



## Recommended Renault equipment Sector: Electricity-Automation

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

**Subject:** Define the list of recommended electrical and automation equipment to reduce the diversity in the Bodywork-Body-Assembly and Powertrain workshops in the Renault plants.

**Context:**

**Available from :** Inside Renault, on the Intranet : <http://gdxpegi.ava.tcr.renault.fr>  
Outside Renault, on the Internet : [www.cnomo.com](http://www.cnomo.com)  
E-mail : [norminfo.moyens@renault.com](mailto:norminfo.moyens@renault.com)

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Approved by	Job title	Signature	Adoption date
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# 1 Foreword

## 1.1 Scope of application

The current standard forms the STANDARD of electrical and electronic equipment and automation components retained in the RENAULT Group for all the facilities in Bodywork, Body, Assembly and Powertrain. The objective of this standard is to limit the diversity of the components entering the RENAULT workshops.

The associated process is defined in the **E00.30.020.R** standard «Pièces de rechange des machines, installations et outillages industriels. Préconisations et limitation de la diversité. Elaboration des listes de pièces de rechange et approvisionnement » (Spare parts of machines, installations and industrial toolings. Recommendations and limitation of the variety. Elaboration of the lists of spare parts and supply).

This standard concerns the new projects, the carry-over is managed with the recommended equipment standard used in initial install, see with the automatism project manager the integration of new equipments.

This standard is completed for the powertrain machining by SIEMENS, FANUC and LUMBERG technical reference systems.

These reference systems are available to the addresses specified in this document.

## 1.2 Generalities

This standard is to be applied on a priority basis to the “core” of automation, meaning:

- Programmable Logic Controllers (PLC), or Digital Controls ,
- Safety components,
- Intelligent Human -Machine Interfaces,
- Industrial or fieldbus networks,
- Identification systems,
- Motorizations
- Robots
- Softwares.

## 1.3 Instructions for use

The EB03.C0.613 standard is made up a word document is made available in PDF format, containing:

- Functional recommendations
- Technical specifications
- Recommended suppliers for each family of components

No more excel files with the lists of required references, these lists are hosted in the supplier website, They are obtained by clicking on the name of recommended supplier. This procedure is in the establishment phase, we have begun with the material in the “core” of automation.

The project books, that are in this referenced standard are available in the same way.

The standard is completed by the robot technical definitions annexed in the directory “Offre\_Robot”

The standard is divided into two parts corresponding to two big equipment families:

- Family 1: Low Voltage Equipment
- Family 2: Safety, Motorization, Control and related systems

The two parts have the same division. Title 1 of part 1 corresponds to the pages of part 2; other levels of titles of part 1 correspond to the first columns of part 2. The families which do not have the list of goods, but only functional recommendations or recommendations for the brands, only appear in part 1.

At the end of this document, there is the list of recommended suppliers with URL, for our main suppliers, of website where are hosted the recommended references and eventually procedure, username and password to access it.

## 1.4 Limitations

This standard does not define the following items:

- Motor reduction gear units: see Renault standard [E14.03.810.R](#).
- Solenoid valves, pressure switches, etc., see Renault standards [E05.03.105.R](#) and [E06.03.105.R](#).
- Pyrometry equipment: see Renault standard [E04.80.110.R](#).

# Part 1: Functional recommendations

## Family 1 : Low voltage equipment

### 2 Breaking and protection of circuits (EIB1 Segment)

When using a Neutral conductor, comply with the rules prescribed in article 431 of standard **NF C 15-100** with regard to its protection. The Neutral conductor must be broken.

In places with risk of fire (BE2) or explosion (BE3) the ducts in TN system must be protected by the core balance transformers equal to 300mA at the most (according to **NF C15-100** part 4-42).

#### 2.1 Direct current magnetic terminal circuit breakers

**Characteristics:** Compliance with standard **IEC 60934**.

**Brands:** SIEMENS, ETA

**Use:** Protection from short circuits of direct current control circuits.

**Operational requirements:** —

**Observations:** Triggering delay  $\leq 10$  ms.

#### 2.2 Modular circuit breakers

**Characteristics:** Compliance with standards **IEC 60947-2** and **IEC 60898-2**. Mandatory rule for alternating current terminals (N), L1, L2, and L3 from left to right.

**Brands:** LEGRAND, SCHNEIDER ELECTRIC, ABB

**Main use:** Protection from excess current of direct or alternating current circuits.

**Operational requirements:** Breaking capacity at least equal to the presumed short circuit current, at the connecting point.

**Observations:** Protecting people by adding residual current protection.

##### 2.2.1 Residual current additive blocks

**Characteristics:** Compliance with standard **IEC 61009-1**

**Brands:** LEGRAND, SCHNEIDER ELECTRIC

**Main use:** Protecting people from indirect contacts and additional from direct contacts. The socket-outlets, of rated current equal to 32A at the most, must be protected by residual current device equal to 30mA at the most according to standard **NF C 15-100**.

**Observations:** Damp workshops (grade AD4): regardless of their rated current, the sockets must be protected by residual current devices of 30 mA max.

##### 2.2.2 Residual current modular circuit breakers

**Characteristics:** Compliance with standard **IEC 61009-1**, with high sensitivity of 30 mA.

**Brands:** LEGRAND

**Main use:** Protecting people from indirect contact and additional protection from direct contact. The socket-outlets, of rated current equal to 32A at the most, should be protected by residual current protective devices equal to 30mA at the most according to standard **NF C 15-100**

**Observations:** Damp workshops (grade AD4): regardless of their rated current, the sockets must be protected by residual current devices of 30 mA max.



### 2.2.3 Thermal-magnetic modular circuit breakers

**Characteristics:** Tripping ranges of curve B or C or D or Z (LEGRAND and SCHNEIDER ELECTRIC) or A (SIEMENS), Uni models, Uni + Neutral, Bi, Tri, Tetra.

**Brands:** LEGRAND, SCHNEIDER ELECTRIC, [SIEMENS](#)

**Main use:** Protection from excess current of control circuits, auxiliary circuits, sockets, etc. These suppliers suggest tripping curve adapted at the protection of electronic circuits (24V voltage for PLC input or interface). Z curve in Schneider and Legrand, A curve in Siemens.

**Observations:** —

### 2.2.4 Direct current thermal-magnetic modular circuit breakers

**Characteristics:** Tripping current range Curve C.

**Brands:** SCHNEIDER ELECTRIC, [SIEMENS](#)

**Main use:** Protection from excess current of direct current control units.

**Observations:** Polarised model.

### 2.2.5 Direct current electronic circuit breakers

**Characteristics:** Protecting for the 24VDC circuits. Adjustable calibre.

**Brands :** ETA (Class ESX10-T...), MURRELEKTRONIK (Class Mico), [SIEMENS](#)

**Main use:** Protecting of the 24V downstream from the switched-mode power supplies.

**Observations :** —

## 2.3 Power circuit breakers

**Characteristics:** Compliance with standard [IEC 60947-2](#). Circuit breaker fit for sectioning. Mandatory rule for terminals (N), L1, L2, and L3 from left to right. In external control, the device is lockable when in “opening” position with a lock.

**Brands:** ABB, SCHNEIDER ELECTRIC, MOELLER-EATON

**Use:** In equipment head, general sectioning of the machine and facilities supply.

Other use: Protection of motor circuits.

**Operational requirements:** Breaking capacity at least equal to the presumed short circuit current at the connecting point.

**Observations:** For currents  $\geq 160A$ , to recommend upstream screw/nut terminals.

When the separable control lever is fixed to the door, the locking system with lock inevitably blocks this door opening and this locking is only possible if the circuit breaker is open and the door is closed. Moreover, if the appliance consists of a lock which prevents the door from opening in the closing position of the circuit breaker, this device must be unlockable with a tool.

## 2.4 Switches-disconnectors

**Characteristics:** Compliance with standard [IEC 60947-3](#). Fit for sectioning. Mandatory rule for terminals (N): L1, L2, L3 from left to right. IP Code IP2X.

**Brands:** LEGRAND, SOCOMEC, SCHNEIDER ELECTRIC, [SIEMENS](#)

**Use:** General sectioning of the machine and facilities supply or divisional sectioning.

**Operational requirements:** —

**Observations:** Sectioning safety by fully apparent and visible break (if recommended). Red lever with yellow protective covering if the appliance is used as an emergency stop device.

### 2.4.1 Switches-disconnectors with visible break

**Characteristics:** The main contacts are visible in the “open” switching point.

**Brands:** LEGRAND, SOCOMEC, SCHNEIDER ELECTRIC, [SIEMENS](#)

**Main use:** Sectioning of lifting facilities (see 2.4.3)

**Observations:** —

## 2.4.2 Fuse switches-disconnectors

**Characteristics:** Recommended external side control, lockable in “opening” position with lock or direct control.

**Brands:** SOCOMEC, SCHNEIDER ELECTRIC.

**Main use:** General sectioning of the machine and facilities supply (recommended external right side control). In case a side control is impossible; for frontal control, see power circuit breaker specifications in paragraph 2.3.

**Observations:** Comply with the max. rated current of the fuse according to sizes in accordance with standard **IEC 60269-2**. Rated voltage of 500V AC, see paragraph 2.6.



**Polar tetra model not permitted if the Neutral conductor section is lower than those of the phases.**

## 2.4.3 Fuse switch-disconnector in box

**Characteristics:** Tripolar switch-disconnector with lockable external side control, visible break, with fuses in box fitted with a glass panel, IP54 min.

**Brands:** SOCOMEC

**Main use:** General sectioning of the lifting facilities supply (travelling cranes, hoists).

**Observations:** Comply with the maxi. rated current of the fuses according to sizes in accordance with **IEC 60269-2**. Rated voltage of 500V AC, see paragraph 2.6.

## 2.5 Disconnectors

**Characteristics:** Compliance with standard **IEC 60947-3**. IP Code IP2X.

**Brands:** LEGRAND, SOCOMEC, SCHNEIDER ELECTRIC

**Use:** Divisional sectioning only of the internal control.

**Operational requirements:** Do not use in equipment **head sectioning**.



**Observations:** —

### 2.5.1 Fuse-holder disconnectors

**Characteristics:** Frontal or internal side control.

**Brands:** SOCOMEC, SCHNEIDER ELECTRIC

**Main use:** Divisional sectioning.

**Observations:** Comply with the rated current of the fuses according to sizes in accordance with standard **IEC 60269-2**. See paragraph 1.6.

### 2.5.2 Modular fuse-holder disconnectors

**Characteristics:** —

**Brands:** LEGRAND, SOCOMEC, SCHNEIDER ELECTRIC

**Main use:** Divisional sectioning.

**Observations:** Comply with the rated current of the fuses according to sizes in accordance with standard **NF C 63-213**.

## 2.6 Industrial fuses (fuse links)

**Characteristics:** Compliance with standard **IEC 60269-1** and **IEC 60269-2**. Type HPC120 kA, 500V AC.

**Brands:** All brands certified as compliant.

**Use:** Protection of power and control circuits.

**Operational requirements:** Comply with the rated current of the fuses according to sizes in accordance with standard **IEC 60269-2**, according to the table below:

Cylindrical fuse cartridge 500 VAC			Knife-blade fuse-cartridge 500 VAC		
Size	In (A)		Size	In (A)	
	gG	aM		gG	aM
10 x 38	25	16	0	160	160
14 x 51	50	40	1	250	250
22 x 58	100	100	2	400	400
			3	630	630
			4	1000	1000
			4a	1250	1250

**Observations:** —

### 2.6.1 Cylindrical fuse cartridge

**Characteristics:** Sizes 8.5x31.5\*, 10x38, 14x51, 22x58, types gG or aM.

**Brands:** All brands certified as compliant.

**Main use:** Type gG (distribution) protection of lines from overloads and short circuits, type aM (motor protection fuse) protection from motor short circuits or primary circuits of transformers.

**Observations:** \* Size 8.5x31.5 20kA 400V AC reserved for protecting circuits used in control transformers (type gG).

### 2.6.2 Knife-blade fuse cartridge

**Characteristics:** Sizes 0, 1, 2, 3, 4.

**Brands:** All brands certified as compliant.

**Main use:** Type gG (distribution) protection of lines from overloads and short circuits, type aM (motor protection fuse) protection from motor short circuits or primary circuits of transformers.

**Observations:** —

### 2.7 Miniature fuses

**Characteristics:** Compliance with standards **IEC 60127-2** and **NF C 93-435**. Sizes 5x20 and 6.3x32.

**Brands:** All brands certified as compliant.

**Use:** Electronic circuit, solenoid valve protection.

**Operational requirements:** Only high current-breaking capacity fuse cartridge are accepted (glass tube fuse-not permitted).

**Observations:** —



### 2.8 Fuses for semi-conductors

**Characteristics:** Compliance with standard **IEC 60269-4** grade aR or gR.

**Brands:** All brands certified as compliant.

**Use:** High-speed fuses for semi-conductor protection.

**Operational requirements:** —

**Observations:** Cylindrical fuse cartridge sizes 10x38, 14x51, 22x58, 27x60 or contact square body to be screwed to the SI pitch or knife-blade cartridges.

### 2.9 Proximity break switchboxes

**Characteristics:** —

**Brands:** MOELLER-EATON, SOCOMEC, SCHNEIDER ELECTRIC

**Use:** safety intervention device.

**Observations:** —

*Zone without text*

## 3 Connecting hardware (EIB2 Segment)

### 3.1 Terminal block

**Characteristics:** Preferably spring clamp terminal than screw terminal Concept 24V. Attachment on DIN rail or in G-type rail.

Number of stages 1 or 2

Compliance with standard [IEC 60947-7-1](#)

**Brands:** ALL

**Use:** the orange colour terminal blocks must be used on the auxiliary circuits uncut by the main disconnecting device. If many types of terminals are used side by side, they must be of the same series. For the terminals fitted with TEST cells, the bulkheads are essential; only spring clamp terminals for connectors subjected to vibrations.

**Observations:** For spring clamp terminals, one connector per terminal. For screw terminals, if two conductors, they must be of the same section. The use of crimped connection end is related to the supplier manual.

### 3.2 Splitter boxes

**Characteristics:** IP67 Equipped with cylindrical connectors 4 \* M12; 5 pins or 8 \* M12; 5 pins; contact position in code A ([IEC 61076-2-101](#)); with or without views. Sealed connection M23 19 pins or overmoulded cable 10 or 15 m PVC, PUR.

Minimum cross-section of conductors: common and PE 1mm<sup>2</sup>, 0,34mm<sup>2</sup> for others.

It must be functional with T cable splitter M12. Printed circuit behaviour 10In 10s.

**Brands:** ALL

**Use:** connecting sensors and pre-actuators.

**Observations:** —

### 3.3 Logic function splitter boxes

**Characteristics:** IP67 equipped with cylindrical connectors; 4 \* M12; 5 pins or 8 \* M12; 5 pins; sealed connection M12; 5 pins; contact point in code A ([IEC 61076-2-101](#)).

Forward and backward interlock function.

It must be functional with T cable splitter M12. Printed circuit behaviour 10In 10s.

**Brands:** MURRELEKTRONIK, [SENSTRONIC](#).

**Use:** interfacing of position sensors (advanced, returned) exists in 8 to 16 ways.

If use for part presence, connect only one part presence by channel

**Observations:** —

### 3.4 Rectangular connector

**Characteristics:** from 2 to 216 poles, from 5A to 200A, from 10 to 5000V. Standard screws, cage clamp, crimp or quick connection. Core of the range: 3/6/10/16/24 screw//LP/crimp pins 16A/500V.

**Brands:** HARTING, ILME, WEIDMULLER

**Use:** control connection, power, signals between two enclosures

**Observations:** is available with terminal block; for IP20, with EMC protection, for aggressive environments IP69K, IP68.

### 3.5 Connectors for solenoid valves

**Characteristics:** IP 67 Concept 24VDC; equipped with suppressor diode transil P=1.5kW and non polarized green LED. Extension or Y type (light/dark) equipped with socket M12, overmoulded connector; 5 pins; contact points in code A ([IEC 61076-2](#)); with cable of grade 6 PUR or PVC.

Minimum cross-section of the conductors 0.34mm<sup>2</sup>

The cable, on the M12 connector side, must be fitted with a label holder ring.

On the solenoid valve side, the cable is fitted with a label holder ring or the connector itself is fitted with a label holder.

If Y, the solenoid valve connectors must be identified, dark metallic ring for the connector matching contact 4 of connector M12 and light-coloured metallic ring for the connector matching contact 2 of connector M12.

**Brands:** ALL

**Use:** Connecting pneumatic and hydraulic solenoid valves.

**Observations:** for coil of max 50W, make connection in M12 socket

### 3.6 M12 cylindrical connectors

**Characteristics:** IP 67 Concept 24VDC; 5 pins. Extension, extension lead, grade 6 cable, overmoulded connectors, straight plug/straight or angled socket, contact position in A coding ([IEC 61076-2-101](#)) with: 1, 2, 5 or 10 m length. PVC, PUR.

Minimum cross-section of conductors 0.34 mm<sup>2</sup>

The M12 connectors, 4 pins, can only be used on (pin contacts) and with grade 2 products.

All the cords and extension leads must be fitted with a label holder ring at each end carrying a connector.

**Brands:** ALL

**Use:** connecting sensors and pre-actuators.

**Observations:** —

### 3.7 M12 cylindrical connectors (Y or T cable splitter “light/dark”)

**Characteristics:** IP 67 Concept 24VDC; 5 pins, grade 6 for the Y cable connection cable with overmoulded connectors, contact points in code A ([IEC 61076-2-101](#)).

Minimum cross-section of the conductors 0.34 mm<sup>2</sup>

The cables must be fitted with a label holder ring at each end (only ring at the side of the common connector).

The connectors must be identified, dark metallic ring for the female connector matching contact 4 of the common male connector and light-coloured metallic ring for the female connector matching contact 2 of the common male connector.

**Brands:** JAEGER, LUMBERG, MURRELEKTRONIK, [SENSTRONIC](#)

**Use:** connecting sensors and pre-actuators

**Observations:** —

### 3.8 M12 cylindrical connectors (T “light/light”)

**Characteristics:** IP 67 Concept 24VDC; 5 pins, contact points in code A ([IEC 61076-2-101](#)).

**Brands:** JAEGER, MURRELEKTRONIK, [SENSTRONIC](#)

**Use:** connecting pre-actuators.in parallel, in association with T or Y cable splitter (light/dark)

**Observations:** —

### 3.9 Cylindrical adaptor connectors (M8 female/M12 male)

**Characteristics:** IP 67 Concept 24VDC; 3 pins / 5 pins or 4 pins / 5 pins, M12 connector contact points in code A ([IEC 61076-2-101](#)).

**Brands:** [ESCHA](#) (TURCK BANNER SAS), JAEGER, MURRELEKTRONIK, [SENSTRONIC](#)

**Use:** connecting sensors and pre-actuators (in grade 2)

**Observations:** to be used only for products that cannot be connected in M12.

### 3.10 M23 cylindrical connectors (19 pins)

**Characteristics:** IP 67 Concept 24VDC; Extension, Extension lead, grade 6 cable, overmoulded connectors. Housing. Straight plug/straight or angles socket with length: 5, 10 or 15 m; cable in PVC, PUR, Flexion Torsion, Robotics.

Connector and cable must be compatible with cutting fluids and/or spark-resistant.

Minimum cross-section of conductors; 1 mm<sup>2</sup> for 24V and 0V commons and PE, 0.34 mm<sup>2</sup> for others.

The male conductors are made up of 19 contacts. 16 contacts with diameter of 1 mm (for information) and three contacts with diameter of 1.5 mm (for 24V and 0V commons and PE).

The male ground contact (pin n°12) is longer and structurally connected to the housing. The female contact is structurally connected to the housing.

**Brands:** ALL

**Use:** connecting distributors and pneumatic distributor terminals.

**Observations:** —

### 3.11 Interface

#### 3.11.1 Input/output connection plate

**Characteristics:** 8 E/S, 16 E/S or 32 E/S.

**Brands:** in the PLC brand.

**Use:** for Inrack cards.

**Observations:** to be used with the corresponding cable. Preferably use spring terminals.

## 4 Supply (EIB4 Segment)

The power supplies and transformers are not any more considered as of the "sensitive" material thus more references quoted in the Excel file.

### 4.1 To alternating current


#### 4.1.1 Single-phase transformer

##### 4.1.1.1 Integrated protection

**Characteristics:** Primary: 400 V, Secondary: 24V, Power: from 100 to 630 VA or 2\*115 V, 100 and 1600 VA.

**Brands:** LEGRAND,

**Use:** Control circuit (TDCE) version II

**Observations:** is not used in concept 24 VDC. 

##### 4.1.1.2 Circuit separation

**Characteristics:** Power from 63 to 10000 VA.

**Brands:**

- LEGRAND,
- MURRELEKTRONIK

**Use:** Not to be used for control circuits. 

**Observations:** Bare or protected type, with or without screen.

### 4.2 To direct current

#### 4.2.1 Stabilised

**Characteristics:** Primary: 230V single phase or three phases, 400V three phases. Secondary: Rated voltage 24VDC, adjustable up to 26V.

Rating 5, 10, 20, 30 or 40 A.

**Charge effect <3% in the charge variation range from 10 to 100%.**

Self-protected output from overloads and short circuits with reset or fault signal.

Ripple voltage 2% peak-to-peak of rated voltage output

Mains buffering time  $t > 3\text{ms}$

MTBF (Mean time between failure)  $> 100\ 000\ \text{h}$  at 40°C

**Brands and :**

- LEGRAND, CNOMO
- MURRELEKTRONIK, Emparro and Evolution
- [PHOENIX CONTACT](#), Quint PS
- SCHNEIDER ELECTRIC, ABL8
- [SIEMENS](#), SITOP Modular

**Use:** Supply to industrial programmable system input/output or in supply voltage of local networks

**Observations:** Secondary, do not exceed 27.6 V. Watch out about inrush current on the primary.

*Zone without text*

## 5 Auxiliary contact switch and relays (EIB5 Segment)

All clipped on DIN rail 35mm. Favour the spring terminal connection.

### 5.1 Auxiliary contactor

**Characteristics:** Coil in 24 V direct current, 0.8 to 1.15 Un. Low consumption < 2.4 W. Integrated suppressor. Linked contacts.

**Brands:** [SIEMENS](#), SCHNEIDER ELECTRIC

**Use:** Mainly for safety circuit.

**Observations:** Contact IP20 to be used with closed cabinet door.

### 5.2 Optocoupler

**Characteristics:** Input in 24 VDC, Output 24 VDC 2 A.

**Brands:** LUTZE, MURRELELEKTRONIK, WEIDMULLER

**Use:** Solenoid valve control.

**Observations:** Static output

### 5.3 Terminal relays

#### 5.3.1 Very low level

**Characteristics:** 24 VDC 0.001 mA min. at 5 A max., at the pitch of 18 mm 1C/O contact.

**Brand:** ENTRELEC

**Use:** Interface for exchanging information.

**Observations:** Orange colour.

#### 5.3.2 Low level

**Characteristics:** 24 VDC 1mA min. at 5 A max., at the pitch of 18 mm at 22.5 mm1RT.

**Brands:** LUTZE, MURRELEKTRONIK, WEIDMULLER

**Use:** Interface for exchanging information.

**Observations:** Orange colour.

### 5.4 Strong load terminal relays

**Characteristics:** 24 VDC + 20% 1NO, 100 mA at 5 A, 20 million handlings.

**Brand:** ENTRELEC

**Use:** For strong resistive or inductive load. 

**Observations:** Not to be used for safety functions. Add a diode 5A/100V between +VDC and terminal A (polarity reversal protection), not compatible with two-wire sensors.

### 5.5 Relay plates

**Characteristics:** At 8.16 or 32 relay outputs with visu 1 NO.

**Brands:** Preferably API or CN brand.

**Use:** PLC, CN interface plate.


**Observations:** —

### 5.6 Double channel relay plate

**Characteristics:** at 4 or 8 relays current-breaking capacity 1nW at 1kVA spring or screw terminal unit with withdrawal of 2 C/O contacts.

**Brands:** LUTZE, [PHOENIX CONTACT](#), WAGO, WEIDMULLER

**Use:** API, CN interface plate, wiring head, detection relay circuitry.

**Observations:** Not to be used in output interface. 



## 6 Motor starts and power components (EIB6 Segment)

Motor starters with fuses protection minimum recommended according to the supplier documentation.

The combined motor/contact switch circuit breakers are recommended for control and protection of power motors  $P \leq 15\text{Kw}$  (400V).

### 6.1 Starters-controllers

**Characteristics:** Compliance with standards [IEC 60947-1](#), [IEC 60947-2](#).

**Brands:** SCHNEIDER ELECTRIC.

**Main use:** Combined magnetothermal control and protection of three-phase motors.



**Observations:** Not to be used in case of elevated operation.



**Telemecanique TeSys U power base references LUB12/32 and LU2B12/32 must not be used with high-density automated cards (100 mA)**

### 6.2 Contact switches

**Characteristics:** Compliance with standard [IEC 60947-4-1](#).

**Brands:** [SIEMENS](#), SCHNEIDER ELECTRIC.

**Use:** Motor starts or distribution circuits.

**Operational requirements:** Utilisation category: AC-1 resistive loads, AC-3 inductive loads (squirrel-cage motors), AC-4 squirrel-cage motors, inching.

**Observations:** Low power contact switches: Use the coil contact switches 24 VDC with low consumption and suppression; prohibit connection with “faston” or closed terminals.

High power contact switches: Protection of IP2X terminals.

#### 6.2.1 Triple-pole reversing contact switches

**Characteristics:** —

**Brands:** [SIEMENS](#), SCHNEIDER ELECTRIC.

**Main use:** Bidirectional motor starts

**Observations:** Ensure electric and mechanical locking between the contact switches.

#### 6.2.2 Triple-pole contact switches

**Characteristics:** —

**Brands:** [SIEMENS](#), SCHNEIDER ELECTRIC.

**Main use:** Motor starts

**Observations:** Following applications, ensure electric durability of the contacts and maximum operation rate.

#### 6.2.3 Tetrapolar contact switches

**Characteristics:** —

**Brands:** SCHNEIDER ELECTRIC.

**Main use:** Drive, motor and brake control

**Observations:** Warning, the maximum current declared in the supplier's documentation matches the AC-1 utilisation category (resistive loads).

### 6.3 Motor circuit breakers

**Characteristics:** Compliance with standards [IEC 60947-2](#) and [IEC 60947-4-1](#).

**Brands:** [SIEMENS](#), SCHNEIDER ELECTRIC.

**Use:** Motor starts.

**Operational requirements:** The circuit breaker capability I<sub>cu</sub> must at least be equal to the short circuit current I<sub>cc</sub> at the installation point.

**Observations:** —



### 6.3.1 Magnetic motor circuit breakers

**Characteristics:** —

**Brands:** [SIEMENS](#), SCHNEIDER ELECTRIC.

**Main use:** Motor starts in AC-3 to be associated with a thermal relay.

**Observations:** —

### 6.3.2 Magnetothermal motor circuit breakers

**Characteristics:** —

**Brands:** [SIEMENS](#), SCHNEIDER ELECTRIC.

**Main use:** Motor starts in AC-3.

**Observations:** Circuit breaker/contact switch association for motor starts, according to standard [IEC 60947-4-1](#), refer to the coordination tables in the manufacturers' documentation.

## 6.4 Thermal protection control system

**Characteristics:** —

**Brands:** [SIEMENS](#), SCHNEIDER ELECTRIC.

**Main use:** Thermal monitoring of motors in association with PTC probes.

**Observations:** Manual resetting and detection device for short-circuiting and probe cuts.

## 6.5 Interference suppression modules

**Characteristics:** —

**Brands:** LUTZE, MURRELEKTRONIK, [SIEMENS](#), SCHNEIDER ELECTRIC.

**Use:** Limitation at the source of disturbances appearing at inductive load cut-off point.

**Operational requirements:** —

**Observations:** Varistor interference suppression module, bidirectional clipping diode or RC circuit according to applications.

### 6.5.1 Coil interference suppression modules (relays, contact switches)

**Characteristics:** —

**Brands:** LUTZE, MURRELEKTRONIK, [SIEMENS](#), SCHNEIDER ELECTRIC.

**Main use:** Interference suppression of relay coils and contact switches in alternating and direct currents.

**Observations:** Use the modules adapted to the contact switch make and type.

### 6.5.2 Motor interference suppression modules

**Characteristics:** —

**Brands:** LUTZE, MURRELEKTRONIK.

**Main use:** Three-phase asynchronous motor interference suppression.

**Observations:** Take the motor operation power and frequency into account. Favour screw attachment modules on the motor terminal box.

## 6.6 Thermal protection relays

**Characteristics:** Compliance with standard [IEC 60947-4-1](#).

**Brands:** [SIEMENS](#), SCHNEIDER ELECTRIC.

**Use:** Protection from overloads and three-phase motor cut-off points.

**Operational requirements:** Choose the release class according to the motor start.

**Observations:** Compensated differentials and manual resetting of thermal protection relays.

## 7 Sensing (EIB7 Segment)

All the sensors/photoelectric sensors must:

- have a rated usage voltage including between 10 and 30 V direct current.
- be fitted with an LED visualising their condition
- be connected with M12 connector on housing or duplicate moulding on cable 0.15 m or 0.8 m
- be protected from short circuits, overloads and polarity reversals
- for two-wire sensors, leak current, switched minimum current and voltage drop must be compatible with the Characteristics of the programmable system inputs of "type 3" defined in standard [IEC 61131-2](#) (digital inputs)
- be IP65 at the very least
- the connection housings, cables and accessories must be cutting oil proof and hydrocarbon resistant
- in compliance with the standard [IEC 60947-5-2](#)

They must be quickly replaced without readjusting. **Use the "supports/clamp parts with stops" suggested for that purpose by the manufacturers.**

Specifications for the powertrain projects : assembly lines and machining lines

### - For the machining lines

For handling, gantries or robots, we recommend to use sensors " full metal body " which are cutting-oil-proof and shockproof on the sensitive face.

For machine tools, according to risky installation, it could be necessary to use shavings proof sensors and insensitive to other parts of metal around.

For washing machines, sensors must resist to the cutting and washing liquids and be able to detect the aluminum or stainless steel.

For test benches sensors must be hydrocarbons and shock proof.

Note : the squares shape of 26 mm are not adapted to our environments

### - For the assembly lines

For the handling it is necessary to use detectors with long rated operating distance (at least 25mm) and which resist the shocks caused by the components of assembly, example : alternators, compressors, exhaust manifold,.

In addition , when the pallet move, the detector and its fixation could be destroyed because a weak protection and fixation

It could be necessary to use squares of 40\*40 with a long range.

## 7.1 Capacitive sensors

Used for non-metallic parts

### 7.1.1 Form 26\*26

**Characteristics:** Frontal sensing, switching output PNP, contact NO

**Brand:** [SENSTRONIC](#)

**Use:** —

**Observations:** —

### 7.1.2 Form M18

**Characteristics:** Rated operating distance 8 mm

**Brand:** [BALLUFF](#), [IFM](#), [SCHNEIDER ELECTRIC](#)

**Use:** Mounting clamps

**Observations:** —

## 7.2 Photoelectric cells

### General characteristics:

- Clear switching, active info when light meets the receiver.
- Preferably red light or laser
  - Mode: optics or fiber
- Connecting: 1-3-4 for 3 wires, not 4 wires to protect the connection on distributing T or Y, 5 for PE if necessary
- Function (NO) PNP no switching
- Plastic or metal housing according to the conditions of Use

### 7.2.1 Explosion-proof

**Characteristics:** EEx d IIC T6 protection. M42 x 1.5 body. Armoured output cable. 0 to 200 m range

**Regulation:** **DI 94/9/CE**

**Brand:** [LEUZE](#)

**Use:** Painting

**Observations:** —

### 7.2.2 Optical fibre

The specifications only deal with amplifiers. It is necessary to refer to the supplier documentation for specifications regarding rules and limits of fibre assembly (radii of curvature, temperature, etc.)

#### 7.2.2.1 Amplifiers for optical fibres made of glass

**Characteristics:** Through-beam system or direct reflection, output PNP, connection with M8 or M12 connector, adjustment with potentiometer

**Brands:** [BALLUFF](#), [IFM](#), [LEUZE](#), [SCHNEIDER ELECTRIC](#), [SICK](#).

**Use:** To be favoured for hot or damaging environment

**Observations:** —

#### 7.2.2.2 Amplifiers for optical fibres made of plastic

**Characteristics:** Through-beam system or direct reflection, output PNP, connection with M8 or M12 connector, adjustment with potentiometer

**Brands:** [BALLUFF](#), [IFM](#), [LEUZE](#), [SCHNEIDER ELECTRIC](#), [SICK](#).

**Use:** **To be favoured when small radii of curvature are needed**

**Observations:** —

### 7.2.3 Retro-reflective sensors with polarizing filter

**Characteristics:** Light switching (information at 0 on part detection), 1 m to 15 m range.

**Brands:** [BALLUFF](#), [BANNER](#), [IFM](#), [LEUZE](#), [SCHNEIDER ELECTRIC](#), [SENSTRONIC](#), [SICK](#)

**Use:** —

**Observations:** —

### 7.2.4 Diffuse reflection sensors (proximity) with background suppression

**Characteristics:** Range of 0.15 m to 2 m on white, light switching (information at 1 on part detection).

**Brands:** [BALLUFF](#), [BANNER](#), [IFM](#), [LEUZE](#), [SCHNEIDER ELECTRIC](#), [SENSTRONIC](#), [SICK](#)

**Use:** process

**Observations:**

### 7.2.5 Through-beam system (emitter/receiver)

**Characteristics:** Range of 60 m for laser, 100 m with or without contaminated output.

**Brands:** [BALLUFF](#), [BANNER](#), [IFM](#), [LEUZE](#), [SCHNEIDER ELECTRIC](#), [SICK](#)

**Use:** Handling

**Observations:** Favour metallic or stainless steel housings for harsh environments.

## 7.3 Inductive sensors

### General characteristics:

- Embeddable in metal
- Connecting 1- 4 for 2 wires, 1-3-4 for 3 wires, not 4 wires to protect the connection on distributing T or Y
- Function (NO) PNP. No adjustable sensitivity
- Plastic, metal, Teflon or stainless steel housing according to the conditions of Use

### 7.3.1 Integrated sensing

#### Characteristics: —

**Brands:** [SENSTRONIC](#), [TURCK](#)

**Use:** On retaining and realigning system of parts

**Observations:** Cassette

### 7.3.2 Form 26\*26

**Characteristics:** Rated operating distance 10 mm, fixed on plate providing an attachment centre-to-centre distance of 25 mm

**Use:** Sensing of positioning.

**Observations:** —

#### 7.3.2.1 Standard

**Characteristics:** Connection with M12 connector with cable of 0.15 m or 0.8 m.

**Brands:** [BALLUFF](#), [IFM](#), [SCHNEIDER ELECTRIC](#), [SENSTRONIC](#), [TURCK](#)

**Use:** Assembly with plate: Only attachment on the same plane is permitted.

**Observations:** **Don't use in the welding environment**

#### 7.3.2.2 Insensitive to metal chips

**Characteristics:** Makes it possible to ignore metal chips on sensing, rated operating distance of 8 mm

**Brands:** [SCHNEIDER ELECTRIC](#), [SENSTRONIC](#)

**Use:** Machining.

**Observations:** —

#### 7.3.2.3 Welding environment (jigs on which are made welding operations)

**Characteristics:** **Active face resisting to the sparking**

**Brands:** [SCHNEIDER ELECTRIC](#), [SENSTRONIC](#), [TURCK](#)

**Use:** In bodyshop

**Observations:** Exclusively reserved for welding environment, to compare with the solution with L18 sensor also recommended for welding environment

#### 7.3.2.4 Factor 1

**Characteristics:** ferrous/nonferrous (Alu, CU)

**Brands:** [IFM](#), [TURCK](#)

**Use:** Mainly in machining and bodyshop for aluminium parts.

**Observations:** —

### 7.3.3 Form C (40\*40)

**Characteristics:** Rated operating distance 15 mm, centre-to-centre distance 30 mm

**Use:** For sensing parts.

**Observations:** Takes cubic forms with attaching plate.

#### 7.3.3.1 Standard

**Characteristics:**

**Brands:** [BALLUFF](#), [IFM](#), [SCHNEIDER ELECTRIC](#), [SENSTRONIC](#), [TURCK](#)

**Use:** Only attachment on the same plane is permitted.

**Observations:** **Don't use in the welding environment**

#### 7.3.3.2 Insensitive to metal chips

**Characteristics:** Makes it possible to ignore metal chips on sensing.

**Brands:** [BALLUFF](#), [SCHNEIDER ELECTRIC](#), [SENSTRONIC](#)

**Use:** Machining.

**Observations:** —

### 7.3.3.3 Welding environment (jigs on which are made welding operations)

**Characteristics:** Active face resisting to the sparkling

**Brands:** [BALLUFF](#), [SCHNEIDER ELECTRIC](#), [SENSTRONIC](#), [TURCK](#),

**Use:** Need for resistance to sparks (welding).

**Observations:** In bodyshop

### 7.3.3.4 Factor 1

**Characteristics:** ferrous/nonferrous (Alu, CU).

**Brands:** [BALLUFF](#), [IFM](#), [TURCK](#)

**Use:** Mainly in machining.

**Observations:** —

### 7.3.4 Form D (80\*80)

**Characteristics:** Rated operating distance 40 mm, centre-to-centre distance (65\*65)

**Brands:** [BALLUFF](#), [IFM](#), [SENSTRONIC](#), [TURCK](#)

**Use:** Handling.

**Observations:** —

### 7.3.5 Form M 8

**Characteristics:** Rated operating distance distance 1.5 mm, M12 wiring, cutting oil proof.

**Brands:** [BALLUFF](#), [IFM](#), [SCHNEIDER ELECTRIC](#), [SENSTRONIC](#), [TURCK](#)

**Use:** Clamp mounting.

**Observations:** Not permitted in bodyshop



### 7.3.6 Form M12

**Characteristics:** Rated operating distance 2 mm, M12 wiring, cutting oil proof.

**Brands:** [BALLUFF](#), [IFM](#), [SCHNEIDER ELECTRIC](#), [SENSTRONIC](#), [TURCK](#)

**Use:** Clamp mounting, preferably take short form.

**Observations:** Not permitted in bodyshop



### 7.3.7 Form M18

**Characteristics:** Rated operating distance 5 mm, M12 wiring, cutting oil proof.

**Brands:** [BALLUFF](#), [IFM](#), [SCHNEIDER ELECTRIC](#), [SENSTRONIC](#), [TURCK](#)

**Use:** Clamp mounting.

**Observations:** Not permitted in bodyshop



### 7.3.8 Form L08

**Characteristics:** Rated operating distance 2 mm, M12 wiring, smooth cylindrical sensor with shoulder, ceramic face + clamp of prepositioning and conical protective + plate of adjustment and Kevlar moulded wire.

**Brands :** [SENSTRONIC](#)

**Use :** Fixing with supplier bracket and plate

**Observations :** Exclusively reserved for welding environment.

### 7.3.9 Form L12

**Characteristics:** Rated operating distance 4 mm, M12 wiring, smooth cylindrical sensor with shoulder, ceramic face + clamp of prepositioning and conical protective + plate of adjustment and Kevlar moulded wire.

**Brands :** [SENSTRONIC](#)

**Use :** Fixing with supplier bracket and plate

**Observations :** Exclusively reserved for welding environment.

### 7.3.10 Form L18

**Characteristics:** Rated operating distance 10 mm, M12 wiring, smooth cylindrical sensor with shoulder, ceramic face + clamp of prepositioning and conical protective + plate of adjustment and Kevlar moulded wire.

**Brands :** [SENSTRONIC](#)

**Use :** Fixing with supplier bracket and plate

**Observations :** Exclusively reserved for welding environment, to compare with the solution with form 26\*26 also recommended for welding environment, recommended for jigs with manual welding tools

### 7.3.11 Multiple limit switches

**Characteristics:** (NO and/or NC).

**Brands:** [BALLUFF](#), [EUCHNER](#), [SENSTRONIC](#)

**Use:** —

**Observations:** If precision needed, choose multiple limit switches with mechanical switch

#### 7.3.11.1 Step 12-mm connection with M12

**Characteristics:** —

**Brands:** [BALLUFF](#), [EUCHNER](#), [SENSTRONIC](#)

**Use:** —

**Observations:** —

#### 7.3.11.2 Step 16-mm connection with M12

**Characteristics:** —

**Brands:** [BALLUFF](#), [EUCHNER](#), [SENSTRONIC](#)

**Use:** —

**Observations:** —

## 7.4 Mechanical limit switch

### 7.4.1 Precision model

**Characteristics:** Contact NO and NC roof push switch

**Brands:** [BALLUFF](#), [EUCHNER](#)

**Use:** Machining, displacement control

**Observations:** Is in single or multiple

### 7.4.2 For renault standard poka yoke system

**Characteristics:** M12 wiring

**Brands:** [SICK](#), [SIEMENS](#)

**Use:** Alternative assistance unit

**Observations:** —

## 7.5 Magnetic field sensor

**Characteristics:**

-connecting 1- 4 for 2 wires, 1-3-4 for 3 wires, not 4 wires to protect the connection on distributing T or Y

-Function (NO) PNP. Not adjustable

-resistant to welding electromagnetic fields 100mT.

**Brands:** [BALLUFF](#), [IFM](#), [SENSTRONIC](#), [SICK](#), [TURCK](#)

**Use:** Assembly on pneumatic cylinders in groove in T or mounting flanges according to the forms and diameter.

**Observations:** Is also in Teflon.

## 7.6 Rotation

**Characteristics:** Possible adjustment of number of start pulses and disabling time

**Brands:** [BALLUFF](#), [IFM](#)

**Use:** For stamping.

**Observations:** Stamping.

## 7.7 Distance

**Characteristics:** Laser technology, flight time measurement, range 10 m direct, 75 m on reflector

**Brands:** [IFM](#), [SICK](#)

**Use:** All functions  
**Observations:** —

## 7.8 2D vision sensor

**Characteristics:**  
**Brands:** [IFM](#), [SICK](#)  
**Use:**  
**Observations:** —

## 7.9 ATEX sensing

### 7.9.1 Intrinsically relay

**Characteristics:**  
**Brands:** Pepperl+Fuchs  
**Use:** ATEX area  
**Observations:** —

### 7.9.2 Inductive sensor

**Characteristics:** Namur, 40X40, 80X80 sizes  
**Brands:** Pepperl+Fuchs  
**Use:** ATEX area  
**Observations:** —

### 7.9.3 Magneto-inductive sensor

**Characteristics:** dry contact outputs  
**Brands:** Schmersal  
**Use:** Silhouette position check for paint booth in ATEX area  
**Observations:** —

### 7.9.4 Optical sensor

**Characteristics:** with background suppression  
**Brands:** [LEUZE](#)  
**Use:** Reading of plate code in ATEX area  
**Observations:** —

### 7.9.5 Light curtain

**Characteristics:**  
**Brands:** [SICK](#)  
**Use:** To use only if it is not possible to place the curtains outside of ATEX area  
**Observations:** —

## Family 2 : Safety, Motorization, Control and related systems

### 8 Component parts for safety applications (EIS Segment)

**Regarding people's safety, the safety components have a maximum criticality level; as a result, any use request for safety components which is not included in the recommended equipment list must be made immediately to the referent leader of this segment.**

#### 8.1 Emergency stop

**Characteristics:** 2NC+1NO, 22 and 40-mm diameters keyless, push – turn or push – pull or cable

**Brands:** [SCHNEIDER ELECTRIC](#), [SIEMENS](#),

**Use:** —

**Observations:** —

#### 8.2 Light curtain

##### 8.2.1 Multiple beams

###### 8.2.1.1 Category 4

**Characteristics:** Theoretical reference. Resolution= 30 mm, H = 800 mm.

**Brands:** [KEYENCE](#), [LEUZE](#), [SICK](#)

**Uses:** Protecting the hands and upper limbs, operator safety control in a dangerous area, anti-intrusion without checking the cyclic pass.

**Observations:** —

###### 8.2.1.2 Category 2

**Characteristics:** Theoretical reference. Resolution= 30 mm, H = 800 mm.

**Uses:** Anti-intrusion check with cyclic check.

**Brands:** [LEUZE](#), [SICK](#)

**Observations:** —

#### 8.3 Light curtain laser scanner

**Characteristics:** —

**Brands:** [LEUZE](#), [SICK](#)

**Uses:** Operator safety control in a dangerous area, protecting workstation.

**Observations:** Category 3.

#### 8.4 Safety relay

**Characteristics:** Dual-channel monitoring, with feedback loop monitoring, category 4.

**Brands:** [EUCHNER](#), [PILZ](#), [SCHNEIDER ELECTRIC](#), [SICK](#)

**Use:** Processing of safety functions.

**Observations:** Functions: Emergency stop, Protective door, Light curtain, Two-hand control, Speed monitoring, Standstill monitoring

#### 8.5 Safety edge device

**Characteristics:** —

**Brands:** [HAAKE Gamme HSC](#)

**Use:** Protection against the impacts.

**Observations:** Minimum category 2.



## 8.6 Bumper

**Characteristics:** —

**Brand:** [HAAKE Gamme HSB](#)

**Use:** Protection against the impacts.

**Observations:** Minimum category 2.

## 8.7 Enabling switch

**Characteristics:** 3 positions with anti-contraction and anti-release functions

**Brands:** [EUCHNER](#), [SCHNEIDER ELECTRIC](#)

**Use:** Enabling switch.

**Observations:** —

## 8.8 Switchboxes

**Characteristics:** —

**Brands:** [EUCHNER](#), [SCHNEIDER ELECTRIC](#), [SIEMENS](#)

**Use:** Safety panel for use in a protected area.

**Observations:** "Low level" auxiliary contacts compatible with controller inputs.

## 8.9 Selector

**Characteristics:** 2 NC +1 NO.

**Brand:** [SCHNEIDER ELECTRIC](#)

**Uses:** Safety in use, safety stop control of protected areas.

**Observations:** "Low level" auxiliary contacts compatible with controller inputs.

## 8.10 Safety switch

### 8.10.1 Mechanical switch

**Characteristics:** 2 NC +1 NO or 3 NC. Lockable.

Only a single reference is kept by the supplier (opening in G or D, etc.); for each specific application, contact the supplier who will document the specific reference.

**Brands:** [EUCHNER](#), [SCHNEIDER ELECTRIC](#)

**Use:** Locking device or safety gate interlocks.

**Observations:** —

### 8.10.2 Non-contact switch

**Characteristics:** Static outputs. Transponder technology. Lockable.

**Brands:** [EUCHNER](#), [SICK](#)

**Use:** Coded locking device

**Observations:** Category 4

## 8.11 Sensitive floor

**Characteristics:** —

**Brands:** [HAAKE Gamme HSM](#)

**Uses:** Dangerous area monitoring.

**Observations:** Category 3.

## 8.12 Two-hand control panel

**Characteristics:** —

**Brands:** [SCHNEIDER ELECTRIC](#), [SIEMENS](#)

**Use:** Operator safety with distance.

**Observations:** —

## 8.13 Configurable safety logic controller

**Characteristics:**

**Brands:** [PILZ](#), [SCHNEIDER ELECTRIC](#), [SICK](#)

**Use:** Safety functions processing with setting of blocks functions predefined .

**Observations:** —

## 8.14 Safety PLC

**Characteristics:** Controllers which only process safety functions.

**Brands:** [SIEMENS](#)

**Use:** Safety functions processing

**Observations:** See Programmable logic controller segment.

*Zone without text*

## 9 Motorization (EIM Segment)

### 9.1 Auto-synchronous motor (EIM2 Segment)

#### 9.1.1 SIEMENS

A SIEMENS technical reference system giving the component list recommended for the powertrain machining sector is available at the address "<https://workplace.automation.siemens.com>" ( see your SIEMENS local correspondent to obtain the access right).

#### 9.1.2 FANUC

A FANUC technical reference system, giving the component list recommended for the powertrain machining sector is available at the address  
« <http://share.fanuccnc.eu/share/page/site/Renault/dashboard> » ( see your FANUC local correspondent to obtain the access right).

### 9.2 Spindle motor (EIM2 Segment)

#### 9.2.1 SIEMENS

A SIEMENS technical reference system giving the component list recommended for the powertrain machining sector is available at the address "<https://workplace.automation.siemens.com>" ( see your SIEMENS local correspondent to obtain the access right).

#### 9.2.2 FANUC

A FANUC technical reference system, giving the component list recommended for the powertrain machining sector is available at the address  
« <http://share.fanuccnc.eu/share/page/site/Renault/dashboard> » ( see your FANUC local correspondent to obtain the access right).

### 9.3 Drives and motion control (EIM3 Segment)

#### Warning:

1. For flux vector control regulation and closed loop applications associated with drives, the motors must be the same brand as the drive or approved by the drive supplier.
2. For open loop applications, the OEM must ensure that the drive/motor pair are compatible.



**Observations:** The temperature of the cabinets in which the drives are installed is 40°C at the most. Single-phase drives are prohibited.



The regeneration in the network is recommended when there is economy of energy.  
Parallel motor control on a single drive is usually forbidden. Consult the contract manager.  
Use of drives under IT neutral mode is subject to very significant restrictions: Consult the contract manager.

#### For use on handling applications in assembly body

#### With asynchronous motor :

**Characteristics:** Supply voltage 3 x 230/400 V 50 Hz or 60 Hz, 4-pole coil, Rotation speed 1500 tr/mn,

**Brands:** [LEROY SOMER](#), [SEW-USOCOME](#)

#### **Case of Asynchronous brake motor**

**Brake characteristics:** Loss of voltage, rectified single-phase type, Brake coil 180 Vcc, connection 400V, separate supply,

**Case of Flame-proof asynchronous motor**

Associated with drives, the motors must compulsorily be fitted with temperature probes. The O E M must write the installation self-certification document.

**With Autosynchronous motor**

The motor has an absolute measurement. Multi-turn, it comes with or without brakes.

**Brands:** [BOSCH REXROTH](#), [SIEMENS](#), [LEROY SOMER](#)

**With Permanent-magnet synchronous compact motors,**

**Observation :** with or without brakes. The sensor is the incremental encoder type, multi-turn absolute or multipoint resolver.

The encoder signals and motor temperature without DRIVE-CLIQ interface must be connected via **External Sensor Modules (SME20/25)** in case of **SINAMICS S120**-driven system use.

**Brand:** [SIEMENS](#)

### 9.3.1 BOSCH REXROTH

**Observations:** To be used only with motors and cables by the same manufacturer. This hardware is only operational in the 3 x 400V neutral mode TN connection network. In the case of an neutral mode IT connection, it is compulsory to use an isolating transformer.

#### 9.3.1.1 Bosch rexroth NC locator box

**Characteristics:** drive box for 2 until 4 axis for the positioning .

**Brands:** [BOSCH REXROTH](#)

**Use:** : For various bodywork applications.

**Observations:** For synchronous motor.

This IP54 function is in PN network. Get in touch with the automatism project manager.

### 9.3.2 LEROY SOMER

#### 9.3.2.1 LEROY SOMER UNIDRIVE SP series

**Characteristics:** From 0.75 to 110 kW; I/O option card, positioning card, ground network card.

**Use:** For various uncovered applications by drive functions. Ex: Positioning, closed loop, fluid applications

**Observations:** For induction and asynchronous motors with or without internal or external encoder feedback.

**Card option:** SM INTERBUS, SM PROFIBUS DP, SM IO, SM POS, SM-UNIVERSAL ENCODER PLUS

**Brand :** [LEROY SOMER](#)

#### 9.3.2.2 LEROY SOMER POWERDRIVE series

**Characteristics:** From 45 to 550 kW, braking transistor **IP21 or IP54**

**Use:** For various applications. Ex: Press, fluid applications

**Observations:** For induction motor with or without encoder feedback.

**Do not use network card to preserve the security input.**

**Brand :** [LEROY SOMER](#)



#### 9.3.3 SEW – MOVIPRO series

**Brand:** [SEW-USOCOME](#)

**Use:** For application on the SOPAP turntable

**Observations:** Inverter with a degree of protection IP54, connected on Profinet network , safety with Profisafe, associated with a SEW motor. Get in touch with the automatism project manager

### 9.3.4 SEW – MOVIDRIVE series

**Brand:** [SEW-USOCOME](#)

**Use :** For specific applications on conveyors with a master traction motor and a slave tension motor

**Observations :** Inverters with a degree of protection IP20, associated with SEW motors, connected in Profinet network. Get in touch with the automatism project

### 9.3.5 SCHNEIDER ELECTRIC

#### 9.3.5.1 SCHNEIDER ELECTRIC ATV61 series

**Brand:** [SCHNEIDER ELECTRIC](#)

**Use** Only for pump and ventilation applications.

**Observations:** IP21 or IP54. To be used only for power greater than or equal to 15 KW. Get in touch with the contract manager

#### 9.3.5.2 SCHNEIDER ELECTRIC ATV71 FSAVEQAP071 XXX cabinet series for Press motor

**Brand:** [SCHNEIDER ELECTRIC](#)

**Use:** For press applications.

**Observations:** To be used only for power greater than 55 KW. Get in touch with the contract manager.

### 9.3.6 SIEMENS

- A SIEMENS technical reference system giving the component list recommended for the powertrain machining sector is available at the address "<https://workplace.automation.siemens.com>" ( see your SIEMENS local correspondent to obtain the access right

#### 9.3.6.1 SIEMENS S120 series

**Brand:** [SIEMENS](#)

**Characteristics:** SINAMIC range configurable motions control, available in analogical or digital control version. The axis modules are designed for range 1FT/1FK and 1FN motors, the power modules will be chosen according to the motor power and supply module according to accumulated power called the intermediate circuit.

**For the applications with mono axis, the Blocksize format must be used with a control unit CU310.**

**For the applications with more 3 axis, the booksize format is recommended with a control unit CU320.**

**Use:** Mainly for various mechanical applications for motor control and regulation of machine-tool axes and spindles.

**Observations:** To be used only with motors and cables by the same manufacturer. This hardware is only operational in the 3 x 400V TN connection network. Otherwise, it is compulsory to use an isolating transformer, without also forgetting to use the filtering modules.

Warning with the type of absolute encoder with an asynchronous motor (encoder SSI, ENDAT only)

The control by PN network facilitates the drive implementation, the PROFISAFE protocol allows not to use line relay

The mechanical / electrical sizing and the inverter setting must follow the manufacturer's recommendations.

#### 9.3.6.2 SIEMENS SIMOTION series

**Brand:** [SIEMENS](#)

**Characteristics:** the SIMOTION series is divided into 3 categories. Only the version SIMOTION D is allowed (retained) for our application the Right SIMOTION is a variant compact based on training(drive) of the family SINAMICS S120. SIMOTION answers a need of synchronization and interpolation of trajectory.

**Use :** for application specific in body shop /assembly. Ex Transstoker, test bench.

**Observations :** use only with motor and cables preconised by siemens. This hardware is only operational in the 3 x 400V TN connection network.

#### 9.3.6.3 SIEMENS G120D-2 function drivebox V4

**Brand:** [SIEMENS](#)

**Characteristics:** Drive function from 0.37 to 7.5 kW with or without on-off second axis 0.37 kW or 2.2 kW IP54.

**Use:** For all handling applications from 0.37 kW to 7.5 kW.

**Observations:** For asynchronous motor with or without encoder feedback. ( incremental encoder TTL)  
This IP54 function is in PN safe network.

#### 9.3.6.4 SIEMENS G120-2 plate

**Brand:** [SIEMENS](#)

**Characteristics:** Drive function from 11 to 15 kW. IP20

**Use:** For all handling applications from 11 kW to 15 kW.

**Observations:** For asynchronous motor without encoder feedback  
Control is on-off (24 V)

#### 9.3.6.5 SIEMENS G120 series

**Brand:** [SIEMENS](#)

**Characteristics:** Drive from 15 kW to 200 kW. IP20

**Use:** For all handling applications and energy application from 15 kW to 200 kW.

**Observations:** For asynchronous motor choose the power of the drive in high load

**Option:** Line filter

#### 9.3.6.6 SIEMENS G150 series

**Brand:** [SIEMENS](#)

**Characteristics:** Drive cabinet from 55kW to 400kW IP54.

**Use:** for any applications of press.

**Observations:** for asynchronous motor with or without encoder, braking by resistor. Control by Input/output or by network PN. Get in touch with the contract manager.

#### 9.3.6.7 SIEMENS S150 series

**Brand:** [SIEMENS](#)

**Characteristics:** From 75 to 1500 kW; restoration of current.

**IP21 or IP54.**

**Use:** For various bodywork applications. E.g.: Press, fluid applications

**Observations:** For asynchronous or synchronous motor with or without encoder feedback.

This IP54 function is in PN safe network. Get in touch with the contract manager.

### 9.3.7 FANUC

A FANUC technical reference system, giving the component list recommended for the powertrain machining sector is available at the address

« <http://share.fanuccnc.eu/share/page/site/Renault/dashboard> » (see your FANUC local correspondent to obtain the access right).

## 9.4 Starters

**Observations:** Starter usage is kept for pumps and ventilation. Using this is subject to the automation contract manager's approval.

### 9.4.1 SCHNEIDER ATS48

**Brand :** [SCHNEIDER ELECTRIC](#)

**Observations:** in 400V three-phase network. Pay attention to the utilisation category:

Standards CL10 applications

Harsh CL20° applications

Use the by-pass solution with contactor

### 9.4.2 LEROY SOMER DIGISTART D3 Series

**Brand:** [LEROY SOMER](#)

**Observations** : in 400V three-phase network with motor star connection. The option by-pass is necessary. The category of use answers the standard **IEC 60947-4-2** AC53B:

## 9.5 IP65 motor start decentralised

### 9.5.1 In PROFIBUS DP network in IP20 and IP65 enclosures

A SIEMENS technical reference system giving the component list recommended for the powertrain machining sector is available at the address "<https://workplace.automation.siemens.com>" ( see your SIEMENS local correspondent to obtain the access right

### 9.5.2 In PN network in IP65: ET200PRO

**Characteristics: ET200 pro motor start** PN network motor range from 0.37 to 4 kW.

Direct or reversing standard series (abbreviated designation: DSe ST, RSe ST) 0.15 to 2 A and 1.5 to 12 A

**Brand:** [SIEMENS](#)

**Use:** For various handling applications.

**Observation: *Negotiated configuration for 4 tables in line with 0.37 kW Engine fit.***

1 HF PROFINET interface module with termination module incorporating a Switch

1 connection module for PROFINET M12 7/8" interface module

4 110-mm backdrop plane bus modules

1 Electronic Module - 8 inputs 24v DC High Feature

1 CM connection module for IO 8 inputs x M12

3 connector set for power infeed

4 ET 200pro DSe ST, direct motor starter 0.15 to 2A

1 wide Rail 1000 mm for IM, PM-E, IO and motor start

### 9.5.3 PN network: M200D

**Characteristics:** Direct M200D motor starter on the PN network range from 0,37kw to 5.5 kW . Direct standard serie ( abbreviated designation : DS) 0,15 à 2 A et 1,5 à 12 A

**Brand:** [SIEMENS](#)

**Use:** For body shop conveyors.

## 9.6 Optical encoder and scale (EIM9 Segment)

### 9.6.1 Absolute encoder with ENDAT protocol

**Characteristics:** ROQ 425 series (8192 points, 4096 turns, ENDAT output)

**Brand:** HEIDENHAIN

**Observations:** Can be used as an alternative encoder of Unidrive SP drive function

For equipment subjected to cutting fluids, the encoders and scales must be pressurized with the HEIDENHAIN DA300 system with built-in pressure control.

### 9.6.2 Absolute encoder with Profinet protocol

**Characteristics:** Absolute Multiturn encoder

**Brand:** [SIEMENS](#), ITR

**Observations:** Can be used as machine encoder for the position return to PLC.

For encoders used in presses, use of damping.

### 9.6.3 Incremental encoders

**Characteristics:** Incremental rotary encoders, radial termination with cable and connector.

**Brand:** HEIDENHAIN

**Observations:** For equipment subjected to cutting fluids, the encoders and scales must be pressurized with the HEIDENHAIN DA300 system with built-in pressure control.

#### 9.6.4 ATEX incremental encoders

**Characteristics :** Codeur antidéflagrant homologué ATEX Directive 94/9/CE

**Brand :** BEI IDEACOD Range GAMX

**Observations :** For convoyors in ATEX area

#### 9.6.5 Optical linear scale

**Characteristics:** LS or LC series incremental or absolute scales

**Brand:** HEIDENHAIN

**Observations:** These incremental scales must be pressurized and assembly must be carried out in such a way as to facilitate the change (HEIDENHAIN supports are recommended). For equipment subjected to cutting fluids, the encoders and scales must be pressurized with the HEIDENHAIN DA300 system with built-in pressure control.

#### 9.6.6 Optical linear position sensor

**Characteristics:** Reading of a bar code to determine a position.

**Brand :** [SICK](#) , [LEUZE](#), PEPPER FUCHS

**Observations :** SSI Interface. The implementation shall have to be strictly in compliance with the requirements of the manufacturer.

Used in handling applications in bodywork-assembly.

#### 9.6.7 ATEX encoder

**Characteristics :**

**Brands :** BEI IDEACOD Gamme xx

**Observations :** if si impossibilité de montage du codeur hors zone ATEX.

*Zone without text*



## 10 Programmable logic Controller - PLC (EIA Segment)

### 10.1 SCHNEIDER (EIA4 Segment)

The Schneider Electric technical reference can be used only for the carry-over.

Available on [Schneider Electric](#)

#### 10.1.1 Software Workshop

The software workshop held on a project must be appropriate with the software installed on the Main operator panel.

### 10.2 SIEMENS (EIA5 Segment)

Using of Siemens PLC is done in the Scube standard panel function used in bodywork/assembly and assembly powertrain sectors.

A SIEMENS technical reference system giving the component list recommended for the powertrain machining sector is available at the address "<https://workplace.automation.siemens.com>" ( see your SIEMENS local correspondent to obtain the access right

#### 10.2.1 S7-300 PLC

**Characteristics:** Modular and compact design, this range uses a vast choice of I/O modules, functional modules and network communication or point to point, can be combined at will. This range is distinguished moreover by the higher performances, complete instruction as well as the skill set to be communicated on MPI, Profibus-DP, Profinet-PN and AS-I

**Brand:** [SIEMENS](#)

**Use:** Standard and special machine tools, handling Panel Functions (MAC, LOP, MOP).

**Observations:** The programming is done using the Step7 software tool.

#### 10.2.2 ET200S CPU

**Characteristics:** The modularity of the ET200S I/O allows to realize with a im151-8(F) PN/DP a configuration of a System of order for small-scale facility with a single function. This device is limited in terms: of memory (192 to 256 Ko following the type of device), network, communication card, Plc embedded is type of S7-314 for a maximal of 128 I/O and requires an MMC card for use the PLC function.

**Brand:** [SIEMENS](#)

**Use:** Limited to one simple function without or with an HMI interface limited (Maxi 200 variables of tag). With this technical limits the use of this device is subjected after agreement of the account manager by making sure that the automatism and network and communication architectures and HMI necessary to the function needs are covered.

Using for order the whole of a facility is not authorized, in this case thanks to use the S7-300 PLC

**Observations:** The programming is done using the Step7 software tool.

#### 10.2.3 Software Workshop

The software workshop held on a project must be appropriate with the software installed on the Main operator panel (MOP)

**For more information about the software version in accordance to the Master and Panel type see GE03.W0.005 document**

## 11 Panels Functions

### 11.1 SCHNEIDER (EIA4 Segment)

The Schneider Electric can be used only for the carry-over.  
Available on [Schneider Electric](#)

### 11.2 SIEMENS (EIA5 Segment)

#### 11.2.1 Renault standard poka yoke system (MAC)

The Renault standard poka yoke system makes it possible to manage up to 200 cases in the Bodywork and assembly workshops, on the ASI V3 network in relation with the control system PSF, IPPS or Sip Meca. This function is dispatched by Sofrastock

List of references in the Excel file « codes mabec MAC » available on the Automatism and Robotic department website.

#### 11.2.2 Renault standard unforgettable system (SAO)

The SAO Function consists of an control box and 6 panel operator in max.  
This function is dispatched by Sofrastock

List of references in the Excel file « codes mabec MAC » available on the Automatism and Robotic department website.

#### 11.2.3 Panel “Specifications Standard System (S<sup>3</sup>)”

There is a [SIEMENS](#) configurator for all the panel functions. It makes it possible to obtain the Panel reference according to the options and the chosen customisations. Version of configurator to confirm with the project manager.

**For more information about the software version in accordance to the master and panel type, see the [GE03.W0.005](#) document. Version to confirm with the project manager.**

##### 11.2.3.1 MOP V2/V3 (Main Operator Panel)

###### 11.2.3.1.1 MOP V2

###### Controller and network :

- CPU S7-319F-3 PN/DP (customisable) Firmware version 2.3 mini
- Ethernet Switch Scalance X216 (16 Ethernet ports)
- Interfaces :
  - 1 SMP/OSCAR link (Ethernet Level 2)
  - 1 PSF/SIPTOL link (Ethernet Level 2)
  - 1 CIMPLICITY link (Ethernet Level 2) – option
  - 1 CP343-1 Standard for facility exchanges
  - 1 additional CP343-1 lean
  - 5 Ethernet TCP/IP ports on switch (Level1)
  - 1 Ethernet port on CPU for PG link
  - 10 connectors M12 PROFINET (Level 0), 12 if option PN/PN
  - 2 serial link RS232 or RS485

###### PC hardware:

- PC Box 627C (Core-I3 / 2,13GHz, 2Go RAM, HDD 250Go), Windows XP
- Screen TFT 15”
- Keyboard + mouse

###### Customisation:

Pushbutton type	Bodywork, paint, assembly, stamping, energy-process
CPU	319 PN/DP, 319F PN/DP
Language	French, English, Spanish, Russian, Indian, Turkish, Romanian, Portuguese, Slovenian

PLC Memory card	512KB, 2MB, 4MB
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**Options:**

Light stack call operator
Proper shutdown of the PC during a sudden power cut
Back extension cabinet
Lateral cabinet extension of 600mm
Air conditioning
PN/PN Coupler for facility exchanges
Level 1 Ethernet for facility exchange of important volume of data (CP343)
Additional coupler Link (CP343-1 lean)
CIMPLICITY or SAM Link (CP343-1 lean)
Serial link RS232 (CP340)
Serial link RS485 (CP340)
Panel shock absorber
Electrical Main Switch

## 11.2.3.1.2 MOP V3

**Controller and network :**

- CPU S7-319F-3 PN/DP with memory card 4Mb
- Switch Scalance X216 (16 Ethernet ports)
- Interfaces:
  - 1 Ethernet PC SMP/GEDAUTO link (Level 2)
  - 1 PSF/SIPTOL link (Level 2)
  - 5 Ethernet TCP/IP ports on switch (Level 1)
  - 1 Ethernet port on CPU for PG link
  - 8 M12 PROFINET connectors (Level 0)
  - With option or kit PN/PN gateway, 2 additional M12 connectors

**PC hardware:**

- IPC627D (Core-I3 / 2,4GHz, 4Go RAM, HDD 250Go), Windows 7
- Screen IFP1900, 19" (16:9)
- Keyboard qwerty US + mouse

**Options or Extension kits:**

Proper shutdown of the PC and CPU during a sudden power cut
Cooling unit
PN/PN gateway for facility exchanges (exchanges of safety datas is possible)

## 11.2.3.2 SOP V2/V3 (Sub Operator Panel)

## 11.2.3.2.1 SOP V2

**Base**

- PC Microbox 427C (Celeron M 1.2GHz, 1Go RAM, compact flash 2Go)
- 10" 800x600 Touch-sensitive screen
- Pushbuttons

**Customisation :**

Pushbutton type	Bodywork, paint, assembly, stamping, energy-process
Language	French, English, Spanish, Russian, Indian, Turkish, Romanian, Portuguese, Slovenian

**Options :**

Pedestrian or wall mounting fixing
Keyboard holder

## 11.2.3.2 SOP V3

SOP V3 is only compatible with MOP V3.

**Base**

- ITC1500 15" Thin Client
- Pushbuttons
- Remote access (VNC)

**Options :**

Pedestrian or wall mounting fixing
Keyboard holder + mouse holder

## 11.2.3.3 ROP-V2 (Remote Operator Panel)

**Interfaces:**

- 1 Anywhere PC link (Ethernet Level 1)
- 2 M12 connectors (if option pushbutton)

**PC hardware:**

- PC Box 627C (Core-I3 / 2,13GHz, 2Go RAM, HDD 250Go), Windows XP
- Screen TFT 15"
- Keyboard + mouse

**Customisation:**

Pushbutton type	Without Bodywork, paint, assembly, stamping, energy-process
Language	French, English, Spanish, Russian, Indian, Turkish Romanian, Portuguese, Slovenian
Supply	TN, IT

**Options:**

Light stack call operator
Proper shutdown of the PC during a sudden power cut
Air conditioning
Main Switch
Panel shock absorber

## 11.2.3.4 WOP-V2 (Workflow Operator Panel)

**Network**

- 1 X208 Scalance switch (8 Ethernet Ports)

**Interfaces**

- 1 SMP/OSCAR link (Ethernet Level 2)
- 7 ports Ethernet TCP/IP on switch
- 2 M12 connectors (if option pushbutton)

**Customisation:**

Pushbutton type	Without Bodywork, paint,
Language	French, English, Spanish, Russian, Indian, Turkish, Romanian, Portuguese, Slovenian
Power supplies	TN, IT

**Options:**

Light stack call operator
Proper shutdown of the PC during a sudden power cut
Air conditioning
Main Switch
Panel shock absorber

## 11.2.3.5 LOP V2/V3 (Lite Operator Panel)

## 11.2.3.5.1 LOP V2

**Basic characteristics:**

Touch screen

- MP 277 10" (or option without screen)

PLC and network

- PLC customisable
- 2x16 inputs cards (SM321) and 1x16 outputs cards (SM322)

Interfaces

- According to the options retained.

**Customisation:**

Supply type	TNS, TNC, IT (with transfo)
CPU	317 PN/DP, 317F PN/DP (no compatible with Safety V2) 319F 3PN/DP (compatible with safety V2)
Language	French, English, Spanish, Russian, Indian, Turkish, Romanian, Portuguese, Slovenian
PLC Memory card	512KB, 2MB, 4MB

**Options:**

LOP without screen (Remote screen to be ordered with the D-LOP reference)
D-LOP (1 max, 2 if LOP with screen)
Lateral extension of 600mm
Light stack call operator
4 Colours luminous column
Air conditioning
Rack extension (IM360 and 361)
8 port Profinet switch (only 1 switch possible: Profinet OR Level1)
Level 1 Ethernet switch, 8 ports(only 1 switch possible: Profinet OR Level1)
Level 1 Ethernet link(CP343)
PSF/SIPTOL Link (CP343-1 lean)
SAM/SMPLOC Link (CP343-1 lean)
RS232 Serial link(CP340) (2 max serial links)
RS485 Serial link(CP340) (2 max serial links)
RFID Coupler
PN/PN Coupler for inter-islet exchanges

## 11.2.3.5.2 LOP V3

**Basic characteristics:**

Controller and network

- CPU S7-317 2PN/DP
- Switch Scalance X208 (8 Ethernet ports)
- ET200S with 3x8 inputs cards, 2x8 outputs cards, 1 RS232 card

Interfaces

- 1 PSF/SIPTOL/SIPMECA link (Level 2)
- 1 RS 232 serial link (ET200S)
- 3 Ethernet TCP/IP ports on switch (Level 1)
- 3 M12 Profinet connectors (Level 0)

**Options :**

Lateral extension of 600mm
Cooling unit
Power supply 400V IT (with transfo)

## 11.2.3.6 D-LOP V2/V3 Remote screen for LOP (Decentralized - Lite Operator Panel)

## 11.2.3.6.1 DLOP V2

**Basic characteristics:**

Touch screen

- MP 277 10"

Interfaces

- DI for pushbutton - option
- MPI link for screen
- Connection by Wago plug

**Customisation:**

Support	Wall or Ground mounting
Language	French, English, Spanish, Russian, Indian, Turkish, Romanian, Portuguese, Slovenian

**Options:**

With pushbutton
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## 11.2.3.6.2 DLOP V3

**Basic characteristics :**

Touch screen :

- TP 900 Comfort, 9"

Interfaces :

- DI for pushbuttons
- 2 Ethernet TCP/IP ports

**Options :**

Fixing: pedestrian or by the top
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## 11.2.3.7 PMS Box (Poste Manuel Standard)

## 11.2.3.7.1 PMS V1

PMS box, allow to transfer all the connection near of the operative device of the workstation . In addition to the power supplies of the box you can connect:

- The workstation HMI (SOP), and her pushbutton
- RFID station with 1 or 2 slots of reading / writing
- electrical screwing
- Remote I/O for take part, tools and poka-yoke
- One Bar code reader,
- Specific device of control for measuring or Waterproofness

**Basic characteristics:**

- 3 x 24 DCV output on terminal block
- 7 Profinet link on M12 connector
- 5 digital Input and 7 digital output available
- 1 RS232 link on Sub-D9 connector

## 11.2.3.7.2 PMS V2

The PMS box V2 has the same function like the PMS box V1

It's possible to connect:

- HMI (DLOP), and buttons.
- RFID station with 1 or 2 read / write devices
- Electric screwdrivers
- remote I / O for parts, tools, poka -yoke
- Bar code reader
- Autonomous specific devices such as sealing control box, mesures box, etc.

The PMS Box is available on 4 different references:

- PMS V2B (PMS base) *compatible with V1, it's possible to connect with MOP and SOP*
- PMS V2M (PMS + movement controls) *compatible with V1, it's possible to connect with MOP and SOP*
- PMS V2A (PMS + PLC)
- PMS V2AM (PMS + PLC+ movement controls)

**Electric specifications:**

- 2 connections 24V available,
- 7 connections profinet on M12 connectors
- 12 digital inputs and 15 outputs available
- 1 RS232 sub-d9 connection for bar code reader

## 12 Digital Control (EIC Segment)

### 12.1 SIEMENS (EIC2 Segment)

A SIEMENS technical reference system giving the component list recommended for the powertrain machining perimeter is available at the address "<https://workplace.automation.siemens.com>" for the integrators ( see your SIEMENS local correspondent to obtain the access right).

### 12.2 FANUC (segment EIC4)

A FANUC technical reference table giving the product list recommended for the powertrain machining perimeter is available at this address "<http://share.fanuccnc.eu/share/page/site/Renault/dashboard>" for the integrators ( see your SIEMENS local correspondent to obtain the access right).

*Zone without text*

## 13 Identification (EII Segment)

### 13.1 Radio frequency (RFID)

#### Main characteristics

- Read/Write error rate = **Zero** error without default message.
- Each error produces a breakdown, then less than one breakdown a month. Error rate = 1/10,000,000
- Operating temperature: - 10 °C to + 50 °C
- Storage temperature: - 25 °C to + 70 °C
- Shock resistant, vibration resistant
- Resistant in washing machine (IP68) for the tags.
- Resistance to the drying cycles by depression (Characteristics given by the mechanical workshop)
- Frequency 13.56MHz
- Compatibility with the norms:
  - The **ISO/IEC 15693** (Part 1 to 3) or **ISO/IEC 18000-3** norm Mode 1
  - The **ISO/IEC 14443** norm (Part 1 to 4)

**Brands:** [SIEMENS](#) RF300, [BALLUFF](#) BIS-C only for machining workshop

#### Particularities:

- BIET Balogh for reading tags Balogh from an API Siemens

#### 13.1.1 Transmitter – Receiver (E/R)

**Protection:** IP65

**Connection:** M12 connector

#### Characteristics:

- Operating temperature: 5 °C to 50 °C
- Storage temperature: - 25 °C to + 70 °C
- Shock resistant, vibration resistant

**Possible distance between Antenna and Control unit:** Greater than 30m – (desired 50m)

**Movement direction:** No direction if possible.

#### 13.1.2 Dynamic tags

**Protection:** IP68

**Technology:** FRAM. No battery for the data backup.

**Life duration of the tag :** Read + write more than 10<sup>+10</sup>

**Information retention:** More than 10 years

#### Characteristics:

- Operating temperature : - 10 °C to + 50 °C (-10°C due to exterior gateway)
- Storage temperature: - 25 °C to + 70 °C
- Shock resistant, vibration resistant
- Passing in washing machine (IP68) for the tags.
- Resistance top the drying cycles by depression (Characteristics given by the mechanical workshop)
- Direct fixing on the metal.

#### Memory characteristics

- Capacity : 8 Kbytes or 32 Kbytes
- Organisation : acces in word or in byte

#### Coupling Antenna – Label.

- **Nominal working distance :** 20mm
- **Maximum dialogue distance :** 100mm
- **Permissible off-centre:** +/- 30mm



### 13.1.3 Control and interface unit (CIU)

**Plan a program – Functional Block of communication:**

This program must ensure the following functions: communication commissioning control, network establishment control, management of the read or write-in command, breakdown of the control into several frames, send a specific defect code for each type of defect, communication recovery before the declaration of the dialogue problem, diagnostic zone reading in the CIU, etc.

**Networks:**

Profibus, Profinet, Ethernet TCP/IP,

**Protection:**

- IP65 for a network workshop assembly.
- IP20 for a switchbox and cabinet assembly.

**Possible distance between Antenna and Control unit :** Greater than 30m – (desired 50m)

**Input/Output:**

- Can control up to 2 read/write antennas.
- Available TOR Input/Output.

### 13.1.4 Portable terminal

**Characteristics:** Diagnostic pocket with display unit, remote antenna connectable for tags with a difficult access.

**Use constraints:** All the supplier range tags

## 13.2 Bar codes

### 13.2.1 Readers and Codes

**Brands :** DATALOGIC, [SICK](#)

**Code:**

- **Code 1D** (linear):
  - Alphanumeric Code: **Code 128A, code 128B, Code 128C.**
  - The code **128B**. This code accepts the figures and the uppercase and lowercase alphabetic characters. We would prefer the code 28B to the code 128A. Each byte encode one character.
  - The code **128C**. This numeric code is more compact. Each byte encode 2 figures.
- **Code 2D** (more dense) :
  - Code **PDF417**: Piling up of the linear code.
  - **Datamatrix** code: Matrix code, very dense code.  
Consider the cost of code generation in the choice of the solution.

**Manual Scanner:**

- Preferably with wire
- Wireless if justified. Several wireless technologies are available. Prefer 433MHz to Bluetooth which could disturb WIFI and PEV facilities used in our plants.

**2D Scanner:**

- The 2D scanners can scan codes 1D and 2D for the code PDF417. The Datamatrix code requires a more efficient material, costly. Recently, the 2D scanners can scan the 3 codes pertaining to us, in normal conditions.

**Resolution:**

The resolution is the width of the thinnest bar. This resolution defines the density of the code. In the choice of a scanner, it is necessary to check the compatibility with the code resolution.

### 13.2.2 Fixed Scanner

**Characteristics:** Industrial model, RS232 interface,

**Use constraints:** The choice of the scanner in the range is made according to the scanning distance, the dispersion of the bar code positioning to scan and its resolution.

**Observations:** Select models with integrated decoder due to the simplification (number of elements) to be implemented and the limitation of the availability of stock, but for dimensional constraint, it is possible for some to have the same model with external decoder.

There are 3 types of scanning:

- linear: Used to scan the codes in "scale" (horizontal bars-vertical scanning) on all the distances.
- Raster: Used to scan the codes in barrier (vertical bars) up to the average distance (30cm).
- Vibrating: Codes in barrier with a dispersion of the label location in surface and in the depth of the field and up to great distances.

### 13.2.3 Manual scanner: linear handheld scanner 1D

#### Characteristics:

- Scanner for all the 1D linear codes, exclusively. These scanners do not scan the 2D codes. They are less complex and less expensive. It is the scanner to be chosen to scan code128.
- The link with the control system can be with wire or wireless. (The wireless link increases the cost by around 200 €). Interface with wire of the type RS232 or screen/keyboard.
- For a greater distance link ( greater than 15m) between the scanner and control system, provide a RS232/RS485 adaptor

### 13.2.4 Manual Scanner: linear and PDF417 handheld scanner

**Characteristics:** Mechanical head with raster style scanner, RS232 interface or screen/keyboard.

**Observations:** This handheld scanner can scan only the PDF417 as bi-dimensional barcode. It can however scan all the other 1D linear barcodes. This type of scanner tends to be replaced by material which can also scan the Datamatrix. For a similar price, we would prefer the more efficient material.

### 13.2.5 Manual scanner: linear and bidimensional (PDF417, Datamatrix) handheld scanner

**Characteristics:** CCD (camera) Sensor head, RS232 interface or screen/keyboard.

**Use constraints:** There are several interfaces of which RS232, emulation keyboard screen used in our plants.

This scanner will be convenient for scanning the barcodes on paper.

### 13.2.6 Manual Scanner: handheld scanner for difficult bidimensional Datamatrix barcodes

**Characteristics:** CCD (camera) Sensor head, RS232 interface or screen/keyboard. This scanner is of a special category containing a lighting module in its scanning head. This is the only material which can scan a **Datamatrix** code hammered on a bright metallic surface in all the lighting conditions. Example of difficult reading : Datamatrix code on break disk, on aluminium rim, metal rusty, etc. It is always necessary to make a trial scanning in the real conditions before choosing the material. The fact sheet scanner is not sufficient. It is a costly material (around 3000€), but necessary for this case. If the code has to be scanned at several places, we recommend the same material for all the scanning positions internally and externally (supplier)

**Use constraints:** There are several interfaces of which RS232, emulation keyboard screen used in our plants.

### 13.2.7 Network interface

After scanning a barcode, the scanner sends a single frame which contains the entire information scanned, without standard protocol.

Profinet network connectivity is available from SICK

## 14 Fieldbus network, serial network and Ethernet network (EIT Segment)

### 14.1 Serial Network (EIT1 segment)

The recommended equipments for Serial Network are specified in the version D (and earlier) of the document EB03.C0.613.

### 14.2 Interbus (EIT4 segment)

The recommended equipments for Interbus network are specified in the version D (and earlier) of the document EB03.C0.613.

The Schneider Electric can be used only for the carry-over.

Available on [Schneider Electric](#)

### 14.3 Profibus DP (EIT5 segment)

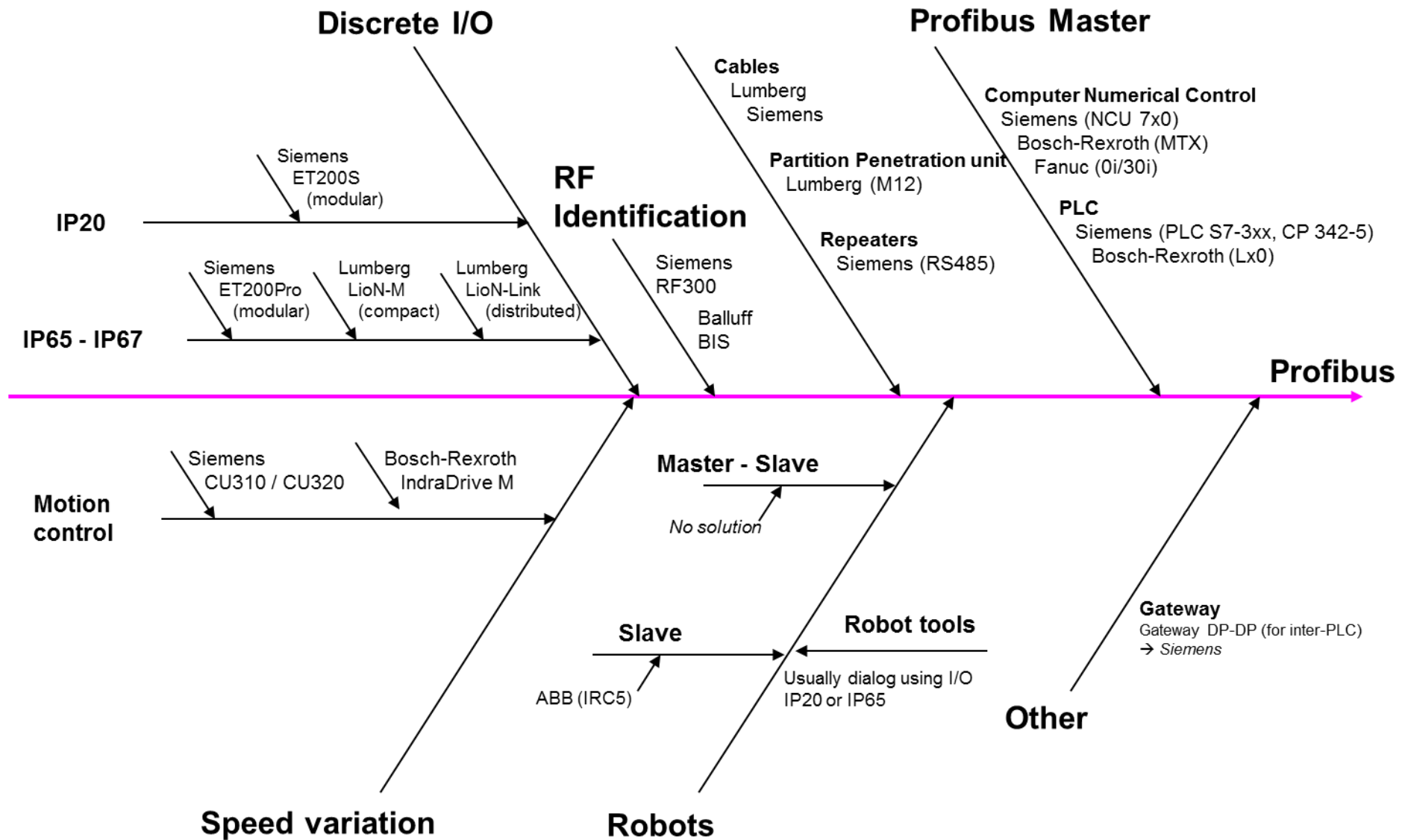
The EIT5 segment groups two fieldbus networks. DP-Profibus and IO-Profinet.

A SIEMENS technical reference system, giving access to the recommended references on the machining scope, is available at the address « <https://workplace.automation.siemens.com> » (see the SIEMENS correspondent for the access).

A [BELDEN-LUMBERG](#) standard, giving access to the recommended references on the machining perimeter, is available.

*Zone without text*

14.3.1 Network connectivity Fishbone Diagram



## 14.4 Profinet IO (EIT5 segment)

The EIT5 segment groups two fieldbus networks. DP-Profibus and IO-Profinet.

All the master and slaves connected to the Profinet IO network must be certified by the Profinet user organization (<http://www.profibus.com> [PI]). The integrator who wants to use a module not included in the "Renault recommended list of Equipment "must produce a product certificate copy to Renault.

A SIEMENS technical reference system, giving access to the recommended references on the machining perimeter, is available at the address « <https://workplace.automation.siemens.com> » (see the SIEMENS correspondent for the access).

### 14.4.1 Cabling

Description rules of implementation wiring in the guide **GE03.C0.160** (§3.7).

Each cable network has to be:

- Qualified for Profinet (note: certifications don't exist for Profinet cables)
- Buy at one of the laid down lengths (See below)
- With the **bending and torsion characteristics adapted to the need** (cable-carrier chain, robotic harness, or just laying in the duct)

**Observations:**

Preferably use **green** colour for PROFINET cordset, (and in any case, a distinct colour from these of the other installation cables)

**Brands:** ALL

#### 14.4.1.1 Network Wiring IP67

**Characteristics:** M12-M12 overmoulded cable (coding D-4 pins, male plugs)

**Imposed lengths:** 0.4m / 1m / 3m / 7m / 12m / 25m / (or near these lengths, according to the existing sizes proposed by the manufacturers)

#### 14.4.1.2 Network Wiring IP20

**Characteristics** RJ45-RJ45 overmoulded cable (uncrossed type cables)

**Imposed lengths:** 0.60 m / 1.5 m / 3m (or near these lengths, according to the existing sizes proposed by the manufacturers)

#### 14.4.1.3 Supply Wiring 24V – IP67

**Characteristics** : standard 7/8" connection 5 pins plug, (on the interface and power module PM-E) or M12-5 pins.

### 14.4.2 I/O IP20

#### 14.4.2.1 Modular Station (ET200S)

**Characteristics:** The modular peripheric station ET200S is made with an Interface and extension modules (up to 63). These extension modules can be Digital I/O or analog modules, technological modules (for sensor SSI, step by step motor, the counting, for serial data exchange by point to point link), direct or inverter electromechanical motor starter function box, and also security modules for the control of emergency stop and protection doors of security grade from 2 to 4.

**Observations:** certain extension module choices are common with those of the Profibus network.

**Brand:** [SIEMENS](#)

### 14.4.3 I/O IP65 (or IP67)

#### 14.4.3.1 Compact modules IP67 (ET200eco)

**Characteristics:** I/O modules, with 2 M12 ports (coding D) for Profinet network daisy chain, and 2 M12 port (coding A) daisy chain plugs for output supply. Each M12 I/O plug, enables to connect 2 inputs or 2 outputs (depending on the type of module).

**Brand:** [SIEMENS](#)

**IMPORTANT note:** Certain references of the ET200eco family use the electronic 24V as common supply for some outputs.

For example, on the 8DO DC24V/1 3A 8xM12 module:

- the 2 X3-X4 plugs are supplied by an auxiliary 24V (24V for outputs that can be cut in order to make secure an operator for example)
- the 2 X1-X2 plugs are supplied by the electronic 24V (thus supplied permanently!)

**References to be PROHIBITED** in new projects:



- 6ES7 142-6BH00-0AB0 : 16 DO DC24V/1.3A 8xM12
- 6ES7 142-6BF00-0AB0 : 8 DO DC24V/1.3A 4xM12
- All other reference using the electronic 24V as common supply for outputs.

#### 14.4.3.2 Modular stations IP67 (ET200pro)

**Characteristics:** the modular peripheral station ET200pro is made of a rail section supporting an interface module for PROFINET, power supply modules and the discrete I/O modules (maximum of 16 extension modules).

**Brands:** [SIEMENS](#)

#### 14.4.3.3 Compact module IP67 (LioN-M)

**Characteristics:** Profinet interface 2xM12D. 16 I/O M12A universal (configurable) 24V/1,6A. Power supply 7/8. Plastic housing.

**Observation:** for powertrain factories / projects only.

**Brand:** [BELDEN-LUMBERG](#)

#### 14.4.3.4 Distributed station IP67 (LioN-Link)

**Characteristics:** bus head with 2 sub-bus 100m maxi. Up to 15 I/O modules per sub-bus.

Bus-head: Profinet interface 2xM12D. Power supply M12A. Plastic housing.

I/O modules: 8 or 16 I/O M12A universal (configurable) 24V/1,6A. Power supply M12A or 7/8. Plastic housing.

**Observation:** for powertrain factories / projects only.

**Brand:** [BELDEN-LUMBERG](#)

#### 14.4.3.5 Profinet head modules for pneumatic platform (CPX)

**Characteristics:**

Use of the "CPX" system

Profinet interface with 2xM12 ports (coding D) and power supply 24V 7/8. The I/O modules have M12 ports (coding A). Aluminium housing.

The CPX system can have a maximum of 10 electrical modules (with the head station module) + 1 pneumatic interface module. The maximum volume address is 64 bytes inputs and 64 bytes outputs.

For pneumatic equipments, refer to the list of Renault recommended equipments [E06.03.105.R](#) .

**Brand:** [FESTO](#)

#### 14.4.4 Profinet Switches

Use of manageable switches, managing the Profinet frame priority.

**Brand:** Siemens, references X208, X208pro, and X216 (IP20).

#### 14.4.5 PN/PN Gateway

Description of the PN/PN gateway implementation in the guide [GE03.C0.160](#) (Annex 7).

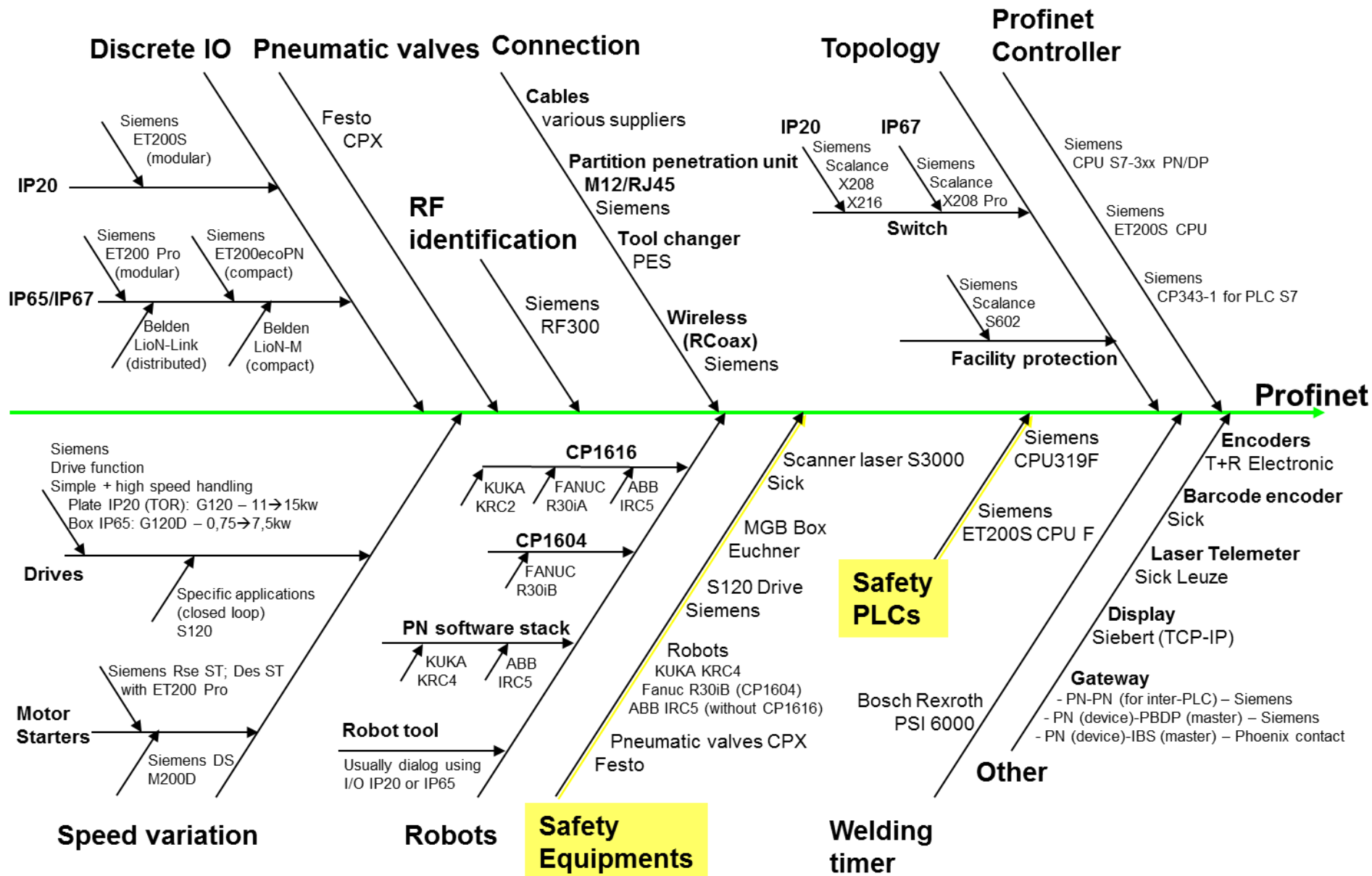
**Use:** The PN/PN gateway allows the data exchange between 2 Siemens PLCs. It is used for the inter-facilities communication.

**Brand:** [SIEMENS](#)

It is available in option or extension kit in the MOP.

*Zone without text*

14.4.6 Network connectivity Fishbone Diagram





## 14.5 Ethernet (EIT6 segment)

### 14.5.1 Industrial Switches IP20 – for automation networks

Recommendations extracted of the *“Implementation guide for Level 1 and Level 2 network function, in the Siemens Scube technical reference guide”* [GE03.CO.004](#).

**Use:**

- Do not use HUB
- These switches **MUST NOT BE** used for Profinet network.
- These switches must not be connected to the Ethernet network of the plant (IT level), and are destined to the local Ethernet networks used in the Automation perimeter of responsibility.
- Must be used in an **IP20** industrial environment, in cabinet or box.

**Characteristics:**

- 24V power supply
- RJ45 copper ports
- Ethernet compatible 10/100 Mbit/s Base-T (copper twisted pairs)
- “autocrossing” functionality for each port
- DIN rail connector
- quick replacement (no setup or configuration on removable support, plug-in connecting blocks)
- minimum diagnostic on the front LEDs:
  - presence of network tension: 1 LED per port
  - presence of the supply tension of the Switch

**Brands:** [PHOENIX CONTACT](#), [SIEMENS](#)

Other brands possible after agreement of Renault person in charge of automatism

### 14.5.2 Switches – for connection to the Ethernet network of the plant (IT Level)

Recommendations extracted from the document *“Guide de mise en œuvre des réseaux Ethernet, dans le Référentiel technique Schneider”* – [GE03.MO.170](#)

**Use:** for certain specific architectures, when it is necessary to connect an network of the automation Level (Automation perimeter of responsibility), directly to the Ethernet network of the plant.

**Characteristics:**

The switches connected to the plant network must be validated by the person in charge of the IT infrastructure of the factory.

The recommendations of the DSIR are the followings:

- manageable switch
- Cisco brand

**Other automation recommendations:**

They must be rapidly replaced in case of failure. Thus, their configuration must be as in default, or they must have a memory card storing the parameters.

**Brand:** Cisco

### 14.5.3 Cabling

**Observation:** use Ethernet cable, overmoulded, ordered at required length (the extra length has to be optimised, according to the existing sizes proposed by the manufacturers), preferably use white colour (and in any case, a distinct colour from that of Profinet cables).

**Cables characteristics:**

- Ethernet cables 100 BASE TX (cable made of 4 twisted pairs)
- RJ45-RJ45 uncrossed type
- 100 Ohms, FTP protection (sheet of foil surrounding the wires) with a mass drain connected to RJ45 connector shieldings.
- Category 5 or higher (performance levels and characteristics of the cables certified to be used at speed up to 100Mhz)
- Halogen free envelope (LSZH) (fire proof and does not produce toxic smoke during combustion)

**Brands:** TOUTES

#### 14.5.4 Optical data transmission

Existing with an Ethernet Interface or in RS232/RS485 serial link

**Use:** Optical data transmission over long distance, using infra-red frequency (e.g.: tri stock).

**Characteristics:** Range 0 – 200m/500m, 24V DC, 2Mbit/s maximum.

**Brands:** [Leuze Electronic](#)

#### 14.5.5 Isolation of networks (S602)

Description of the Scalance S602 implementation in the guide [GE03.C0.024](#).

**Use:** Safety modules permit to protect a network, in allowing only some accesses. It is used to separate the facility network and the backup network, when there is a backup management for several facilities.

**Characteristics:** Scalance S602 safety module, NAT function, firewall

**Brand:** [SIEMENS](#)

### 14.6 Inter-network gateway

Gateways allow communication between equipments belonging to two distinct networks, can be different types.

It exists 2 sorts of gateways:

- slave / slave : communication between 2 master of distinct networks
- slave / master : communication between 1 master and some slaves belonging to different types of networks.

Description of the general principles of gateways in the document [GE03.U0.005](#).

#### 14.6.1 Profinet IO / Interbus gateway

**Use:** Communication between a S7 PLC and Interbus slaves

**Characteristics:** PN device / IBS master gateway

**Brand:** [PHOENIX CONTACT](#)

#### 14.6.2 Other gateways

Contact Renault person in charge of automatism.

**Brand:** HMS

*Zone sans texte*

## 15 HMI (EIH Segment)

See also the technical reference system of control system in question

### 15.1 HMI : operator console function

**Characteristics:** Touch screen terminal installed in switchbox assembly; Connection with the help of the plugs or plug-in terminal block (M12,M23 or WAGO type); Push button composed of two buttons, a luminous push button and an emergency stop button; Screen resistant to the welding spatters or protection by the transparent hood with hinges; SIEMENS material (Sub Operator Panel) usable exclusively with a MOP; Supply of the cables and in option, foot and keyboard shelf.

**Brands:** [SIEMENS](#)

**Use:** Bodywork Assembly and Powertrain Plant

**Observations:** —

### 15.2 HMI : starting point display

**Characteristics:** Display diversity in steel housing - 2 lines of 13 characters - Power supply over Connector 7/8 - Net Ethernet TCP-IP

**Brands:** SIEBERT

**Use:** Bodywork Assembly Plant.

**Observations:** —

## 16 Robotic (EIR Segment)

Each robot supplier who is in the Renault panel has a technical reference validated by the Automation and Robotic Engineering Department.

These technical reference describe:

- The list of available processes (handling, SRE+handling, Sealant, etc.)
- The process detail (controller equipment, robot, etc.)
- The different options (length of the controller/robots links, operator cam. Etc.)
- The software versions (manufacturer basic and application)
- ...

These technical reference systems are available in the directory: "Offre\_Robot"

### 16.1 ABB IRC5 Robot Controller: Segment EIR2

**Installation on Profinet/Profisafe field bus network**

**Technical reference :** *Profinet offer: Technical descriptive CVP 2014\_Profinet*  
*Profisafe offer: Technical descriptive of ABB Equipment Cordoba*  
*V4\_Profisafe*

### 16.2 Robot controller KUKA KRC4: Segment EIR3

#### 16.2.1 Installation on Profinet/Profisafe field bus network

**Technical reference:** Technical offer *KUKA Ref : 6284./R/11 project 2011/921/0010*

### 16.3 FANUC R30iA Robot Controller: Segment EIR6

#### 16.3.1 Installation on Profinet/Profisafe

**Technical reference :** Technical offer *FANUC EL1503078\_A – Renault\_tolerie-robots\_Equipements-projets\_2.pdf*

### 16.4 Robot controller UNIVERSAL ROBOT CB3

**Technical reference :** *UR10 + baie de commande CB3 (Offre commerciale D140437D)*

## 17 List of recommended brands

- ABB
- Balluff  
<http://www.balluff.com/balluff/MFR/fr/service/project-documents-downloads.jsp#>
- Belden Lumberg  
Pour les projets mécaniques :  
[http://beldensolutions.com/en/Solutions-Markets/automotive/automotive\\_portal](http://beldensolutions.com/en/Solutions-Markets/automotive/automotive_portal)  
Username: automotive-portal@belden.com  
Password: 1234abcd
- Bosch Rexroth  
<http://www.boschrexroth.com/rnspec>
- Cisco
- Datalogic
- Entrelec
- ETA
- Euchner  
[www.euchner.de](http://www.euchner.de) Language EN, click on Service tab, Download, Automotive field and  
Username: Renault  
Password: Renault
- Fanuc
- Festo  
[http://www.festo.com/cms/en-gb\\_gb/15084.htm](http://www.festo.com/cms/en-gb_gb/15084.htm)
- Haake  
[http://www.haake-technik.com/index.php/Lsite\\_de\\_référence.html](http://www.haake-technik.com/index.php/Lsite_de_référence.html)
- Harting
- Heidenhain
- HMS
- IFM  
<http://www.ifm.com/ifmgb/web/automobile-download.htm>
- ILME
- ITR
- Jaeger
- Keyence  
[https://www.keyence.fr/landing/fr\\_lp\\_renault\\_GL-R.jsp](https://www.keyence.fr/landing/fr_lp_renault_GL-R.jsp)
- Kuka
- Legrand
- Leroy Somer  
<http://www.emersonindustrial.com/en-EN/automationsolutions/renault/Pages/default.aspx>
- Leuze  
[http://www.leuze-electronic.de/fr/deutschland/kontakt\\_und\\_support/download/freigabelisten/index.php](http://www.leuze-electronic.de/fr/deutschland/kontakt_und_support/download/freigabelisten/index.php)
- Lutze
- Moeller-Eaton
- Murrelektronik
- Phoenix Contact  
[https://www.phoenixcontact.com/online/portal/fr?1dmy&urile=wcm%3apath%3a/frfr/web/main/solutions/subcategory\\_pages/Automotive\\_Industry](https://www.phoenixcontact.com/online/portal/fr?1dmy&urile=wcm%3apath%3a/frfr/web/main/solutions/subcategory_pages/Automotive_Industry)
- Pilz  
[https://www.pilz.com/eshop/b2b/init.do?language=fr&userid=DD10E6B22A1&password=renault&category=AC006\\_FR07\\_BP\\_70065829\\_RENAULT](https://www.pilz.com/eshop/b2b/init.do?language=fr&userid=DD10E6B22A1&password=renault&category=AC006_FR07_BP_70065829_RENAULT)

- Schmersal
- Schneider Electric, Télémécanique  
<https://sites.google.com/site/schneiderrenault/>
- Senstronic  
<http://senstronic.com/partage/renault/>
- Sew Usocome  
[https://share.usocome.com/upload/renault/SEW\\_USOCOME\\_-\\_Modif\\_TG.pdf](https://share.usocome.com/upload/renault/SEW_USOCOME_-_Modif_TG.pdf)
- Sick  
[https://s.sick.com/fr-fr-liste-materiel\\_SICK\\_Renault\\_norme\\_EB03C0613](https://s.sick.com/fr-fr-liste-materiel_SICK_Renault_norme_EB03C0613)
- Siemens  
<https://www.workspace.swe.siemens.com/content/10000001/renault-carrosserie/>
- Socomec
- Turck Banner Escha  
[https://portal.turck.de/sites/pr\\_office/sales/renault](https://portal.turck.de/sites/pr_office/sales/renault), username and wordpass must be asked to [Lionel.Miquet@turck.com](mailto:Lionel.Miquet@turck.com) or <ftp://ftp.turck.de/Renault/> with as username: renault-read and as wordpass #SiM5!!
- Wago
- Weidmuller

## 18 List of referenced documents

NOTE	:	For undated documents, the latest version in force applies
Di 94/9/CE	:	Directive concerning the coming together of the legislations of Member states for devices and the protective systems intended to be used in explosive atmospheres.
IEC 60127-2	:	Miniature fuses - Part 2 : cartridge fuse-links
IEC 60269-1	:	Low-voltage fuses - Part 1 : general requirements.
IEC 60269-2	:	Low-voltage fuses. Part 2 : supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application)
IEC 60269-4	:	Low-voltage fuses - Part 4 : supplementary requirements for fuse-links for the protection of semiconductor devices
IEC 60898-2	:	Circuit-breakers for overcurrent protection for household and similar installations - Part 2 : circuit-breakers for a.c and d.c. operation
IEC 60934	:	Circuit-breakers for equipment (CBE)
IEC 60947-1	:	Low-voltage switchgear and controlgear - Part 1 : general rules
IEC 60947-2	:	Low-voltage switchgear and controlgear - Part 2 : circuit-breakers
IEC 60947-3	:	Low-voltage switchgear and controlgear - Part 3 : switches, disconnectors, switch-disconnectors and fuse-combination units
IEC 60947-4-1	:	Low-voltage switchgear and controlgear - Part 4-1 : contactors and motor-starters - Electromechanical contactors and motor-starters
IEC 60947-5-2	:	Low-voltage switchgear and controlgear - Part 5-2 : control circuit devices and switching elements - Proximity switches
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