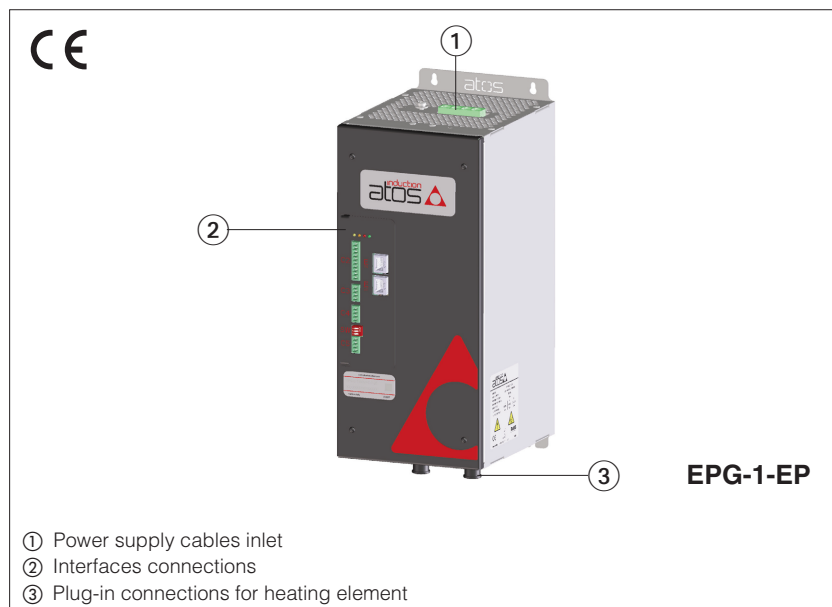


Electronic power generators

for induction heating elements



EPG

Electronic power generators designed to supply Atos Induction inductive heating elements.

They provide a fast, efficient and uniform heating solution for plasticising barrels, molds, and fluids, replacing conventional heating systems such as electric resistors or open-flame burners.

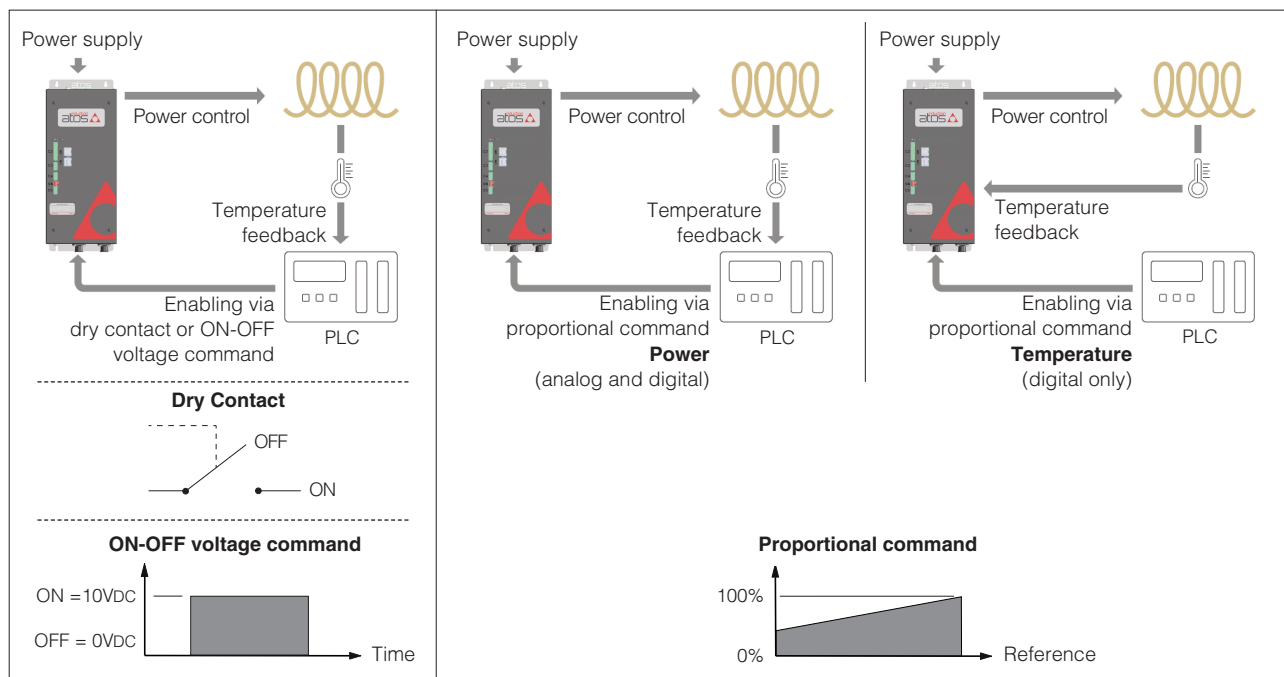
The generators combine high-frequency power generation with automatic adaptation to the electrical characteristics of the heating system, optimizing energy transfer and reducing electrical transmission losses.

EPG generators are designed for integration into the customer machine and electrical cabinet, providing a compact and efficient solution for industrial induction heating applications.

1 MODEL CODE

EPG	-	1	-	NP	/	L	*	20
Electronic power generator								Series number
1 = Channel output								
Communications interface, analog reference always present								
NP = Modbus RTU								
EP = PROFINET RT/IRT (1)								
EH = EtherCAT (1)								
EM = Modbus TCP/IP (1)								
(1) Ethernet interfaces available on request. For details, please contact our technical department.								
(2) To be selected according to the heating element to be connected								
Setting (factory setup code)								
Size (2)								
L = up to 6 kW			M = up to 10 kW			H = up to 20 kW		

2 FUNCTIONAL EXAMPLE



3 FUNCTIONAL DESCRIPTION

EPG electronic power generators are designed to supply Atos Induction heating elements with amplitude and frequency modulated currents. They generate magnetic fields capable of heating elements composed of ferromagnetic materials (e.g., plasticising barrels, moulds, etc.). The system automatically detects the electrical resonance frequency, characteristic of the magnetic coupling between the heating element and the element to be heated, modulating the output current around this value to reduce electrical transmission losses and increase process efficiency.

The generators can be controlled through the following modes, selectable by the customer via the supplied software through the Serial debug connection (C4):

- ON-OFF control via voltage-free dry contact.
- Analog control through 0-10 VDC input, configurable as ON-OFF command, with 0 VDC = heating OFF and 10 VDC = heating ON, or as proportional command. For proportional control, the working range is 2-10 VDC.
- Digital control via Modbus RTU on RS485 physical layer. Ethernet based protocols are available by optional fieldbus module.

The RS485 Modbus connection can also be used only for monitoring of operating parameters while the generator is controlled by dry contact, analog input or thermoregulated control.

Only one heating control mode must be selected at a time. The setup software is supplied by Atos Induction, using a USB cable which can be supplied as optional.

4 POWER SUPPLY AND CONTROL SPECIFICATIONS

4.1 Power supply

The EPG power generator is available in two setting:

400VAC: suitable for mains power supply $400 \pm 10\%$ VAC , 50/60 Hz, L1 L2 L3 PE.

460VAC: suitable for mains power supply $460 \pm 10\%$ VAC , 50/60 Hz, L1 L2 L3 PE.

See installation prescriptions in section 9.

4.2 Heating enable command

The heating can be activated via analog or digital signals using the following modes:

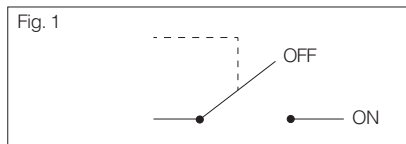
a) Generator enabling via dry contact - see Fig. 1

It is a voltage free ON-OFF signal, normally provided by a relay included in the machine control, or installed by the user.

With CLOSED relay (ON), the generator supplies the heating element.

With OPEN relay (OFF), the generator does not supply the heating element.

The contact is electrically isolated.

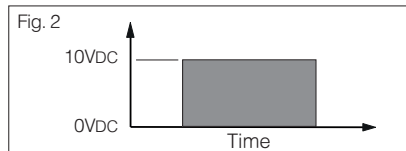


b) Generator enabling via ON-OFF voltage command - see Fig. 2

This is a voltage input in the range 0-10 VDC.

Analog control through 0-10 VDC input, configurable as ON-OFF command, with 0 VDC = heating OFF and 10 VDC = heating ON.

For correct operation, the polarity of the cables must be observed as indicated in the section 8. The contact is protected from the reversed polarity and electrically isolated.

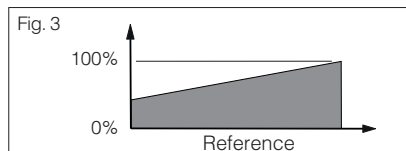


c) Generator enabling via proportional command - see Fig. 3

This is a voltage input in the range 0-10 VDC.

Analog control through 0-10 VDC input, configurable as proportional command, with 2 VDC (0%) = OFF and 10 VDC (100%) = max power.

For correct operation, the polarity of the cables must be observed as indicated in the section 8. The contact is protected from the reversed polarity and electrically isolated.



Note:

EPG-*/L 10V = 6kW

EPG-*/M 10V = 10kW

EPG-*/H 10V = 20kW

d) Generator enabling via Modbus RTU on RS485 physical layer command

The system can be digitally controlled (e.g., power setpoint) via Modbus protocol.

e) Generator enabling via Ethernet fieldbus protocol (option)

The system can be digitally controlled (e.g., power setpoint) via Ethernet fieldbus protocol.

 Only one heating control mode must be selected at a time.

5 MAIN CHARACTERISTICS

Model	EPG-*/L		EPG-*/M		EPG-*/H	
Power supply	400/460 ±10% VAC , 50/60 Hz, L1 L2 L3 PE					
Max power [kW]	6 ±15%		10 ±15%		20 ±15%	
Max absorbed current (±5%) [A]	400VAC	460VAC	400VAC	460VAC	400VAC	460VAC
	9,1	7,9	15,2	13,2	30	26
Max power factor (cos ϕ)	0,97					
Max efficiency	98,5%					
Peak voltage [V]	1200					
Output Peak current [A]	55		85		130	
Frequency [kHz]	7 - 30		7 - 30		7 - 30	
IP protection degree [CEI EN 605229]	IP 20					
Compliance	EC Declaration of Conformity valid in accordance with the directives: EMC 2014/30/UE (EN IEC 61000-6-2; EN IEC 61000-6-4); Low Voltage 2014/35/UE (EN 60519-1; EN 60519-3); RoHS 2011/65/UE; REACH (CE n° 1907/2006)					

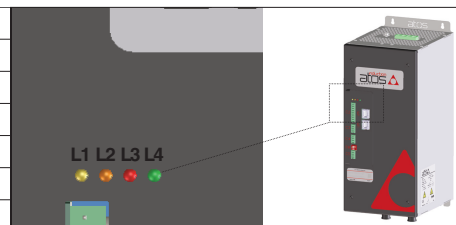
6 INSTALLATION REQUIREMENTS

Assembly position	Vertical with fan down (recommended)		
Electrical cabinet requirements	Electric cabinet minimum protection IP54, with forced ventilation		
Max heat dissipated by each generator [W]	EPG-*/L	EPG-*/M	EPG-*/H
	90	150	300
Electrical protections	Following protections must be provided by the customer: - Residual current circuit breaker with overcurrent protection for protection against leakage currents - Fuses for protection against overloads and short circuits See section 9 for details		
Recommended fuses	Fuse type	gG 500V 10x38 120kA	
(for 400VAC and 460VAC)	Current	10A	25A
Ambient temperature range	0°C ÷ +40°C		
Ambient humidity range	30% ÷ 60%		

7 DIAGNOSTICS

The EPG generator is provided with internal diagnostics permitting the real time monitoring of generator and heating element status. Eventual failures are immediately identified by means of diagnostic LEDs and an alarm switch.

LED	LED COLOUR	STATUS
L1	Yellow	LED ON - Generator powered
L2	Orange flashing	LED ON - Digital communication active
L3	Red	LED ON - Alarm
L4	Green	LED ON - EPG power enabled
	Green flashing	LED ON - EPG temperature regulation enabled
L3+L2	Red ON / flashing + Orange	System fault



In case of system fault, the power supply to the heating element is immediately interrupted.

7.1 Alarm switch

It is a voltage free ON-OFF contact, provided by a generator internal relay, used to monitor eventual failures. The alarm output is a voltage-free relay contact; max applicable signal/load: 24 VDC - 3 A. Do not exceed the contact rating. The CLOSED contact indicates the normal generator functioning. The OPEN contact indicates the generator alarm condition. When the generator is powered the contact is CLOSED. If a failure of the generator or heating element is detected, the contact opens.

7.2 Connection with PC

The Serial debug connection (connector C4) allows the transmission of generator diagnostics information, operating status, alarms and parameters to a computer.

Communication with the PC is performed through the setup software supplied by Atos Induction. The software communicates through the Serial debug port.

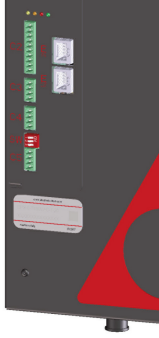
The Serial debug connection can also be used only for monitoring when the generator is controlled by dry contact, analog input or thermoregulated control and digital control.

The setup software is supplied by Atos Induction, using a USB cable which can be supplied as optional.

POWER SUPPLY
view B



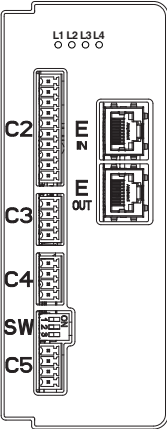
view A
I/O (Input/Output)
A/D (Analog/Digital)



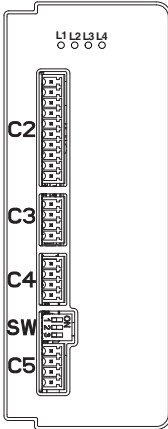
view C
PLUG IN COIL CONNECTOR



view A
EP, EH, EM interfaces



view A
NP interface

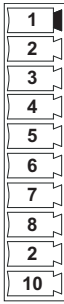


View B



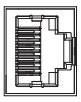
View C

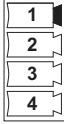


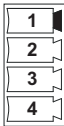
C2	PIN	TECHNICAL SPECIFICATIONS
	1	ALARM (internal voltage free relay 24V - 3A)
	2	ALARM (internal voltage free relay 24V - 3A)
	3	P.SUPPLY+ (24 VDC external power supply for analog interface, max absorption 65mA)
	4	P.SUPPLY- (0 VDC external power supply for analog interface)
	5	COOLING OUT + (to drive external relay for cooling, relay coil max 50 mA)
	6	COOLING OUT - (to drive external relay for cooling)
	7	INPUT- (input for analog proportional command 0-10V, max absorbed current 2 mA)
	8	INPUT+ (input for analog proportional command 0-10V, max absorbed current 2 mA)
	9	MONITOR- (output for analog proportional command 0-10V)
	10	MONITOR+ (output for analog proportional command 0-10V)

SW	PIN	TECHNICAL SPECIFICATIONS
	1	485 Polarization (Default: LOW / OFF)
	2	485 Polarization (Default: LOW / OFF)
	3	120 Ohm Termination (for 485 Modbus RTU) (Enable only if last or unique device connected to the modbus RTU)

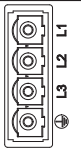
Only for EP, EH, EM:

EIN-EOUT	TECHNICAL SPECIFICATIONS
	RJ45 Ethernet base fieldbus

C3	PIN	TECHNICAL SPECIFICATIONS
	1	ENABLE (to be connected to a dry contact)
	2	ENABLE (to be connected to a dry contact)
	3	THERMOCOUPLE K+ (connect insulated junction K-Type TC)
	4	THERMOCOUPLE K- (connect insulated junction K-Type TC)
		⚠ Do not apply any external voltage to connector C3

C4	PIN	TECHNICAL SPECIFICATIONS - Serial debug
	1	UART GND
	2	UART RX
	3	UART TX
	4	UART 5V/3.3V

C5	PIN	TECHNICAL SPECIFICATIONS - Modbus RTU (1)
	1	485 A (for Modbus RTU)
	2	485 B (for Modbus RTU)
	3	485 GND (for Modbus RTU)
	4	485 Shield (for Modbus RTU)

C1	PIN	TECHNICAL SPECIFICATIONS
	L1	400/460 VAC ±10% - 50/60 Hz L1 L2 L3 PE
	L2	
	L3	
		PE

⚠ Both earth connections must be connected

C6, C7	PIN	TECHNICAL SPECIFICATIONS
		Plug-in coil connector for Atos Induction heating element

(1) The RS485 connector pins can be wired in two different ways:
Standard (for major applications): connecting only signals **A** and **B** is sufficient
High noise immunity: use a shielded twisted-pair cable for **A** and **B**, a third conductor connected to **485 GND**, and connect the braided shield to the **485 shield** pin

Connection to the power grid

Install a three-phase residual current circuit breaker (to be sized by user) at the mains junction. Install a three-phase fuse holder in series with the residual current circuit breaker, and connect the fuse holder to the generator through unipolar flame retardant cables; see section 8 for fuses type.

The operations described above must be carried out in accordance with the applicable safety and industrial systems requirements of the country of installation.

Cables shall have a minimum size of:

- 2,5 mm² for generator EPG-*/L
- 4 mm² for generator EPG-*/M
- 6 mm² for generator EPG-*/H

Connect conductors L1, L2, L3, and PE directly into the screw connector C1.

In case of multiple generators, each generator must be individually protected with the appropriate electrical protections, see Figure 3.

To comply with the regulations applicable to industrial electrical systems, it is mandatory to install a RCBO to protect the three-phase line supplying the generator. Specifically, a RCCB 3P 400VAC, In = 40 A, Type A, I Δ n = 300 mA + MCB 3P 400VAC, In = 32 A, curve C, breaking capacity to be selected according to the prospective short-circuit current at the installation point, see Figure 3 point.

To comply with electromagnetic compatibility regulations, it is mandatory to install a ferrite with the follow characteristics: High-permeability nanocrystalline toroidal core, ungapped, with initial relative permeability $\mu_i \geq 50.000$, suitable for high-frequency common-mode EMI suppression and operation in the 150 kHz–several MHz frequency range. Core dimensions approximately 60 × 50 × 25 mm (OD × ID × H). Install the ferrite immediately before the generator's three-phase connection. Specifically, the three cables L1, L2 and L3 must be passed through the ferrite and wound around it for three complete turns., see Figure 3 point (3).



Do not pass the PE cable through the ferrite

Note: in the event of use for temperature control, use exclusively K-type thermocouple with insulated junction, electrically isolated from ground.

Ground PE connection

The PE conductor must be the same cross-section as the three-phase power cables and must be connected in both of the following locations:

- to the EPG case: using a ring lug with a 6 mm hole (see section 8)
- to the three-phase connector: directly as a bare wire/conductor

Heating element connection

The generator can power only one heating element at a time, then it is not possible to connect several heating elements to a single generator. Use only the heating elements cables provided by Atos Induction. The cables of the single heating element must be insulated from each other and laid twisted into insulating ducts: e.g., corrugated (non-metallic) or conduits. If there are multiple generators inside the same electrical cabinet, their cables must be separated from each other.

The heating elements cables must be separated by three-phase power supply and signal cables.

Control and signal connections

The ENABLE input must be connected only to a voltage-free dry contact. Do not apply any external voltage to pins 1 and 2 (ENABLE) and pins 3 and 4 (THERMOCOUPLE) of connector C3.

The alarm relay contact is voltage-free; max applicable signal/load is 24 VDC - 3 A.

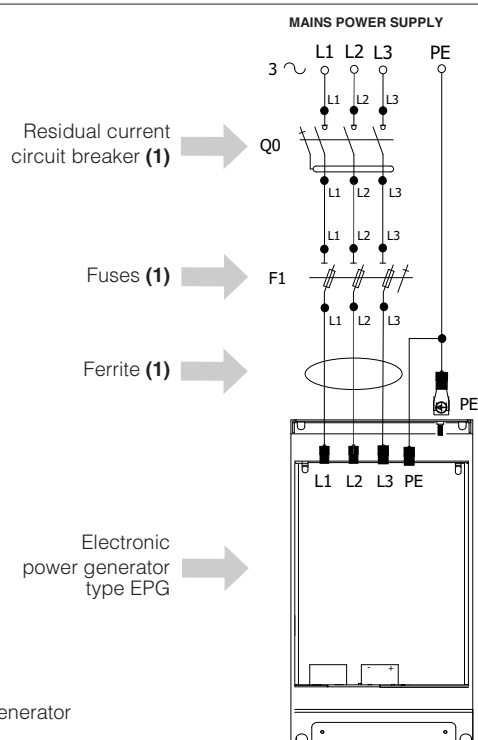
The analog interface requires an external 24 VDC power supply; max current consumption is 65 mA. The analog command input range is 0-10 VDC, with max absorbed current 2 mA.

For proportional analog control, the recommended working range is 2-10 VDC.

Recommended: the EPG analog section need to be supplied by the same 24 VDC that supply the signal-generator PLC (avoid separate power supplies). The 0 VDC of the analog signal must be connected directly to the 0V of the PLC power supply (locally on the PLC itself), thus ensuring a common ground reference and preventing measurement errors.

Use shielded cables for analog command and RS485 Modbus connections. Signal cables must be separated from power supply and heating element cables.

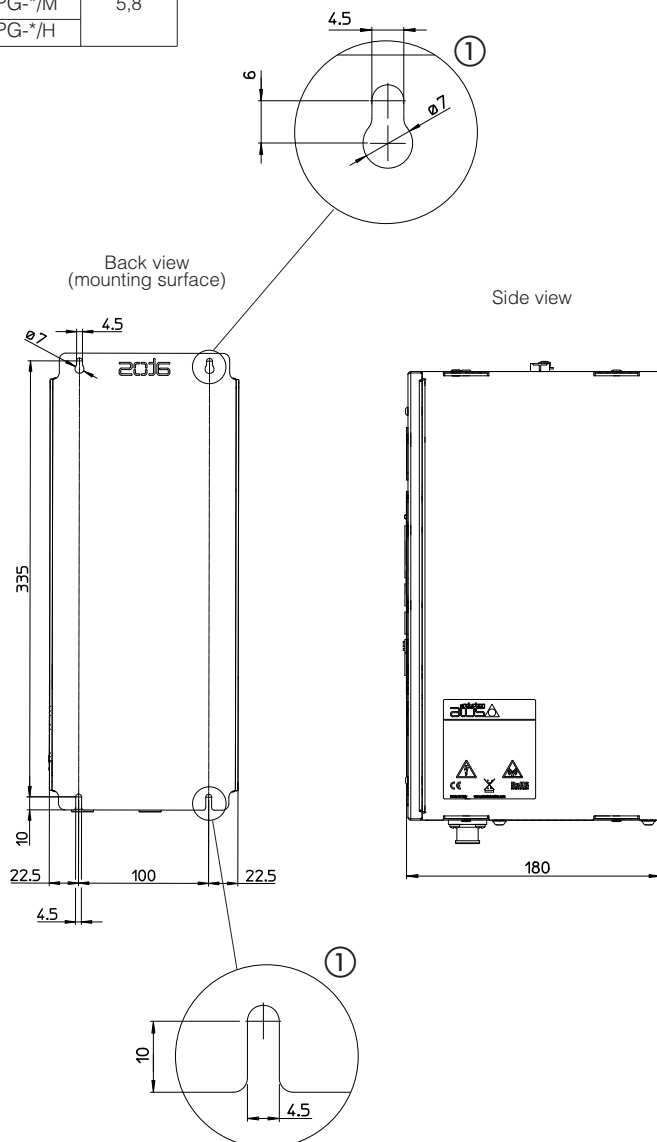
Figure 3



10 INSTALLATION REQUIREMENTS AND DIMENSIONS [mm]

The generator must be installed inside an electrical panel preferably in vertical position, with the fan at the bottom to enhance heat dissipation. N°4 eyelets are located in the back side of the generator, allowing the positioning of the generator on the cabinet wall by means 4 M4 screws (not included). In the electrical cabinet, forced ventilation must be ensured to dissipate the thermal power produced during generator work, see section 6. It is required a clear space of at least 200 mm above and below the generator to allow air circulation.

Weight [kg]	
EPG-*/L	5,8
EPG-*/M	
EPG-*/H	



11 RELATED DOCUMENTATION

- AI110** Electronic communication devices
- AI220** Closed heating coils

E-MAN-EPG Use and instruction manual