Welding control cabinet for manual guns with a Medium frequency (1,000 or 1,800Hz) integrated transformer.

Technical specifications

IMPORTANTE NOTE : This document has been translated from French. In the event of any dispute, only the French version is referred to as the reference text and is binding on the parties.

Objective

To specify the technical characteristics for welding control cabinets which control manual guns with medium frequency (1,000 or 1,800 Hz) integrated transformers.

Scope

Renault Group

Issued by

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Confidentiality

Not confidential

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### Version history

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**Replaces**

EM34.SO.194 /A of 12/2009

### Availability

- Internal to Renault, on the intranet: [http://gdxpegi.ava.tcr.renault.fr](http://gdxpegi.ava.tcr.renault.fr)
- External to Renault, on the Internet: [www.cnomo.com](http://www.cnomo.com)
- E-mail: norminfo.moyens@renault.com

### Documents cited

**Regulations**

- International: CEI 60204-1, CEI 61000-4-1, CEI 61000-4-3, CEI 61000-4-4.
- European:
- French:
- CNOMO:
- Renault: E00.30.020.R, E06.03.105.R, EB00.20.600, EB03.D0.010, EB15.14.000, EB15.31.000, EB75.04.130, EM34.03.110, EM34.SO.185, EP34.SO.650, GE03.B0.026, GE03.PR.020.
- Other internal docs:
- Other external docs:

### Code

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1 Compliance
Welding control cabinets must comply with standard CEI 60204-1 and with EB03.D0.010, regarding general safety rules for machines with electrical components and Renault standard EB75.04.130.

2 General characteristics of a cabinet
A welding control cabinet for a manual gun with an integrated transformer is made up of:
- The electrical section
- The “Fluids” section

3 Electrical section

3.1 Electrical characteristics of the welding network
The welding network is supplied by a transformer with the following characteristics:
- Off-load secondary voltage: 400V
- Short circuit voltage: 1.5%.
- Short circuit current presumed approximately 100 kA effective

The power table for a welding machine is connected to the 400V welding network from a bypass cabinet where the engine accompaniment type HPC fuses are located.
The switches are protected against downstream short circuits due to their limited cut-off power.

Operating diagram
The circuit breaker, the rating of which is determined by the welding application of the machine to be connected, is located in the head unit of the machine power circuit. In order to plan the type of fuse placed upstream of the circuit breaker (responsibility of dept. 65933), the choice of circuit breaker, heat protection rating and magnetic protection rating of the installation are summarized in table form (according to reference guidelines GE03.PR.020).

3.2 Welding cabinet

The welding cabinet has an IP54 protection index. It consists of four main components:

--- Differential protection circuit breaker
--- Auxiliaries (circuit breaker control, 24V power supply, etc.)
--- Medium frequency converter (1,000 or 1,800Hz)
--- Programmable Welding Control (CPS)

3.3 Protective circuit breaker

The power circuit head unit is protected by a magnetothermic circuit breaker. The differential magnetothermic circuit breaker complies with the following conditions:

--- Fully visible cut-off
--- Capable of transferring a current thermally equivalent to the nominal current when ambient temperature is 45°C (see CEI 60204-1)
--- Can repeatedly withstand maximum currents values up to eight times its nominal current (In)
--- No limiters (no repulsion of contacts)
--- 30mA differential protection with test button
--- Lockable handle
--- Adjustable (from 0.6 to In) and compensated thermal protection,
--- Adjustable instant magnetic protection (from 5 to 10 In at least)
--- Minimum cut-off power from 35 to 50 kA effective

In summary, cut-off powers and characteristics are sufficient to ensure the following services:

--- Short circuit cut-off with short-circuit current, I_{cc}, presumed close to the circuit breaker cut-off power: only the circuit breaker must be in operation.
--- Short circuit cut-off with I_{cc} > than the circuit breaker cut-off power: upstream fuse blows before circuit breaker opens.
3.4 Auxiliary devices

The power supply to the auxiliaries is drawn upstream of the welding circuit breaker to protect the welding control in order to retain the error messages (see CEI 60204-1). The circuit breaker is triggered by a current emitting coil.

When using a “double travel” gun control, the operating principle complies with recommendations from 17011 Dpt. “safety work condition” (bi-stable statuses).

The following “operator controls” can be accessed from one side of the cabinet:

- Switch “with and without welding, tightening without welding”
- On/Off switch
- “Fault” warning light
- “End of Electrode Life” (FDVE) warning light
- “Fault reset” push button (if function is not present on the front of the CPS)
- “Counter reset” (FVDE) push button

As an option, the cabinet can control two guns (non simultaneous operation).

Les divers EV (s) des pinces sont alimentés en 24 V DC.

3.5 Welding gun functioning mode

The welding cabinet must allow the control of single double stroke welding guns.

In case of using a double stroke cabinet, the functioning mode is in accordance with the 17011 Dpt. (safety work condition) instruction, the statuses are bi-stable.

Each power down, powerup or under pressure switch on mustn't generate dangerous moves.

Welding gun with big deep work (PU >500mm) will need utilization of progressive under pression valve to cancel dangerous quick move.

As mechanical interlocks of double strokes welding guns are different between each manufacturer, the following functioning modes must be accepted, by programming, by automatism of the welding cabinet.

(By convention, PO = small opening, GO = big opening)

- Direct welding (control of the Welding EV) is not possible from the GO position
- A timer may be necessary between PO mechanical interlock and start welding.
- Welding is impossible with gun in unlocked PO position.
- Direct move from welding to GO position is impossible
- During the move from PO to GO or GO to PO, actions on Pushbuttons (BPs) are not taken into consideration
- There is no position sensor on the gun (PO, GO, Locked, Unlocked)
- There is only one pushbutton (BP) who permit move from PO to GO and One for the welding.
- The guns have only 3 valves (EV): PO, GO and SR. Locked and unlocked are done par pneumatic control of the same valve as PO and GO.

In case of software control of these functioning mode (inside the cabinet), when powerup and independently of the opening position of the gun, the system will have to consider that the gun is in the GO position and each action on BPs (PO, GO or SR (Start welding)) will have to be inactive or put the gun into the PO position.

If the gun is PO position, system confirm that, is the gun is in GO position, system control to the PO.

The tension of controls of the EV (s) of different guns is 24 V DC.
3.6 **Medium frequency converter 50/1,000 or 1,800Hz)**

The converter is capacity type and is chosen according to the ranges of instant and permanent current required to ensure the welding capacities specified in standard **EM34.SO.650**.

The cabinet must allow the use of an air-cooled (natural convection) or water-cooled converter via an (optional) interface (according to the use coefficient and the ambient temperature in the plant which uses it).

No special tool is required to assemble and disassemble the converter.

3.7 **Programmable Welding Control (CPS)**

The use of the CPS, for which “Welding Operations” comply with standard **EM34.SO.185**.

The programming of the CPS is performed either using an integrated HMI or with an external pocket computer or a PC.

The preheating, welding, slopes and annealing times are programmed in ms.

The servo-control of welding current is performed by measuring the current in the secondary circuit of the transformer.

3.8 **Functioning mode for the system « Cabinet-Inverter »**

If basically, These components permit welding simple mode with control current by secondary measurement, it must be possible to update them on site, by addition of others components, to allow the Auto adaptive mode.

3.9 **Protection against micro-outages and other disturbances (EMC)**

Best practice must be complied with for the wiring design (according to **GE03.B0.026** to guarantee interference immunity tests results which comply with standards:

- CEI 61000-4-1,
- CEI 61000-4-3,
- CEI 61000-4-4.

Level 3 of severity, minimum. A test report must be communicated to Renault.

3.10 **Interchangeability of equipment installed in the cabinet**

The installation of equipment in the cabinet (CPS, converter) must not affect interchangeability. The installation must take into account the maximum volume of these components (volumes specified in standards).

Option:

When specific by the command, the welding cabinet allows manual connection and disconnection to the power, control and fluid circuits without risk to either the operator or the equipment in use.

3.11 **Thermal dissipation**

The cabinet allows sufficient thermal dissipation to ensure the operation of the installation in an environment in which the temperature can vary from 5 to 45°C. Thermal dissipation is verified by calculation (see reference guideline **GE03.PR.020**).

In case of air-cooling by natural convection, the temperature of the converter radiator must never be greater than 60°C in the case of the most difficult conditions for use.
4 The “Fluids” section
This consists of a panel fixed to the back of the cabinet and combines the equipment required for the pneumatic control and cooling of the gun.

4.1 Pneumatic equipment
The following pneumatic components are attached to the upper section of the “fluids” panel:

- A lockable stop valve with a drainage system fitted with a silencer
- A filter/expansion-valve/manometer assembly
- A proportional valve (optional)

The pneumatic network pressure is 7 bar ± 1, and 5 bar minimum.

4.2 Cooling equipment
The following equipment required for cooling is attached to the “fluid” panel (lower section):

- Two cutoff valves (¼ turn)
- A filter located in the inlet
- A visual water flow-rate controller (optional for electronic)
- Two manifolds marked “In” and “Out”, fitted with connectors

Use of self-tightening hoses selected in the standard **E06.03.105.R**.

4.3 Flow rates

- Welding transformer: see manufacturer’s handbook
- Gun arm: 4 l/min when using Ø 16 electrodes with Ø 4x6.3 mm injectors or 5 l/min when using Ø 20 electrodes with Ø 6 x 8.3 mm injectors.
- Converter: see manufacturer’s handbook

The design of the cooling circuit as well as the equipment chosen allows water flow-rates to be achieved in the welding gun (transformer, gun arm, electrodes, connections), with a maximum loss of load (Δp) between the inlet and outlet of the full circuit of 1.5 bar.

5 Reliability
Overall reliability of the complete welding cabinet:

- Number of breakdowns per 1,000,000 spot welds: 0.6
- Average duration of downtime incidents (TMP): 6 min.

6 Connections

6.1 Electrics

Upstream connection
The cabinet power supply cable can be multipolar or unipolar.
A minimum space of 250mm above the circuit breaker is left for connection by crimped terminals. The cables are fed through a cable gland at the top of the cabinet.

Downstream connection
The transformer power supply cable can be multipolar or unipolar.
Sufficient space is left for its connection on crimped terminals.

6.2 Fluids
The water and air inlets and the water return are located in the upper section of the “fluid” panel, and the distribution to the gun in the lower or upper section.
7 Attachment and Handling of the complete cabinet

Components in the upper section allow the handling and attachment of the cabinet. The cabinet can be attached to the floor using a suitable mounting (free lower surface).

8 Welding capacity

The welding cabinet allows the control of all models of manual welding gun with integrated transformer for which the characteristics are described in standard EP34.SO.650. The settings for thermal and magnetic protection are adapted to the welding transformers and welding procedures used.

Primary and secondary wiring harnesses:

Qualities of the recommended cables:
- Primary wiring harness: H07RNF type cable for the trunking/power column section
- * Secondary wiring harness: "robotics" quality tool terminal connection cables (spare wiring harness in case of use of a system of manual connection and disconnection of the power circuit).

9 Troubleshooting and Maintenance

The replacement time for main cabinet components must be less than:
- For the converter section: 30 minutes
- For the CPS section: 20 minutes
- For the auxiliary components (power supply, relay): 15 minutes

10 Documentation

See standard EB00.20.600 and its supplement EM34.03.110. The welding cabinets are delivered with the following documentation in the language of the country where they are intended to be used:
- Electrical (principle and connection) and pneumatic circuit diagrams
- “Fluids” panel drawing
- Equipment layout drawing
- Bill of materials with supplier and manufacturer references for the sub-assemblies in compliance with standard EB15.14.000
- List of spare parts in accordance with standard E00.30.020.R
- Descriptive user guide
- Preventive and curative maintenance schedule (see standard EB15.31.000)
- Technical description for the cabinet and programming the CPS
- The HMI for the pocket computer or software for programming the CPS must be in the language of the country in which it is intended to be used
11 List of reference documents

Note : For documents without dates, the latest version applies

CEI 60204-1 : Machine safety, Electrical equipment of the machines, Part 1: General rules
CEI 61000-4-1 : Electromagnetic compatibility (EMC) - Part 4-1 : testing and measurement techniques - Overview of IEC 61000-4 series
CEI 61000-4-3 : Electromagnetic compatibility (EMC) - Part 4-3 : testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test
CEI 61000-4-4 : Electromagnetic compatibility (EMC) - Part 4-4 : testing and measurement techniques - Electrical fast transient/burst immunity test
EB00.20.600 : Industrial machines, facilities and tooling, Technical documentation, Structure, content and transmission
E00.30.020.R : Spare parts for machines, facilities and industrial tooling, Identification and supply, Recommendations for equipment and the limiting of diversity
EB03.D0.010 : Rules for the conception of the distribution) and the electric application
GE03.B0.026 : Implementation guide for equipotential connections And electromagnetic protection
GE03.PR.020 : Study information sheets for bodywork facilities
E06.03.105.R : Pneumatic equipment, List of equipment recommended by Renault
EB15.14.000 : TDI: Facilities Breakdown Table, Presentations, Processes and Content Management
EB15.31.000 : Industrial machines and facilities, Preventive Maintenance Plan
EM34.SO.185 : Electrical resistance welding, Programmable welding control, General specifications
EP34.SO.650 : Resistance welding, Technical specifications for manual guns
EM34.03.110 : Body shop facilities and exhaust manufacturing facilities, Technical documentation, Setting milestones, scheduling and acceptance.
EB75.04.130 : Industrial machines and facilities, Safety & Working conditions, Technical specifications