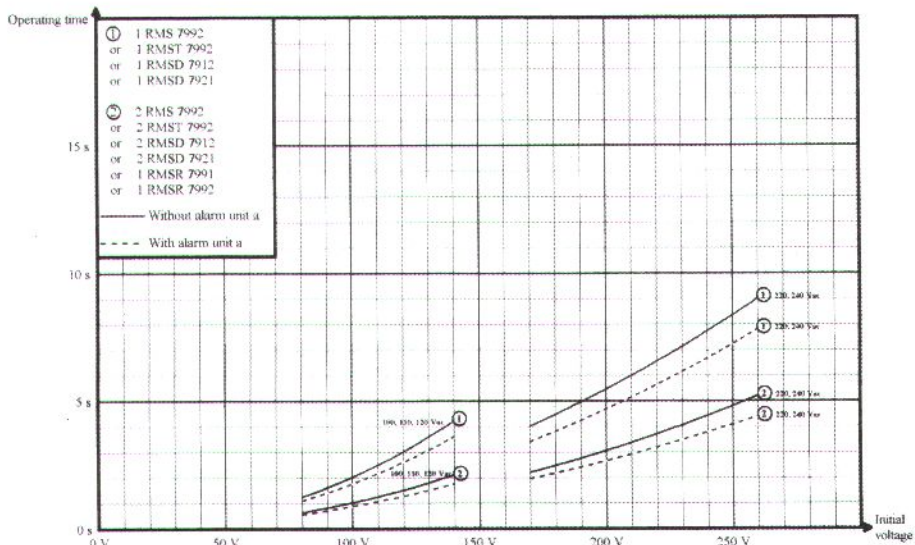


Figure n° 4  
Circuit breaker tripping and auxiliary power supply for a protection relay. Maximum operating time for a PROCOM relay.



(d) Self powered protection and trip system

The use of the **BAT 7001** allows a self powered protection and trip impulse system to be obtained :

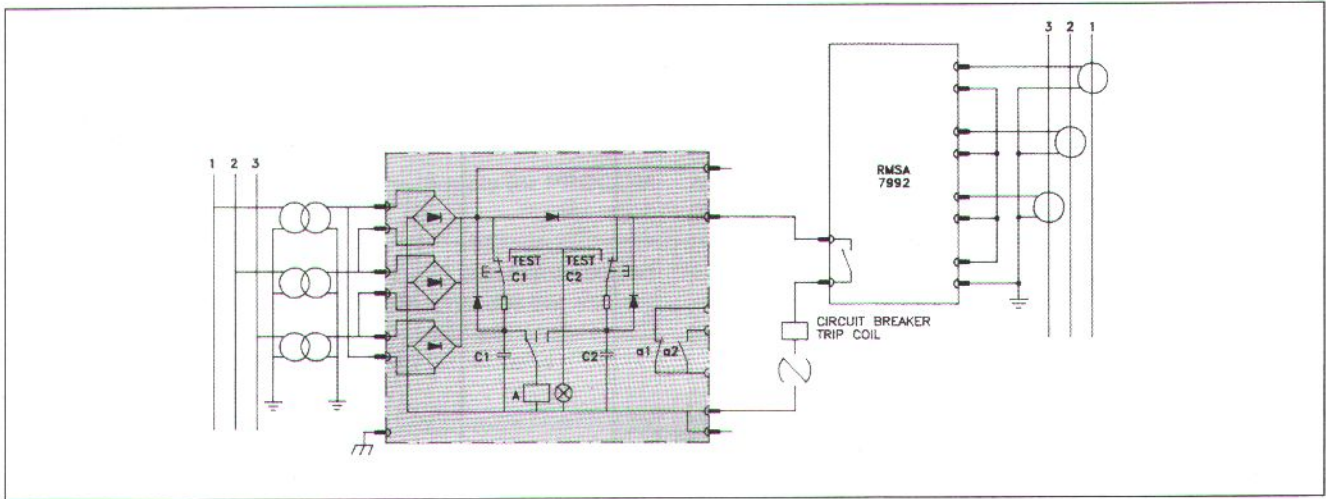
- Either, by providing the auxiliary supply to **PROCOM** protection relays and energy needed to trip the circuit breaker. (See paragraph (c)) ;
- Or, by providing the supply to the circuit breaker trip coil initiated by a relay which does not need an auxiliary supply such as the **RMSA 7992**. (See leaflet n° 1805 / 1A and application scheme n° 4).

This last scheme is particularly recommended since it provides the maximum available energy to tripping the circuit breaker (as per paragraph (a)) and without limiting the maximum response time of the protection, allowing the

selection of a dependent time operating characteristic.

- Application suggestions and recommendations

- Checking that the circuit breaker trips correctly as well as the maximum operating time of the **PROCOM** relay, for a particular application, supplied by a **BAT 7001** has to be undertaken before proceeding to the final choice of the relay operating time and before putting the system into service.
- The **BAT 7001** will have to be supplied for at least 1 second in the case of an application described in paragraph (a) or (d), and approximately 5 to 25 seconds in the case of an application described in paragraph (b) or (c) (so as to allow the execution of micro diagnostics programs during start up), before the correct operation of the system is ensured.



APPLICATION DIAGRAM N° 4  
SELF POWERED PROTECTION AND TRIP SYSTEM

Major advantages

- Reliability and availability

As a member of the R type case family, the design and construction of this equipment meet the same standards of reliability and safety used by C.E.E. for the manufacture of conventional static protection devices :

- Compliance with I.E.C. 255 recommendations and standards ;
- Mechanical, fool-proof fouling pins on cases and bases ;
- Debugging and individual testing of certain critical components ;
- Component selection based upon their short time

thermal withstand as well as their over voltage withstand, etc...

- Withstand of severe environment : humid heat, 56 days, 40°C 93 %, relative humidity.

As they are mounted in modular, plug-in, metallic cases, the **BAT 7001** may be used either :

- As independent modules ;
- As modules integrated into a rack cradle.

The flexible presentation means that the **BAT 7001** may be easily adapted to the user's actual technical and economic requirements and can, for example, be inserted into existing schemes and installations.

## - Availability

To complement the mechanical design, the **BAT 7001** possesses an alarm relay which changes state as soon as the voltage to its terminals disappears. This relay can be switched into or out of service by the operator, and if need be can supervise either the voltage of energy sources (C1) and (C2) or (C2) on its

own. Two volt free contacts on the alarm relay are provided.

The operator can also verify the charge on capacitors (C1) and (C2) with the help of two push buttons situated on the front plate, these allow their simultaneous discharge through a green lamp, which should remain lit for at least 10 seconds.

# General characteristics

## 1- Inputs - Outputs

### AC input and output quantities

|                                                                                           |                                                                                        |
|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| . 3 voltage inputs. Single, two or three phase connection                                 |                                                                                        |
| . Rated voltage                                                                           | $U_n = 100\text{ V}-110\text{ V}-120\text{ V}$ or $U_n = 220\text{ V}-240\text{ V}$    |
| . Rated frequency                                                                         | 50/60 Hz                                                                               |
| . Operating range                                                                         |                                                                                        |
| $U_n = 100\text{ V}-110\text{ V}-120\text{ V}$                                            | $U_e=80\text{ V}$ to $132\text{ V}$ i.e. $100\text{ V} - 20\%$ to $120\text{ V}+10\%$  |
| $U_n = 220\text{ V}-240\text{ V}$                                                         | $U_e=175\text{ V}$ to $264\text{ V}$ i.e. $220\text{ V} - 20\%$ to $240\text{ V}+10\%$ |
| . Overload capacity                                                                       |                                                                                        |
| $U_n = 100\text{ V}-110\text{ V}-120\text{ V}$                                            | 170 V - 10 s                                                                           |
| $U_n = 220\text{ V}-240\text{ V}$                                                         | 280 V - 10 s                                                                           |
| . C1 and C2 capacitor time constant                                                       | $T = 0.5\text{ s}$                                                                     |
| (C1= energy source for protective relay output<br>C2= energy source for trip coil output) |                                                                                        |
| . Ie maximum load current for the pair of capacitors C1 and C2                            | $I_e < 1\text{ A}$                                                                     |

### Auxiliary dc output voltage for 38-250V PROCOM relays

|                                                     |                                                                   |
|-----------------------------------------------------|-------------------------------------------------------------------|
| . Supply options                                    | 1 or 2 RMS 7992, RMST 7992, RMSD 7921<br>1 RMSR 7991, 1 RMSR 7992 |
| . No load dc output voltage $U_s$                   | $U_s = 1.4 U_e$                                                   |
| . dc output voltage when loaded (2 RMS 7992 relays) | approx 1.15 $U_e$                                                 |

### Auxiliary dc output voltage for trip coils

|                                                                                                                               |                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| . Associated circuit breakers                                                                                                 | $U_e = 100-110-120\text{Vac}$ :<br>circuit breaker $V_n = 100-110-125\text{ Vdc}$ $P < 100\text{ W}$<br>$U_e = 220-240\text{ Vac}$ :<br>circuit breaker $V_n = 220-240\text{ Vdc}$ $P < 200\text{ W}$ |
| . No load dc output voltage                                                                                                   | $U_s = 1.4 U_e$                                                                                                                                                                                       |
| . Energy stored in 400 ms E                                                                                                   |                                                                                                                                                                                                       |
| 1 capacitor available (C1 dedicated to supplying one or 2 RMS relays)                                                         | $E = 7.5\text{ joules}$ at 100 V, $E = 9\text{ joules}$ at 110 V<br>$E = 11\text{ joules}$ at 120 V, $E = 18.5\text{ joules}$ at 220V<br>$E = 22\text{ joules}$ at 240 V                              |
| 2 capacitors available (self powered protection relay)                                                                        | $E = \text{above values} \times 2$                                                                                                                                                                    |
| . Voltage guaranteed at the terminals of C1 and C2 when there is no external load, no alarm relay "a" and after loss of $U_e$ | 90% $U_s$ after 10 mn<br>70% $U_s$ after 30 mn                                                                                                                                                        |

### Alarm

|                                                                                                                                                                                                                                        |                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| . 3 positions (ALARM) switch enabling the "a" alarm relay (1 NO and 1 NC contact) to be switched either to the terminals of C1 (position C1) or to the terminals of C1 and C2 in parallel (position C2) or out of service (position 0) | "a" alarm relay picked up with voltage present on the capacitors, reset when no voltage is present       |
| . Change in the voltage $U_s$ , in the event of the loss of the input voltage with the alarm relay in service an no external load                                                                                                      | $> 70\% U_s$ in 10 s                                                                                     |
| . "a" relay characteristics                                                                                                                                                                                                            |                                                                                                          |
| Ur reset voltage                                                                                                                                                                                                                       | $U_r = 20\text{ V}$ for $U_n = 100-110-120\text{ V}$<br>$U_r = 40\text{ V}$ for $U_n = 200-240\text{ V}$ |

General characteristics

|                                                                              |                                       |
|------------------------------------------------------------------------------|---------------------------------------|
| . Contacts :                                                                 |                                       |
| Maximum voltage .....                                                        | 250 V                                 |
| Maximum continuous current .....                                             | 2.5 A                                 |
| Closing capacity (0.2 s) .....                                               | 5 A                                   |
| Rupturing capacity                                                           |                                       |
| on dc (L/R = 40 ms) .....                                                    | 25 W (0.18 A/140 Vdc, 0.08 A/300 Vdc) |
| on ac (cos phi = 0.4) .....                                                  | 625 VA / I < 1.5 A                    |
| 2- Testing capacitors C1 and C2                                              |                                       |
| Capacitor C1 and C2 condition tested via the push buttons TEST C1 et TEST C2 | Green lamp lights for at least 10 s   |
| 3- Influencing quantities nominal ranges                                     |                                       |
| . Temperature .....                                                          | -10 / +55° C                          |
| . Frequency .....                                                            | 40 to 70 Hz                           |
| 4- Insulation to IEC 255-5                                                   |                                       |
| . Dielectric withstand .....                                                 | 2 KV -50 Hz - 1 mn                    |
| . Insulation resistance at 500 VDC .....                                     | > 10 000 MΩ                           |
| . Impulse voltage withstand .....                                            | 5 KV peak to peak 1.2/50 μs           |
| 5- Disturbance                                                               |                                       |
| . High frequency conducted disturbance to IEC 255-22-1 .....                 | 2.5 KV and 1 KV 1 MHz / class III     |
| . Electrostatic discharge to IEC 255-22-2 .....                              | 8 KV / class III                      |
| 6- Case                                                                      | type R 2                              |
| 7- Weight                                                                    | 3.5 Kg                                |
| 8- Identifying drawing                                                       | 19 A4                                 |

Style number identification

|                      |                                                                                    |            |  |   |  |   |   |             |   |   |  |
|----------------------|------------------------------------------------------------------------------------|------------|--|---|--|---|---|-------------|---|---|--|
|                      |                                                                                    | BAT 7001 - |  | A |  | - | B |             | - | C |  |
|                      |                                                                                    |            |  | ↑ |  |   |   | ↑           |   | ↑ |  |
| Nominal Voltage a.c. | 100V - 110V - 120V<br>220V - 240V                                                  | a<br>b     |  |   |  |   |   |             |   |   |  |
| Alarm relay          | with                                                                               |            |  |   |  | a |   |             |   |   |  |
| Case R2              | projecting front connection<br>projecting rear connection<br>flush rear connection |            |  |   |  |   |   | a<br>b<br>c |   |   |  |

