

# AMS 7000

*Procom*



**DIGITAL  
AUTOMATION  
MEASURING  
AND  
CONTROL  
DEVICES**



*The ultimate in power network supervision*



# Digital automation, measuring and control devices with communications capability AMS 7000

## PROCOM

The optimum operation of an electrical network depends particularly on the reliability and the availability of the protection, measuring and automation devices, and the manner in which these devices can communicate the information in their possession. PROCOM, CEE's new modular system, satisfies these criteria by providing the possibility of using either separately or in an integrated system all of the intelligent functions of an electrical cubicle: protection, measurement, automation, communication.

CEE's exceptional experience in the fields of network protection using static relays (more than 400,000 units in operation throughout the world) enabled our engineers to define, develop and manufacture PROCOM to the standards of quality and concepts of technical innovation which have been the foundation of CEE's reputation over the past 30 years.

## Principles and applications

AMS 7000 series devices provide the "automatic control" (AMS 7001) and the "automatic control and instrumentation" (AMS 7002) parts of the PROCOM system. Using digital microprocessor technology, these units also provide switchgear "supervision/control" features, and manage the communication between the switchboard panels and the master supervisory stations.

### — Automatic control

Thanks to the LAMS1 secure programming language, the AMS 7000 can reliably execute automatic control programs including the following analogue inputs:

- 2 voltage inputs on the AMS 7001,
  - 1 voltage input and 1 current input on the AMS 7002.
- To this end, the operator has access to a sequential logic environment, including:
- 14 all or nothing inputs (2 of which are galvanically separate),
  - 16 timers with settings from 0.04 to 1000 secs.,
  - 8 (over or under) operating levels associated with the analogue inputs,
  - 5 output relays.

Definition of the sequential logic combinations, the number of all or nothing and analogue inputs, and of the timers is carried out using LAM1 software running on a PC computer.

The analogue thresholds and time delays can be adjusted on site via the RS232C/DB9 socket on the AMS 7000 front plate.

The binary file which results from the compilation, using the EDLAMS program, of the automatic control program that has been written by the user is loaded into permanent memory.

In the AMS 7001, the program is downloaded via an EPROM programmer into an EPROM memory which is inserted into the relay front plate.

In the AMS 7002, the program is loaded into internal EEPROM memory using a PC computer connected directly to the DB9 socket.

The AMS 7001 is recommended to be used in automatic changeover and transfer schemes as it can simultaneously control 2 circuit breakers and monitor 2 voltages.

The AMS 7002 is more specifically designed to be used where switchboards include supervision/control, metering and instrumentation, and/or automatic local control such as motor restart sequences using real time voltage monitoring.

### — Instrumentation and metering

By sampling the analogue input voltage and current and by using Fast Fourier Transformation techniques, the AMS 7002 calculates the 10 electrical values which are most often required to operate electrical switchboards correctly.

These values can be displayed on the front panel of the AMS 7002 and transmitted via the communications port.

- U = Line to line rms voltage
- I = Rms current
- C = Power factor (Cos Phi)
- P = Real power
- Q = Reactive power
- M = Real power maximum demand integrated over a period of 5 to 60 minutes (adjustable)
- A+ = KWhr import
- A- = KWhr export
- R+ = KVARhr import
- R- = KVARhr export

## Major advantages

The AMS 7000 incorporate the following 3 series of major advantages:

### — Reliability and availability

The design and construction of these devices respect the standards of reliability and safety used by CEE for the manufacture of classical static protective relays:

- Conformity to the recommendations and standards of IEC 255.
- Mechanical, fool-proof fouling pins on the cases.
- Debugging and individual testing of certain components.
- Choice of component both their thermal capacity and for overvoltage withstand etc.
- Withstand in severe environments = heat/humidity 56 days, 40°C, 93% relative humidity.

As well as these precautions in their basic construction, AMS 7000 devices are equipped with a self-checking system which, together with the plug-in feature of their case, leads to optimum availability.

The self-checking features operate in three levels:

- Detection of the loss of auxiliary supply.
- Detection of a microprocessor failure by a watchdog.
- Detection of the failure of one of the microprocessor peripherals (RAM, EEPROM, etc.) by execution of microdiagnostic programs.

The user is warned of the operation of the self-checking system by the closure of a dry contact brought out on terminals and/or by interruption of the communications.

### — Adaptability and autonomy

As they are presented in metallic modular plug-in type R cases.



AMS 7000 devices may be used either individually or as modules integrated into a rack, itself an element of the PROCOM architecture.

This flexible presentation allows the use of the AMS 7000 to be adapted to the real technical and economic needs of the user, for example, by enabling it to be fitted into an existing installation. These characteristics of autonomy and adaptability of the AMS 7000 are completed by the possibility of connecting it without special precautions to any source of auxiliary supply, ac or dc, varying within a large range (20 - 66V or 38 - 250V).

#### – Power and flexibility of the communications

The AMS 7000 devices communicate with the outside world in three main ways :

• **Local communication:** the equipment/user dialogue is performed by a pocket terminal enabling the reading of the operating program and the adjustment of the parameters of the time delays and voltage operating levels. Ten LED's seven of which are programmable, indicate the phases of relay operation. The AMS 7002 device is equipped with an alpha-numerical display of 8 digits to visualize the 10 available measurements which are selectable by push button. A sequential display of 10 measurements is possible.

• **Communication via all-or-nothing channels:** the AMS 7000 can take into account 14 all-or-nothing inputs (12 of which have a common terminal and 2 are isolated). Six electromagnetic relays provide the functions of control, signalling and alarm.  
– Control: two output units with a high closing capacity are provided for closing/tripping of the power devices.

– Signalling: three output units whose operation is user programmable are provided to give signals by contact to the exterior.

– Alarm: a dry contact from the watchdog is provided.

• **Digital communication:** the AMS 7000 devices are provided with 3 serial digital communication channels:

– 1 channel on a DB-9 socket for local dialogue using the pocket terminal (see above)

– 2 channels on sockets for the current loop system (0 - 20mA) for connecting the AMS 7000 into a communication network collected by a PC or other device\* range using a master/slave protocol to the J BUS standards (or other on request).

The AMS 7000 plays the role of a digital communication node at the level of a cubicle in the switchgear panel:

– As the master element in the mini-network (called "Downstream network"), the AMS 7000 supervises up to 6 relays from the PROCOM series.

– As the slave element of the network controlled via the PC (called "Upstream network"), the AMS 7000 communicates to the central control station all of the data and events at its own level or from the downstream network.

**Remark:** the downstream communication of the AMS 7002 can be configured to ensure the galvanic insulation and amplify the upstream network.

On this main network extension, it is possible to connect up to 8 PROCOM modules.

\* Please consult us.

## General characteristics

### 1 Input and output quantities

• Frequency	
– Nominal frequency $F_n$	50 / 60 Hz
– Operating range	$F_n \pm 5 \text{ Hz}$
• Voltage	
– Nominal Ph-Ph voltage $U_n$	100V - 110V - 120V - 380V (AMS 7001 only)
– Nominal operating range	0.05 to 1.5 $U_n$
– Permanent withstand	1.5 $U_n$
– Short-time thermal withstand	2 $U_n$ for 10s
– Burden	< 0.3 VA per phase at $U_n$
• Current	
– Nominal current $I_n$	1 A or 5 A
– Nominal operating range	0 to 1.5 $I_n$
– Permanent withstand	2 $I_n$
– Short-time thermal withstand	80 $I_n$ for 1s - 20 $I_n$ for 3s
– Burden	< 0.3 VA per phase at $I_n$
• Auxiliary supply	
– Ranges	20 to 66 Vdc or Vac 50/60 Hz 38 to 250 Vdc or Vac 50/60 Hz
– Burden	≤ 10 W DC ≤ 15 VA AC
• Logic inputs	
– Inputs with common wire	12 - polarised by the AMS 7000 (voltage without load : 30V)
– Isolated inputs	2 - via opto-isolators, needing polarisation current 20 mA
– Timing	10 ms
• Output contacts:	
– Control	SR1 SR2 SR3, SR4, SR5
– Maximum voltage	600 V 250 V
– Maximum permanent current	5 A 2.5 A
– Closing current	10 A 5 A
– Rupturing capacity	
– dc ( $L/R = 40 \text{ ms}$ )	50W (1A/48Vdc - 0.5A/110 Vdc) 25W (0.5A/48Vdc - 0.25A/110Vdc)
– ac ( $\cos \varphi = 0.4$ )	1250 VA; $I < 3 \text{ A}$ 625 VA; $I < 1.5 \text{ A}$
• Signalling	
– State of the watchdog	picked up in quiescent state drops out to give alarm
• Local signalling	10 LEDs

### 2 Nominal ranges of influencing factors

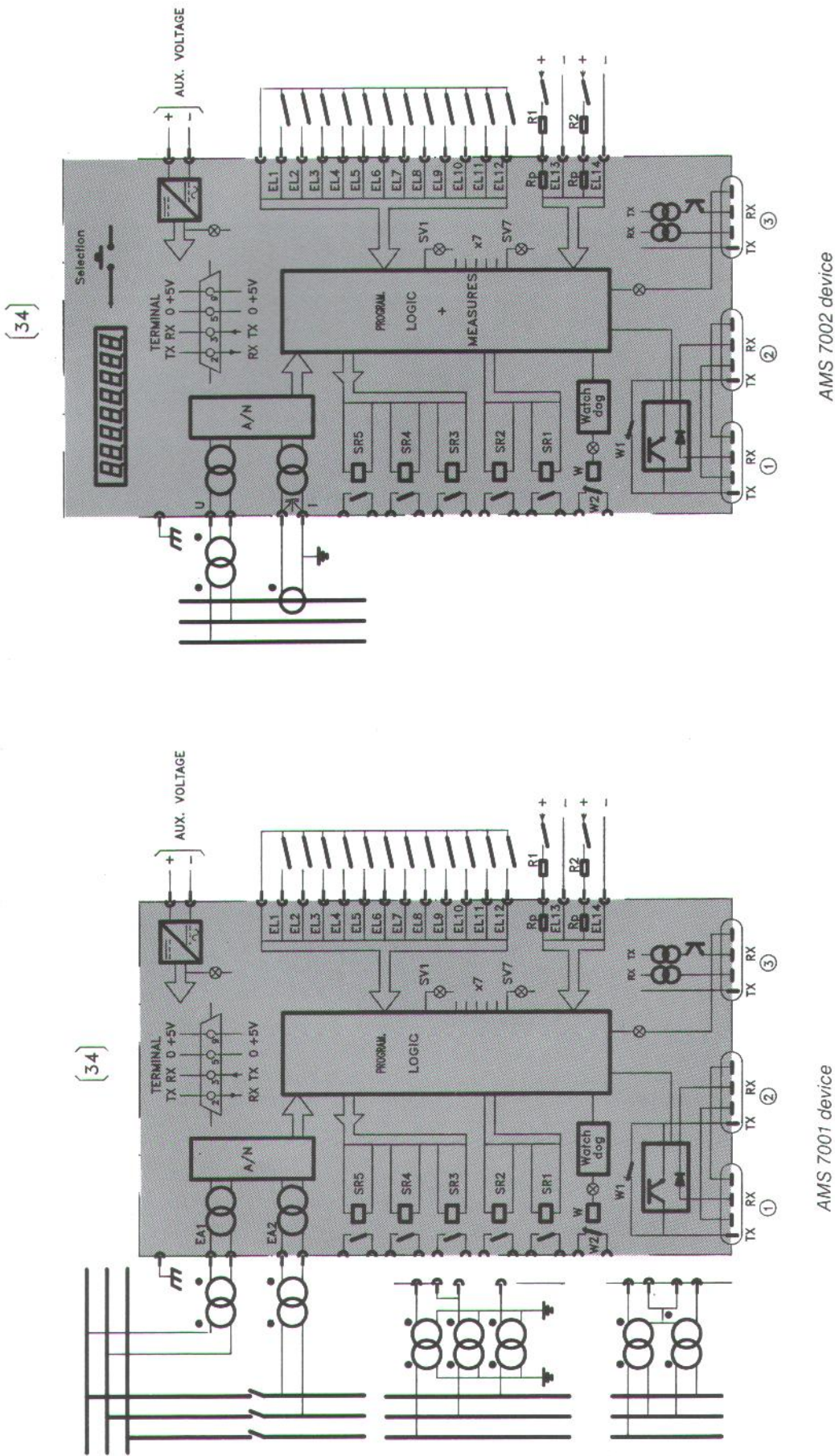
• Temperature	– 10°C to + 55°C
• Frequency	$F_n \pm 5 \text{ Hz}$



## General characteristics (continued)

<b>3 Operating levels</b>	
• Number of operating levels .....	8 over or undervoltage selected by programming
– Voltage sets .....	5 to 120% of $U_n$
– Current sets .....	5 to 120% of $I_n$ (AMS 7002 only)
• Precision .....	$\pm 3\%$ of $U_n$ ... (AMS 7001) $\pm 1\%$ of $U_n$ or $I_n$ ... (AMS 7002)
• Resetting value:	
– on undervoltage units (on undercurrent: AMS 7002) .....	95% (AMS 7001) - 92% (AMS 7002)
– on overvoltage units (or overcurrent: AMS 7002) .....	105% (AMS 7001) - 108% (AMS 7002)
<b>4 Time delays</b>	
• Number .....	16
• Setting range .....	40 ms to 1000 s
• Precision .....	$\pm 20$ ms for times $< 1$ s $\pm 40$ ms for times $> 1$ s
<b>5 Measurement</b>	
• Voltage	
– Nominal primary values range ( $U_n$ ) .....	0.100 kV to 240 kV
– Relay configuration resolution .....	10 V
– Precision class index .....	3 (AMS 7001) - 0.5 (AMS 7002)
• Current (AMS 7002 only)	
– Nominal primary values range ( $I_n$ ) .....	10A to 100 KA
– Relay configuration resolution .....	1 A
– Precision class index .....	0.5
• Power factors (AMS 7002 only)	
– Measured range .....	4 quadrants
– Resolution .....	0.01
– Precision class index .....	1
• Powers P - Q - S and integrated powers (AMS 7002)	
– Measured range .....	100 K to 100 M (W/VA or VAR)
– Resolution .....	1 K to 1M according to the range
– Extent of measurement .....	0 to 3.9 $U_n \cdot I_n$
– Precision class index .....	1
• Energy (AMS 7002 only)	
– Maximum values stored .....	32 Gwh
– Precision class index .....	1
– Permanent register .....	every 24 hours
<b>6 Digital communication</b>	
• Support .....	2 channels having sockets : current loop (0-20 mA)
• Communicating protocols .....	Master/slave as required (J/BUS or other)
• Downstream network :	
– Transmission speed .....	1200 bauds
– Master .....	AMS 7000
– Slaves .....	Max of 6 communicating relays (except AMS 7000)
• Upstream network :	
– Transmission speed .....	1200 / 2400 / 4800 bauds
– Master .....	P.C. or other system (please consult us)
• Programming :	
– Language .....	LAMS 1
– Lines of program .....	255
– Number of program elements/line (variables, instructions, operators) .....	16
– Program development tool (Editor + compiler) .....	EDLAMS supplied by C.E.E.
– EPROM configuration tool for AMS 7001 and 7002 .....	LAMSTEL supplied by C.E.E.
<b>7 Insulation level to IEC 255-5</b>	
• Dielectric withstand :	
– All terminals connected together to frame, and isolated input groups to each other .....	2 kV - 50/60 Hz - 1 mn (except current loop inputs 1 kV - 1 mn)
– DB 9 socket .....	500 V - 50/60 Hz - 1 mn
– Insulation resistance at 500 V .....	$> 10\,000$ M ohms
– Impulse voltage withstand (except DB 9 socket) .....	5 kV - 1.2 / 50 $\mu$ s
<b>8 High frequency disturbance withstand to I.E.C. 255-22-1 (except DB9 socket) .....</b>	
2.5 kV and 1 kV - 1 MHz class III	
<b>9 Case .....</b>	
R3	
<b>10 Weight .....</b>	
3.8 kg	
<b>11 Identifying drawing .....</b>	
03A9 (AMS 7001) - 16A5 (AMS 7002)	

Operation

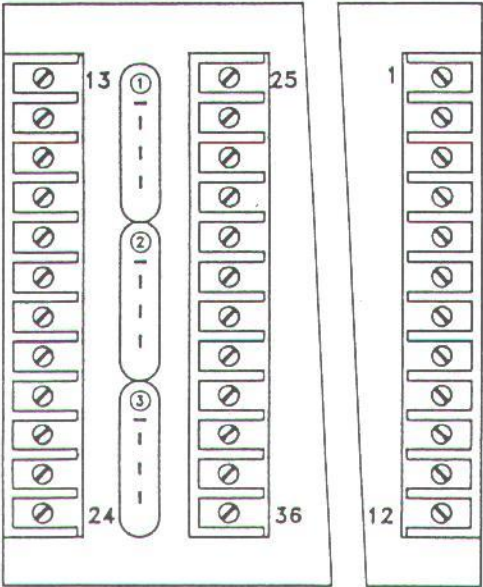


Simplified operation and connection diagrams

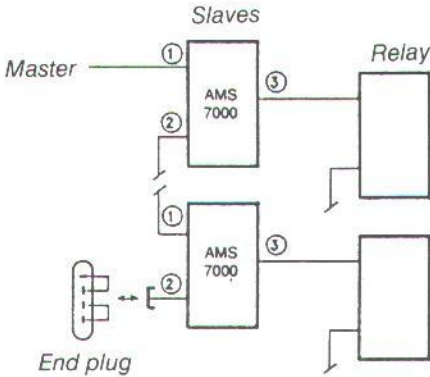


Case type R3

		projecting rear connection	flush rear connection
CASE DIMENSIONS	CONNECTING SCREWS Ø M4		
		$x = 89$ for panel th. $< 2$ $x = 90,5$ for panel th. $> 2$	
R3	CASE DIMENSIONS		
	DRILLING AND CUT OUT		



Rear view



Only documents supplied with our acknowledgement are to be considered as binding.

